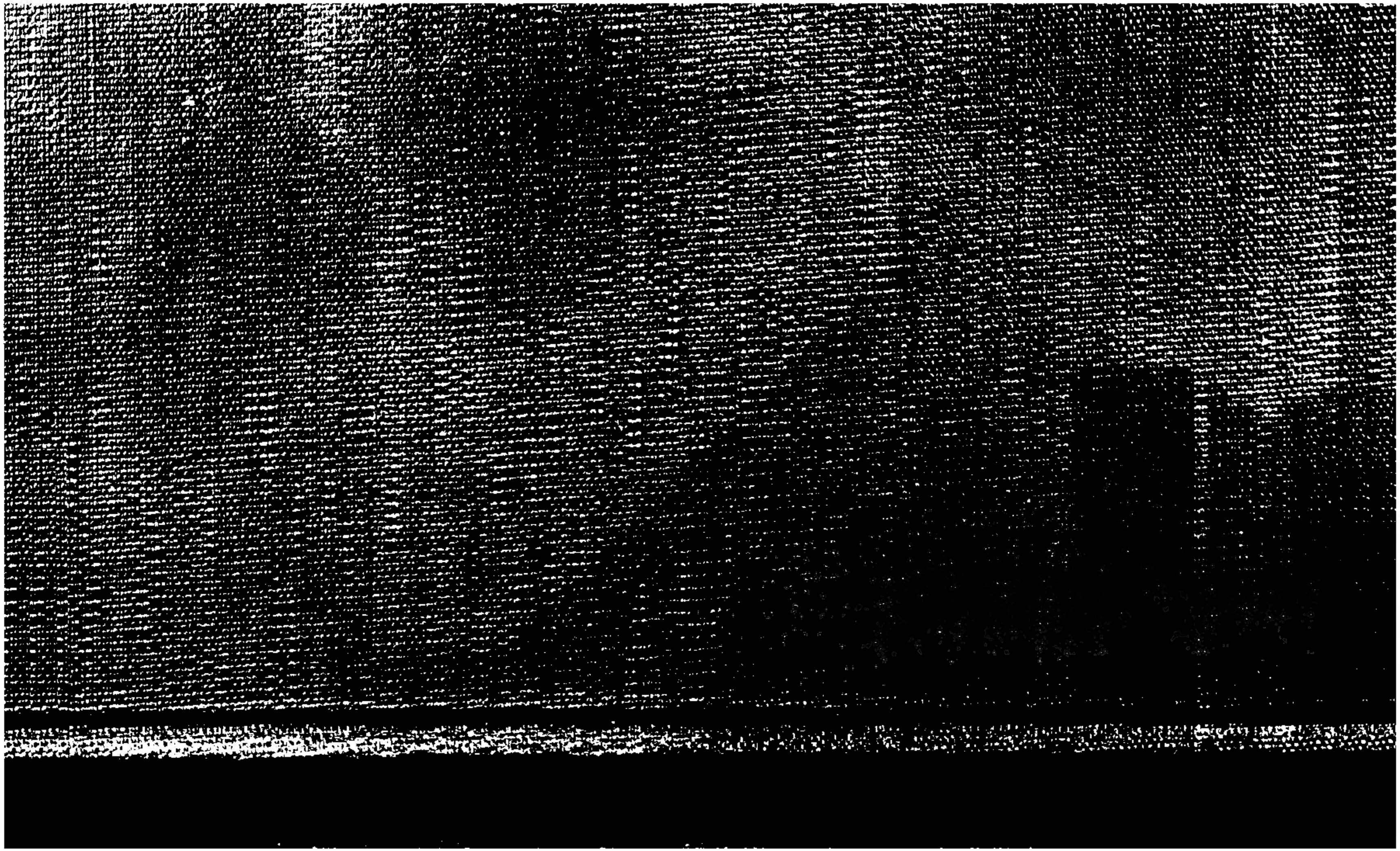

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The New York Botanical Garden

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(Nos. 193–199)

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Director of the Laboratories

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FRANCIS WHITTIER PENNELL

Associate Curator

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EDITOR
ARLOW BURDETTE STOUT
Director of the Laboratories

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VOL. XVII January, 1916 No. 193

REPORT ON A COLLECTING TRIP TO THE CENTRAL ROCKY MOUNTAIN REGION

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF,

Dear Sir: In order to study species of the Figwort family (Scrophulariaceae) a group assigned to me for "North American Flora" I was privileged to spend the greater part of the past summer in the central Rocky Mountain states, Colorado, Wyoming, Utah and southeastern Idaho.

I arrived at Pueblo, Colorado, Saturday, June 5. The next two weeks were occupied collecting on the high plains and in the foot-hills of eastern Colorado and southeastern Wyoming. Throughout this region, from Pueblo to Laramie, the same species were repeatedly encountered. Unfortunately the past spring had been very backward, even on the sixth of June a considerable fall of snow occurring over part of this area.

Pueblo is on the high plains. The topography was that met with throughout the western plateaus, great stretches of slightly rolling table-land broken by sudden terrace-like escarpments. These stretches were in all localities covered by sage-brush, or where the soil was strongly alkaline by various Chenopodiaceous plants. At Pueblo large clumps of a shrubby Opuntia were locally predominant.

Three species of Pentstemons were collected at Pueblo, *P. angustifolius*, *P. Jamesii*, and a third bright-blue species which I believe to be undescribed. Two of *Castilleja* were found, *C. integra*, a gorgeous-red, and the pale-yellow *C. sessiliflora*. As the species of Scrophulariaceae collected have not yet been

[Journal for December (16: 243–264) was issued Jan. 15, 1916]

critically reviewed, the names here used are tentative. I believe all are current and easily understood.

The high plains appear to, and in fact actually do, terminate, very abruptly. In early June, in a clear atmosphere, sight carried to a distance and with a distinctness quite novel to one from the East. From the Spanish Peaks to the south to Pikes Peak to the northwest, from Pikes Peak to Longs Peak, then to the Medicine Bow Range, mountain-chain after mountain-chain, each peak crested with snow, stood sharply against the sky. Only upon near approach did one see the "tumbled," irregular foot-hills, seemingly mountains in themselves, which everywhere to the east lie at the base of the great ranges.

I was upon the foot-hills first west of Colorado Springs. There the lower valleys of these were wooded, and the upper hillsides covered with thickets of oak. Near their base on open hillsides I first saw the beautiful lilac *Pentstemon secundiflorus*. The deep-blue *Pentstemon humilis*, a *Scrophularia* and *Pedicularis fluviatilis* were also noted in woodland.

At Denver I greatly appreciated the kindness of Prof. Ellsworth Bethel, who spared no effort to help me obtain the objects of my search. In his company collections were made at many points near the city, and at Golden and Boulder about the bases of the foot-hills.

At Windsor I was equally indebted to Mr. George E. Osterhout. Not only both in mid-June and in early-August was I the guest of himself and Mrs. Osterhout, but it was also a rare privilege to one freshly arrived in Colorado on a botanical mission to avail himself of Mr. Osterhout's extensive acquaintance with the state flora. During part of my excursion, as will be narrated later, I spent some time collecting with this botanist.

At Laramie, Wyoming, Prof. Nelson made me free to consult the Rocky Mountain Herbarium, and with one of his assistants an expedition was made to the type-station of *Wulfenia wyomingensis*. Because of the late season other species desired were not obtained.

While still with much in common, distance and difference of latitude accounted for considerable divergence between the floras

of Pueblo and of Laramie. But, so far as one may judge by a single family, although without any intervening mountain-chain or other natural break there is a much greater divergence between the floras of Laramie and of Rawlins, Wyoming. None of the eastern species were seen again westward, excepting the widely ranging *Collinsia parviflora*, *Veronica americana*, and *V. xalapensis*. Instead a different flora, characteristic of the dry interior of southwestern Wyoming, northwestern Colorado, northern Utah and southeastern Idaho, made its appearance. Two characteristic members of that flora were found at Rawlins, *Castilleja chromosa* and *Pentstemon radicosus*.

About Evanston and westward to the Great Salt Lake the topography is broken, rising to many hills and low mountains. As one ascends such peaks as Medicine Butte north of Evanston one enters forests of aspen, and in and above these the Scrophulariaceous flora is much richer. The lower slopes (toward the Great Salt Lake these mountain-slopes are lower than the Wyoming plateau) have a flora containing species of plateau-escarpments, plus others more local, which together seem to mark out a northern Wasatch flora. *Castilleja chromosa* and *Pentstemon radicosus* were there, also *Pentstemon collinus*, the very beautiful *P. cyananthus*, *Castilleja linariaefolia*, *Orthocarpus Tolmiei*, and *Adensstegia ramosa*. This flora extends to Pocatello, Idaho.

During several days spent at Salt Lake City about the end of June, and again in mid-July, I was the guest of Prof. A. O. Garrett and his family. Every kindness was accorded me; Prof. Garrett helped me to obtain all local species of my quest, and as at Windsor it was indeed a privilege to collect with one so conversant with the plants of his state. In mid-July at some inconvenience Prof. Garrett went with me to Silver Lake, high in the Wasatch.

The Wasatch Mountains in the region of Salt Lake City and southward are much higher than the low mountains farther north. On their western slopes, ascending far up the deep valleys or "cañons," grew two very local species of Pentstemon. These, very abundant in places, were *P. platyphyllus* and *P. sepalulus*.

On June 29th a long trip was taken to the summit of Parleys Cañon. This trip, as also another to the lower portion of Big Cottonwood Cañon, was taken in the automobile of Mr. Fraser, a friend of Prof. Garrett.

On the morning of July 3, after an all night's ride from Salt Lake City, I arrived at Yellowstone, Montana, the western entrance to the Yellowstone National Park. I need not speak of the beauty and constant interest of this well-known region. I "made the tour" by one of the standard camp systems, and, in spite of the difficulty of collecting during six days' nearly continual travel, believe I succeeded in finding nearly all the species of Scrophulariaceae known from the Park. *Pentstemon crassifolius* and a large pink *Pedicularis* were among the finest species seen. On Hedges Peak I was among lingering snow-drifts above the timber-line. Among many beautiful flowers the great masses of a brilliant velvety crimson *Castilleja* (I presume *C. lauta* which has its type-station a few miles distant) afforded a sight not to be forgotten.

Returning across Idaho collections were made at Ashton and at Pocatello, to the latter of which localities allusion has been made.

Silver Lake, locally known as Brighton, is in the heart of the Wasatch near the head of Big Cottonwood Cañon. Dr. Rydberg collected there with Prof. Garrett in 1905, and the latter took me to the type-stations for several of the former's species. There we were at the upper limit of trees, and much of our collecting was above this line. *Castilleja viscida* and *Synthyris pinnatifida* were two local alpine species obtained. About, slightly above, or slightly below tree-line were collected *Pentstemon brevifolius*, *P. procerus*, *Castilleja variabilis*, *Elephantella*, *Mimulus Langsdorfii*, *M. moschatus*, *M. Lewisii*, *Veronica Wormskjoldii*, *V. serpyllifolia*, *Limosella*, etc. Most of these high mountain species were collected on every high chain visited, there, in the Yellowstone, and on the Colorado Rockies. The floras of lower seemed far more diverse geographically than those of higher altitudes.

At Provo I could but spend a day, July 17. I was there the guest of Dr. F. W. Taylor, a physician of prominence and an

enthusiastic member of the Timpanogos Natural History Club. At the summer cottage of his family in the lower Provo Cañon, also through several nearby cañons, I was fortunate to see in abundance *Pentstemon sepalulus* and *P. Eatoni.* The pale blue flowers of the former and the brilliant scarlet flowers of the latter formed a striking contrast.

A very short stop at Soldier Summit proved surprisingly productive.

Eastward from the foot of the Wasatch lie the high dry plateaus of eastern Utah and western Colorado. As in the like portion of Wyoming, which these in alternation of mesa and bluff fully resembled, *Castilleja chromosa* was common. On bluffs were more Scrophulariaceae, species found both at Castle Gate, Utah, and Glenwood Springs, Colorado. Such were *Pedicularis centranthera, Pentstemon Watsoni,* and most interesting to me a tall wide-panicled woolly-anthered *Pentstemon,* which I believe to be new to science.

On July 20 at Glenwood Springs I met Mr. Osterhout and until the 29th we collected together there, at Grand Junction, and about Ouray, Colorado.

The region about Ouray is the most rugged, and for that reason the most magnificent, of any mountain region I have seen. Collections were made on several of the mountains about the town. The richest finding was upon Mount Abram, in fact nearly every species of Scrophulariaceae found during our stay was gotten during a late afternoon's climb to the summit of that peak. In addition to *Pentstemon strictus, Castilleja linariaefolia,* and *Pedicularis Grayi* of lower slopes, to *Elephantella, Pedicularis racemosa, Veronica Wormskjoldii* and various Castillejas of higher slopes, these include a considerable number I had not previously seen. *Pentstemon stenosepalus, Besseya alpina, Pedicularis bracteosa* and *P. Parryi* were found again on mountains eastward, but not *Pentstemon Harbourii, Pedicularis scopulorum* nor the abundant and really local *Besseya Ritteriana.*

Several stops were made in the Gunnison valley, through the region where C. F. Baker collected in 1901, and consequently through a region rich in type stations for species of Dr. Greene's

based upon that expedition. I think that all of these, belonging to the Scrophulariaceae, were re-collected.

I was for a second time at Pueblo on August 4, and collected northward, in large part over the course followed in early June, through foot-hills and high plains, until on August 17 I left Colorado at Julesburg. This route afforded an excellent opportunity to collect in fruit species previously obtained in flower. One day, August 5, was spent on Pikes Peak, and three days, August 8–10, at Tolland. In the absence of Prof. Ramaley, the privileges of the mountain laboratory at Tolland were accorded me by my former fellow-student in Biology at the University of Pennsylvania, Dr. G. S. Dodds.

Between August 17 and 25, returning eastward, stops were made in western Nebraska, at Chicago, and in northern Indiana. These, while successful in obtaining midland Scrophulariaceae, scarcely lie within the area covered by this report.

There remains to give some account of the method pursued and a brief summary of the results of the trip.

A description was made of the fresh flower of each species of Scrophulariaceae collected. Form, pubescence and color of corolla were especially noted. Type-stations wherever possible were visited. Species were collected in considerable number of individuals, and the same species repeatedly re-collected, so as to note geographical constancy of observed specific characters as well as to obtain all possible data of range. These descriptions and notes, supplementing specimens preserved, are invaluable, and will supply many diagnostic characters which could have been obtained in no other manner. That the systematic botany of the future must concern itself more and more with plants as they live in nature is a truism.

In all 736 collections were made, representing 3000–3500 specimens. Of these 672 collections were obtained in the Central Rocky Mountain States, Colorado, Wyoming, Utah and eastern Idaho. Plants other than Scrophulariaceae were only incidentally collected; of that family, about 100 species were obtained.

Respectfully submitted,

FRANCIS W. PENNELL,
Associate Curator.

ILLUSTRATIONS OF FUNGI[1]

The chief object of this paper is to call attention to the colored illustrations of fungi, about 400 in all to date, prepared at the Garden for publication and for mounting on the swinging frames in the museum.

The Collector's Ideal

Whenever and wherever fleshy fungi are collected, the following ideal for the herbarium specimen should be kept in mind:

1. Ample typical specimens in all stages, well dried and well preserved without pressing.

2. Full descriptive field notes, especially of perishable characters, and most characters are perishable to some extent in fleshy fungi.

3. A colored sketch as accurate and detailed as possible and a photograph if practicable. Color notes with a color guide at hand may be used with the photograph.

Arrangement of Illustrations in the Herbarium

The ideal herbarium contains specimens arranged in a single series, with all notes and illustrations classified with the specimens. The maintenance of more than one series is both a complication and an aggravation. However, throughout most of Europe, illustrations are kept in a separate series, just as exsiccati usually are; and I might remark that both exsiccati and illustrations should be in duplicate so that one set may be distributed with the specimens and the other set kept on file for ready reference. At Kew, a splendid set of portfolios has recently been made to hold the large number of colored illustrations made by Cooke, Massee, and others. In the Fries herbarium at Upsala, the drawings are mounted on cardboard and kept in a separate case. The advantage of having colored illustrations readily available when fresh specimens are brought in for comparison appears at once, since characters are then used for determination which disappear when the specimens are dried. Herbarium specimens are rarely consulted for comparison except with dried material. It may also be desirable to know whether

[1] Presented at the December conference of the staff and students.

there exists in the collection a good illustration of the specimen in question so that steps may be taken to fill the gaps as collections are brought in. It has been decided to adopt the following arrangement with our collection of fleshy fungi:

1. Keep a set of colored drawings and photographs convenient for ready reference.

2. Keep all other drawings, such as those of sections, spores, etc. with the specimens in the herbarium; and prepare a duplicate set of photographs and colored drawings for the herbarium wherever practicable.

Not many years ago, I visited the late Hampus von Post, a pupil of Elias Fries, at his home in Upsala, and found a line of shelves around his entire office filled with manuscript volumes containing paintings and descriptions of Swedish fungi. It was the custom of Cooke and Massee to make drawings of most of the fleshy fungi they found and to incorporate them in a series of drawings copied from all the illustrated works on fungi in their possession.

Care of Water-color Paintings

Paintings of fungi in oil are not often seen. Water-color drawings cannot be worked over as much as those in oil but they seem to lend themselves much better to the delicacy and brilliancy of coloring as well as to the perishable character of the fleshy fungi. The colors used should be the best and most permanent on the market and even the best brands should be tested for several months in the glaring sun before they are used. The non-fading brands may then be selected and colors made from combinations of these. The effect of one fading color in a picture can easily be imagined, and, when it becomes known that some of the colors used are unreliable, the feelings of the artist are anything but pleasant.

At the opening of the Simplon tunnel, I visited the little chapel in Milan which contains Leonardo da Vinci's great masterpiece, "The Last Supper," and was not surprised after what I had heard to find it a great disappointment. It was painted on a wall, and the lime, as well as the weather, had greatly disintegrated

portions of the color. Soldiers had also used the place as a stable and had cut a door directly through a portion of the painting. In spite, however, of time, weather, and violence, the great painting is still remarkable, but we must remember that the old painters selected and ground their own paints and all the work was done in oil. Water-color is extremely sensitive to dampness and to various kinds of gases, as well as to light. Water-color paintings should be kept with great care in a dry, dark place. It is very well to have two sets, one to preserve and one to use.

Dr. Wm. J. Gies, professor of biological chemistry at Columbia University, and consulting chemist at the Garden, has been consulted in this matter and he makes the following very pertinent statements:

1. Humidity and light are the chief destructive agents ordinarily. Put the water-color drawings away in a perfectly dark, dry enclosure with dry calcium chlorid in an open container to absorb the moisture that finds its way in. Examine from time to time and renew the absorbent when necessary.

2. Carbon bisulfid is not particularly harmful to water-colors. Fumes of ammonia and acids may be destructive. Hydrogen sulfid affects paintings where lead is a constituent if moisture is present, black lead sulfid being formed. Sulfur dioxid may be very injurious, since it is an active bleaching agent.

3. Naphthalene and camphor, which are much used in the fungous herbarium to keep out insects, are not harmful to paintings; but chloroform, ether, and similar markedly volatile fat solvents, should be carefully guarded against.

Fungi Painted by Mr. Edward C. Volkert

In 1908, when the inauguration of *Mycologia* was being considered, I secured the active interest of Mr. Edward C. Volkert, a painter of some note who lived near me, and we together made a number of experiments in illustrating and reproducing illustrations of fleshy fungi. From 1908 to 1913, he painted 167 species of fungi and these have now all been reproduced in *Mycologia*. Our first experiment was with colored photographs, various printing papers being discarded as useless and platinum paper

being used for a number of plates, but I soon found that the process necessitated practically the painting out of the photograph and the reconstruction on the same spot of another painting of the fungus. It was impossible to secure photographs in which lights and shades were properly distributed to take colors. Also, the fitting of the pieces of the photographs together into a plate was very tedious. If often happened that by the time the photograph was made and the print obtained the specimens were no longer fresh. Photography was soon abandoned for painting pure and simple from the fresh specimens.

We soon found that the question of expense would require crowding on the plates if specimens were to be reproduced natural size—no form of reproduction should be considered that does not show species in their natural size—but this crowding would not allow of variations in color, form, etc. The ideal plate should be of sufficient size to show a number of specimens without crowding and without eliminating portions of any of them. Mr. Volkert found it convenient to have several plates in process of painting at the same time and to insert figures of the specimens as collected where their form and color seemed to dictate. The value of the background is to bring out whites and other delicate shades of color. It need not be reproduced exactly as in the original. Pale-blue seems to be the best for most fungi.

The artist should, if possible, accompany the mycologist on his rambles and take an active interest in the subject, and this is what Mr. Volkert did. He saw most of the specimens growing and got an idea of their appearance that could not be obtained otherwise. He also learned the salient features that distinguish species, and, from long experience, he knew how to represent these so that they would be properly reproduced by the four-color process. While the specimens were being painted, I always made full notes on their perishable characters and many of them were photographed. It is well to preserve in the herbarium a good specimen, properly marked, of every collection that is figured, so that questions arising later may be settled by reference to it. It has too often been the habit of nature-loving artists to prepare series of drawings that later have no material basis in existence. I have several times been asked to determine such collections.

Reproduction of Paintings

Photographs have often been used to illustrate the fleshy fungi, and some have even claimed that they are superior to colored illustrations. This is a great mistake. When a fungus is white or some shade of dark-gray or black, it may be fairly represented by a photograph, but not when otherwise colored. With most of these delicate objects, color may be said to be the most prominent character. Differences are so slight in many of the groups that when specimens are deprived of color it is almost hopeless to separate them properly. Put a handful of fleshy fungi in a jar of alcohol and see what happens in the course of a few days. Alcohol is especially bad because it destroys surface characters also, but the experiment is at least suggestive.

Illustrations were formerly reproduced by lithography, the drawing being engraved by hand on stone. This process produced some excellent work but it was always limited by the delicacy of the hand that did the carving, and stone is a rather rude medium for delicate characters such as exist in the fungi. All the colored plates in *Mycologia* have been printed by the four-color process, which is a half-tone process in which screens are used for the original photographs, and four blocks with the black and primary colors prepared for printing. This process has been greatly improved in recent years, but it still suffers from commercialism and the lack of trained men. It has the advantage over lithography of using light instead of the human hand for tracing the drawings on the block, but it is sometimes difficult to keep one color, the red for instance, from overpowering the more delicate colors. The cost of reproductions by this method may be greatly increased by the number of proofs taken and the number of changes made. These changes require the most skilled labor.

It has been suggested that, instead of making a colored drawing and using this for reproduction, the fungi themselves or a color photograph might be used, but this is impracticable, since fungi would change position while making the necessary exposures. Minerals and other inorganic objects may readily be photographed in color by this process. In order to insure perfect

registry in printing, filled or coated paper must be used in the four-color process, and this paper has the reputation of being perishable. The glue or sizing which holds the pulp together disintegrates with time. The bleaching process also ruins the fibers of the paper. Some of the colors used in printing are also said to be perishable, especially when exposed to light. It may be said that coated paper as now made is far superior to the coated paper of several years ago and the best brands will probably last for 200 years, which should be quite sufficient for most purposes. Chemical processes of removing the bleaching agents which destroy the fiber have been discovered and this makes a world of difference. From 20,000 to 30,000 impressions may be taken from the four-color half-tone blocks by the ordinary modern processes.

The Need of an American Illustrated Work

The various countries of Europe are well supplied with illustrated works on fungi, some of them quite old and very elaborate. Had it not been for these books, the work of many mycologists would have been practically lost or left in such a state as to be more or less useless. America has nothing to compare with any of the illustrated works on fungi in Europe. The need of such a work is fully realized by all, but it requires not only a well-equipped herbarium and library, but also a considerable amount of money to carry out such an undertaking. Artists would have to paint the plants in the fresh condition where they grow and this would necessitate reaching various parts of the country during the growing season, although a large beginning might be made in any given locality. The plates should be prepared and reproduced in the best possible manner, and accompanied by accurate and comprehensive descriptive text. *North American Flora* is planned to include descriptions of all North American species of fungi. A great illustrated work would permanently fix the results of this study and make them available to the forester who wishes to protect his trees from wood-destroying fungi, to the collector of edible mushrooms who wishes to use them for food and to guard against poisonous species, to the

student in college or university, and to the general nature-lover in whatever part of the country he might live. There is nothing that would give a greater impetus to the study of not only our local fungous flora, but to that of all parts of North America than the publication of such a great illustrated work.

FUNGI PAINTED BY MISS MARY E. EATON

For several years, Miss Eaton has devoted considerable time during the growing season to the preparation of paintings of fungi for our museum and in this work she has shown a delicacy and rapidity rarely equaled. Many of these paintings have been mounted on swinging frames, while many others are still unmounted. During the past summer, Miss Eaton obtained 77 additional studies, making a total of about 225 now in the collection. During the winter, she expects to prepare plates from these for publication in future numbers of *Mycologia*.

W. A. MURRILL,
Assistant Director.

NOTES, NEWS AND COMMENT

Dr. C. H. Farr returned to New York on December 23 from Jamaica, where he spent several weeks in botanical investigations.

Professor J. H. Faull, of Toronto University, recently spent nearly two weeks at the Garden in a study of herbarium material of the Polyporaceae, with special reference to collections made in Ontario.

Mr. L. C. Griffith, of the Bureau of Entomology at Washington, was a recent visitor at the Garden. Mr. Griffith is located on Long Island, where he is carrying on investigations on the hickory bark-beetle and other destructive insects. The Garden is indebted to Mr. Griffith for many suggestions regarding the identity and treatment of insects affecting ornamental trees and shrubs.

Dr. W. A. Murrill, Assistant Director, represented the Garden at the Second Pan-American Scientific Congress, held in Washington, D. C., from December 27, 1915, to January 8, 1916.

At the annual meeting of the New York Academy of Sciences held at the Hotel Manhattan on the evening of December 20, 1915, members of the New York Academy were enabled to converse with members of the California Academy of Sciences in San Francisco, by the courtesy of the American Telegraph and Telephone Company. Dr. Britton talked with Miss Alice Eastwood, Curator of the botanical collections of the California Academy, obtained information relative to specimens of certain cactuses collected on the Galapagos Islands, and asked that they be loaned to him for study, which request was granted; a letter written by Miss Eastwood on December 30 states that the specimens will be sent to the New York Botanical Garden in a short time. A record is here made of this event, as doubtless the first instance when botanical specimens were borrowed over a telephonic distance of more than three thousand miles.

The specimens collected in the course of the exploration of southern Florida in 1915 have been mounted and are being incorporated into the permanent collections of the Garden. These specimens comprise many interesting additions to the flora of the United States, both West Indian plants not before found in continental North America and newly discovered endemic species.

Volume 17, Part 3, of *North American Flora*, was issued December 20. It continues the family Poaceae, and is devoted almost wholly to the genus *Panicum*. With this genus the treatment of the Poaceae is taken up by Professor A. S. Hitchcock, systematic agrostologist of the United States Department of Agriculture; Mr. Nash, who contributed the text of the earlier portion of this family, is now at work upon other groups for the *Flora*.

The beds in the court of conservatory range 1 have again been planted with tulips. The color scheme is the same as in past years, although the kinds have been changed to some extent. The central bed is planted with 2,500 La Triumphante, an unusually pink tulip, and the border, 3½ feet wide, with 1,950

White Jewel. Both of these are new to the collections, and were given by John Scheepers & Company, Inc. In previous years Cottage Maid and La Reine have been used. The remaining beds are as in previous years: the two paralleling the central bed, each with about 2,400 Rose Gris-de-lin, pink; the two transverse beds each with about 1,150 Crimson King; and the remaining two beds each with about 575 Chrysolora, yellow.

A collection of 2,150 Darwin and cottage tulips, given by John Scheepers & Company, Inc., have been placed in the west border, just north of the plaza at the Harlem Railroad Station. This collection includes the cottage tulips, La Merveille and Picotee, the latter sometimes known as Maiden's Blush. There are also the following Darwin tulips: Pride of Haarlem, Madame Krelage, The Sultan, all represented in the collections elsewhere; and the following new to the collections: Rev. H. H. d'Ombrain, brilliant geranium-red, with a rich bloom; Hitchcock, glowing vermillion, with a blue base; Massachusetts, vivid pink, with a white center; Margaret, silvery pale rose, flushed white.

Meteorology for December.—The total precipitation for the month was 3.82 inches of which 1.4+ inches (14.75 inches snow measurement) fell as snow. The maximum temperatures for each week were 50° on the 1st, 46° on the 12th, 50° on the 17th, and *55° on the 26th.* The minimum temperatures were 22° on the 5th, *12° on the 13th,* 20° on the 22d, and 15½° on the 31st.

Meteorology for the year 1915.—The total precipitation at the New York Botanical Garden for the year 1915 was 37.98 inches of which 2.7+ inches (27.75 inches snow measurement) fell as snow. The distribution by months was as follows: January 4.86 (including 5.5 inches snow); February 5.02 (including 3.0 inches snow); March 0.45 (all snow); April 2.67; May 3.24; June 2.55; July 3.49; August 6.93; September 1.89; October 1.90; November 1.16; December 3.82 (including 14.75 inches snow).

The maximum temperature recorded for the year was 95° on the 18th and on the 31st of July. The minimum was 11° on the 30th of January. The first killing frost of the autumn was during the night preceding the 24th of October.

ACCESSIONS

MUSEUMS AND HERBARIUM

5 specimens of wooden trays from California and Oregon. (Given by Dr. H. H. Rusby.)

25 specimens of American hepaticae. (Given by Miss Caroline C. Haynes.)

11 specimens of lichens from Berks County, Pennsylvania. (Given by Dr. N. L. Britton.)

3 specimens of mosses from Venezuela. (By exchange with the United States National Museum.)

2 specimens of hepaticae from St. Thomas, West Indies. (By exchange with the Botanical Museum, Copenhagen.)

2 specimens of lichens from Kansu, China. (Given by Mr. Frank Meyer.)

2 specimens of hepaticae from New England. (By exchange with Miss Annie Lorenz.)

5 specimens of fossil algae from the Panama Canal Zone. (Given by the United States Geological Survey.)

217 specimens of mosses from the Philippine Islands. (By exchange with the Bureau of Science, Manila.)

14 specimens of hepaticae from Little Moose Lake, New York. (By exchange with Miss Caroline C. Haynes.)

1 specimen of *Fissidens* from Changhua, Chekiang, China. (Given by Mr. F. N. Meyer.)

98 specimens of mosses from Pinar del Rio, Cuba. (Collected by Brother Leon.)

150 specimens of mosses from Cape Breton Island, Nova Scotia. (By exchange with Dr. G. E. Nichols.)

5 specimens of mosses, types, from Ceylon. (By exchange with Mr. H. N. Dixon.)

2 specimens of hepaticae from Cornish, New Hampshire. (By exchange with Miss Caroline C. Haynes.)

42 specimens of mosses from Peru. (By exchange with Yale University.)

180 specimens of mosses from Brazil.

60 specimens of mosses from the Philippine Islands. (By exchange with the United States National Museum.)

1 specimen of *Cordyceps myrmecophila* from South America. (By exchange with Dr. J. N. Rose.)

14 specimens of fungi from New York. (By exchange with Dr. W. H. Rankin.)

3 specimens of fungi from New York. (By exchange with Mr. Frank H. Ames.)

6 specimens of fungi from New Jersey. (By exchange with Mr. John Festeneck.)

4 specimens of fungi from New York. (By exchange with Mr. Fred S. Boughton.)

6 specimens of fungi from New York. (By exchange with Dr. L. H. Pennington.)

1 specimen of fungus from Pennsylvania. (By exchange with Mr. L. O. Overholts.)

5 specimens of slime-moulds from Porto Rico. (Collected by Professor F. L. Stevens.)

2 specimens of fungi from Washington. (By exchange with Mr. James R. Weir.)

1 specimen of fungus from Montana. (By exchange with Mr. James R. Weir.)

19 specimens of fungi from Cuba. (By exchange with Brother Leon.)

8 specimens of fungi from Minnesota. (By exchange with the University of Minnesota.)

2 specimens of fungi from New Jersey. (Collected by Mr. Percy Wilson.)

28 specimens, "Fungi Dakotenses," fascicle 14. (Distributed by Dr. J. F. Brenckle.)

8 specimens of fungi from North Carolina. (By exchange with Professor W. C. Coker.)

32 specimens of fungi from Alabama. (By exchange with Dr. R. P. Burke.)

1 specimen of fungus from New York. (Collected by Mr. Percy Wilson.)

11 specimens of fungi from Brazil, South America. (Collected by Dr. J. N. Rose.)

7 specimens of fungi from California. (By exchange with Mr. W. W. Thomas.)

1 specimen of fleshy fungus from Illinois. (By exchange with the Field Museum of Natural History.)

1 specimen of *Cortinellus multiformis* from New York. (By exchange with Dr. L. H. Pennington.)

8 specimens of *Corticium vagum*. (By exchange with the University of Illinois.)

1 specimen of fleshy fungus from Ontario, Canada. (By exchange with Professor J. H. Faull.)

4 specimens of woody fungi from Connecticut. (By exchange with Dr. B. O. Dodge.)

1 specimen of *Spongipellis galactinus* from New Rochelle, New York. (Collected by Mr. R. R. Stewart.)

1 specimen of *Spongipellis fissilis* from Bedford, Virginia. (Collected by Dr. R. A. Harper.)

4 specimens of mosses from Newfoundland. (By exchange with Harvard University.)

5 specimens of fungi from New York. (By exchange with Mrs. Fred S. Boughton.)

2 specimens of fungi from New Jersey. (Collected by Mr. Percy Wilson.)

2 specimens of fungi from Canada. (By exchange with Professor John Dearness.)

225 specimens of North American algae. (By exchange with Harvard University.)

6 specimens of flowering plants for the local herbarium. (Given by Mr. Percy Wilson.)

23 specimens of Alaskan hepaticae. (By exchange with Professor T. C. Frye.)

38 specimens of Cuban plants. (Given by Dr. Juan T. Roig.)

8,200 specimens of flowering and flowerless plants from Porto Rico. (Collected by Dr. and Mrs. N. L. Britton.)

681 specimens of mosses and lichens from Brazil and Argentina. (Collected by Dr. J. N. Rose.)

53 specimens of flowering plants from Michigan. (By exchange with Mr. O. A. Farwell.)

93 specimens of cacti from eastern South America. (Collected by Dr. J. N. Rose.)

1,400 specimens of ferns, mosses, and hepaticae. (Being the herbarium of Alwin Berger.)

1 specimen of woody fungus from Englewood, New Jersey. (Collected by Mr. Percy Wilson.)

50 specimens of local fungi from New York and Connecticut. (Collected by Dr. F. J. Seaver.)

11,000 specimens of flowering and flowerless plants from southern Florida. (Collected by Dr. J. K. Small.)

17 specimens of flowering plants from the eastern United States. (Given by Mr. E. P. Bicknell.)

249 specimens of flowering plants from California. (By exchange with the California Academy of Sciences.)

7 specimens of flowering plants from New York. (By exchange with the New York State Museum.)

8 specimens of *Agalinis* from the Central States. (By exchange with the Field Museum of Natural History.)

8,000 specimens of fresh-water algae from Porto Rico. (Collected by Professor Nordal Wille.)

178 specimens of hepaticae from Quebec. (By exchange with Professor A. W. Evans.)

11 specimens of hepatics from Dominica, West Indies. (By exchange with Mr. W. C. Fishlock.)

3 specimens of mosses from the Hawaiian Islands. (By exchange with the United States National Museum.)

5 specimens of hepaticae from Highlands, New Jersey. (By exchange with Miss Caroline C. Haynes.)

4 specimens of mosses, types, from New Zealand. (By exchange with Mr. H. N. Dixon.)

8 specimens of hepaticae from Pinar del Rio, Cuba. (Collected by Brother Leon.)

25 specimens of mosses from Dominica, West Indies. (By exchange with Mr. W. C. Fishlock.)

18 specimens of crude drugs. (Given by Dr. H. H. Rusby.)

8 specimens of *Rubus* from Missouri. (Given by Mr. B. F. Bush.)

3 specimens of fungi from New York. (Given by Mr. Percy Wilson.)

2 specimens of peanuts from Virginia. (Given by Dr. H. H. Rusby.)

PLANTS AND SEEDS

1,227 plants from Brazil. (Collected by Dr. J. N. Rose.)

1 plant for herbaceous grounds. (Collected by Dr. A. B. Stout.)

5 cacti for conservatories. (By exchange with U. S. Dept. of Agr. through Mr. W. H. Long.)

1 plant of *Tectaria heracleifolia*. (By exchange with Mr. Henry B. Yelvington.)

6 plants of *Sedum coeruleum*. (Given by Mr. A. S. Shattuck.)

1 plant of *Sagittaria*. (Collected by Mr. B. Hoffman.)

2 plants of *Oxalis Acetosella*. (Collected by Dr. N. L. Britton.)

1 Opuntia. (Collected by Dr. D. T. MacDougal.)

1 plant of *Lacinaria pycnostachya*. (Collected by Mr. Percy Wilson.)

1 plant of *Phlox Nelsoni*. (By exchange with Bobbink & Atkins.)

1 plant *Sedum Matthewsii*. (By exchange with Mr. Henry Natho.)

2 Opuntias for conservatories. (Collected by Dr. H. H. Rusby.)

34 plants, all orchids, for conservatories. (By exchange with Lager & Hurrell.)
3 plants of *Helianthus divaricatus*. (Given by Mr. S. Alexander.)
51 plants for American wood garden. (Given by Mr. L. Stuart.)
1 Epidendrum from Cuba. (Given by Bro. Leon.)
5 orchids. (Given by Miss Helen Ingersoll.)
1 Mamillaria from Arizona. (Collected by Dr. H. H. Rusby.)
1 plant of *Dracaena fragrans*. (Given by Mrs. Thoede.)
1 plant of *Sarracenia purpurea*. (Collected by Dr. F. W. Pennell.)
1 plant of *Persea persea*. (Given by Mrs. D. M. Steindler.)
23 plants for conservatories. (By exchange with Missouri Botanical Garden.)
1 plant, *Cotoneaster horizontalis*. (Given by Bobbink & Atkins.)
6 plants for conservatories. (Given by Mr. Inglis Stuart.)
2 plants of *Paphiopedilum*. (By exchange with Mr. A. J. Manda.)
2 plants for conservatories. (By exchange with Mr. A. J. Manda.)
2 plants of *Ilex Aquifolium variegata*. (Purchased.)
1 Sedum, from Martha's Vineyard. (Given by Mr. E. P. Bicknell.)
10 orchids for conservatories. (By exchange with Mr. DeVries.)
1 plant of *Azolla caroliniana*. (Given by Prof. L. H. Pennington.)
2 plants for conservatories. (By exchange with Mr. Henry Natho.)
7 cacti for conservatories. (Collected by Mr. Walter Granger.)
28 plants for conservatories. (Given by Mr. F. F. Hunt.)
1 Mesembryanthemum for conservatories. (Given by Mr. Henry W. Becker.)
3 plants of *Quercus Rudkini*. (Collected by Dr. Arthur Hollick.)
1 plant of *Pereskia Conzattei*. (By exchange with U. S. Nat. Museum, through Dr. J. N. Rose.)
7 cacti. (By exchange with U. S. Nat. Museum, through Dr. J. N. Rose.)
1 *Oncidium* for conservatories. (Given by Mr. C. A. Mosier.)
7 plants for conservatories. (Given by Mr. Louis Dupuy.)
1 plant of *Acacia pubescens*. (Purchased.)
15 plants for conservatories. (By exchange with Brooklyn Botanic Garden.)
71 plants. (Derived from seed from various sources.)
31 cuttings of Brazilian plants. (Collected by Dr. J. N. Rose.)
4 cuttings of plants for conservatories. (Collected by Mr. F. L. Stevens.)
4 cuttings of Norway Poplar. (By exchange with Prof. L. H. Bailey.)
212 bulbs of *Iris reticulata* and *Lilium rubellum*. (Given by John Scheepers & Co., Inc.)
11,005 bulbs for decorative purposes. (Purchased.)
8,150 bulbs for decorative purposes. (Given by John Scheepers & Co., Inc.)
50 seeds of *Quercus Robur aurea*. (Collected by Dr. N. L. Britton.)
1 pkt. seed of *Aristolochia Serpentaria*. (Collected by Mr. Percy Wilson.)
1 pkt. seed of *Tilia*. (Given by Miss Caroline Bishop.)
7 pkts. seed. (Given by Dr. H. H. Rusby.)
66 pkts. seed from Mexico. (Given by Mr. A. DeLautreppe.)
1 pkt. seed of *Rhamnus lanceolata*. (Collected by Mr. J. Davis.)
1 pkt. seed of *Thuya orientalis*. (Collected by Dr. N. L. Britton.)
5 pkts. seed from Brazil. (Collected by Dr. J. N. Rose.)
1 pkt. seed of Palestine lemon.
1 pkt. seed. (Collected by Prof. F. L. Stevens.)
18 pkts. seed. (Purchased.)

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Director of the Laboratories

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WINDOW BOX DECORATION

VINE DECORATION

JOURNAL

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THE USE OF DECORATIVE PLANTS IN CITIES

A series of photographs showing how decorative plants may be used to enhance the beauty and value of city property has just been installed on the main floor of the museum building. These photographs were loaned by the Municipal Art Society of New York and the installation of the exhibit was assigned by that society to Mrs. Edward Hagaman Hall, who has kindly contributed the following descriptive account of it for publication:

Urban decoration is not only a beautiful form of nature decoration, but it is very practicable. It may be carried out in various ways, by means of window boxes filled with vines, flowers, and foliage plants, by tree tubs filled with hardy shrubs, by trees planted in areas or on streets, and by vines planted in areas surrounding houses.

For many years foreign cities have recognized the fact that a suggestion of nature is not only restful and inspiring, but that it adds to the beauty of architecture, and in the case of tree planting actually enhances the value of city property.

The Municipal Art Society of New York was organized in 1892 and was incorporated in 1898. When the Society decided to have among its many committees one upon urban decoration it did so with the desire to aid in beautifying the streets of the city by means of tree planting, window box, and tree tub adornment, and vine planting in areas adjoining buildings. The first committee started a "block beautiful" in Brooklyn, and confined its work to that locality.

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The second committee was organized in 1903 and from that date to the present year it has in every way aided in promoting urban decoration in New York City. It has been instrumental in having vines started on public and private schools, business establishments, hotels, clubs and residences, and, while it has never handled window-box material, it has at all times urged the adoption of window boxes.

This committee discovered the law of the City of New York relating to window boxes, which law heretofore was unknown not only to the citizens but to firms dealing in window-box material. The law reads as follows:

"*Section 671.* It shall not be lawful for any person to place or keep on any window-sill, railing, or balcony, top of porch, or any other projection from any house or other building in the City of New York, any earthen flower-pots, wooden box, or other article or thing whatever for the cultivation or retention of flowers, shrubs, vines or any other article or thing whatever, unless every such flower-pot, box, or other article is securely and firmly fastened or protected by iron railings, so fastened as to render it impossible for any such pot, box, or other article to fall into the street, under a penalty of $10 for every offense, to be recovered in the manner now specified by law for the collection of fines imposed for the violation of ordinances of the corporation."

After this law was widely circulated by this committee, the movement of urban decoration grew steadily in this city. Each year many photographs were taken and exhibited showing various ways in which buildings could be adorned. The committee also sent out many circulars giving suggestions on varieties of plants to use, and practical plans on the planting of vines in areas.

Few city florists know the correct formula for soil required for nourishment for the Japanese ivy, which is the best vine to use for city buildings. The formula which has been used most successfully is, as follows:

14 parts of new, fresh, pure garden loam.
3 parts of sharp brown bank sand.
1 part of unleached wood ashes.
1 part of pulverized air-slacked lime.
1 part best quality blood and bone.

To be thoroughly well-mixed from one foot to 18 inches in depth, and the drainage must be perfect.

Owing to the great expense necessary for the proper planting

of street trees in this city, little has been done by the committee in this line of decoration. Many obstacles have been considered almost insurmountable, such as leakage by gas and sewer.

While the streets of New York, so far as their planting is concerned, is under the control of the Park Department, it has been unable to properly care for the few trees that now exist, much less care for trees set out by individuals or organizations.

In order that people interested in this subject may be able at any time to examine the various phases of urban decoration, the Municipal Art Society has accepted the very kind offer of the New York Botanical Garden, Bronx Park, to place upon the walls of the west wing of the main floor of the museum building, a collection of photographs and views illustrating vine decoration on buildings, window-box decoration, roof garden and back yard decoration, and tree planting. The exhibits are as follows:

Exhibit 1. On wall of west wing to the right of entrance. Illustrates the decoration with vines of churches, hospitals, institutions, factories, universities, schools, apartment houses, residences, restaurants, and clubs. Twenty-six photographs.

Exhibit 2. Illustrates decoration of houses in city streets with window boxes, and tree tubs filled with vines, flowers and hardy shrubs. Decoration practical twelve months of the year. Thirty photographs.

Exhibit 3. A suggestion for decorating the side and front areas of a building on a city street with trees, vines and flower boxes. Three photographs, and two water color sketches by Miss J. Brownscombe.

Exhibit 4. Illustrates the decorative treatment of a back yard in Bavaria. Decoration with vines, trees and flower boxes. Oil painting by Miss H. S. Phillips.

Exhibit 5. Illustrates the treatment of Villa Medici, Rome, with trees and shrubs. Oil painting, a copy by Miss H. S. Phillips, original by Velasquez.

Exhibit 6. Illustrates restoration of a courtyard in Pompeii. A water color sketch by Miss J. Brownscombe.

Exhibit 7. Illustrates electroliers on city streets decorated with flowers and vines. Photograph taken on Hennepin Avenue, Minneapolis, Minnesota.

Exhibit 8. Illustrates treatment of roof gardens of hotels and residences by means of shrubs, vines, and flower boxes. Also treatment of side and back yards by means of flowers and shrubs. Twenty-five photographs.

Exhibit 9. On wall of west wing to the left of entrance, illustrates by means of blue prints and photographs practical plans, specifications, treatment and protection of trees necessary for the planting and care of trees in city streets. Ten views.

Exhibit 10. Illustrates decorative treatment of streets in various parts of the world by means of trees and shrubs. Fifty photographs.

WILD ANIMALS IN THE BOTANICAL GARDEN. I

Having recently learned from Mr. Fred F. Houghton that a cardinal bird was seen on Christmas day here in the Garden, and that he has also seen a snowy owl, it may not be amiss to place on permanent record some of the facts with regard to our bird-population. The "mocking-bird" about which the *Evening Mail* was good enough to print some stories a few years ago, died last winter! He was born in the Zoological Park and did not know enough to go south to find a wife. He lived a bachelor life for three or four years here in the Garden, learned to eat all sorts of strange fruits that he had never seen before and probably died an unnatural death, for the feathers of a mocking-bird were found in the stump of an old tree in the willow plantation where probably some mink (or cat?) caught and devoured it!

Mink have been trapped here several times by the "*musk-rat-catcher*" who keeps down our supply of these sappers and miners of banks and dams! One was seen last fall around the shore of the lily-lake watching the ducks and later in the day swam across apparently trying to get them. The ducks from the Zoological Park have become quite tame and several pairs have nested here in the Garden and raised their broods in the Bronx River. They get back and forth from "the Zoo," either under the Linnæan Bridge or by flying across the Pelham Parkway and not long ago one deliberately waddled across and held up a good-natured negro chauffeur, who grinned at me and waited for the duck to get over. Other birds find protection here also. A kingfisher flies up and down the river scolding at all intruders and this winter the blue jays are quite abundant and take refuge in the Hemlock Grove, during the storms. The crows and starlings are quite tame, the latter finding a congenial home in the lantern on top of the big greenhouse dome and in warm corners here and there on the roof and chimney of the power-house, and among the capitals of the columns in front of the Museum.

A horned owl occasionally comes at twilight of a winter's evening to greet us with his who! who! whoo! and whenever there

is a commotion among the cat-birds in the garden or the robins in our street, there is surely a pair of little red barn-owls lurking around, "*looking for graft.*" In fact a whole family of them roosted on the ridgepole of our house, several times last summer, keeping watch on a colony of starlings whose nests are in a poplar tree in the garden of an ex-commissioner of parks.

The fear that most ornithologists have that the starlings will become as great a nuisance as the English sparrow may be well-founded, though their cheerful whistle is a pleasant addition to our winter bird-notes! Chickadees and juncos do not seem to pay any attention to them, but the yellow-hammer or flicker, our big red-crowned woodpecker, shares his favorite feeding-grounds with them rather warily and does a good deal of vicarious home-boring for this pugnacious foreigner! The gray squirrels are the only creatures that do not seem to fear being dispossessed by this aggressive stranger and are actually becoming so numerous that several pairs of them have migrated from the Garden to the town and are tame enough to visit our yards and kitchens in search of food, this winter. We also actually rejoice in two flocks of quail this year and are feeding and giving them shelter, hoping to be able to keep them. They have nested here for three or four years and last summer in "hay-time" some wee baby quail were brought to me, because their nest had been run over by the mowing-machines. They died during the night, before we could get them back to their mother; but the rest of the family escaped and I hope we shall hear "*Bob-white*" calling again next summer, among the shrubs in the fruticetum.

ELIZABETH G. BRITTON

THE FOUNTAIN AT THE ENTRANCE OF THE MUSEUM BUILDING

The following description of the fountain in front of the museum building is taken from an article by Frank Owen Payne in *The International Studio* for January, 1916, entitled "Some Noteworthy American Fountains."

New York is entitled to be called the American city of fountains, for there are at least a dozen fountains of note within the limits of the city. Of these, the superb fountain by Carl Tefft in the Botanic Garden deserves more than mere mention here.

Carl E. Tefft has created a most brilliant work. No other fountain of the city of New York is so admirably located. With the imposing façade of the great Botanic Museum behind it, and with its superb setting of fine shrubbery, this fountain is indeed a thing of rare beauty.

Two plunging bronze horses of heroic size are seen leaping, as it were, into the water of the pool. One horse bears the figure of a nude female in a most hilarious mood, who strives to restrain the beast with one hand, while with the other she waves a merry gesture. The other horse bears a boy, who endeavors to control his animal with one hand and with the other he grasps a fish by the tail.

In the pool below, a merman and a mermaid, alarmed at the sudden approach of the strange wild steeds, turn hastily aside in an attempt to escape. Behind the horses is a huge globe surmounted by a dolphin, which bears upon its back the beautifully modeled figure of a chubby child in whose hand is a tiller of classic design. From underneath the plinth the water flows into a large marble basin, thence into a semi-circular lower basin from which it overflows into the lowest pool of all.

The sculptor has called this the *Fountain of Life*, typifying, as it were, the great life principle of "Struggle for Existence" and "Survival of the Fittest." The marvellous vivacity and motion displayed in this unique group certainly give force to the idea. The most original feature of this work is the treatment of the feet of the Water Horses. In these "umbrella feet," as he calls them, Mr. Tefft has established a precedent. In the classic garden horses of Versailles and in the aquatic horses of German and Italian examples, the feet are invariably cloven.

No more favorable criticism of this superb fountain could possibly be uttered than that expressed by the late Augustus St.-Gaudens, who was enthusiastic in his praise of the strength of its composition and the beauty of its execution. A com-

mendatory letter from St.-Gaudens is among the most highly prized possessions of the sculptor.

The odd web-footed horses in their mad career, the rollicking figures which surmount them, the alarmed merman and mermaid, the charming child figures with globe, dolphin, eagle and fish, make this unique fountain a veritable phantasy in bronze.

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R. S. WILLIAMS

CONFERENCE NOTES

At the January conference of the scientific staff and registered students of the Garden, Dr. Marshall A. Howe spoke on "Some Fossil Calcareous Algae of the West Indies." After alluding to the increasing recognition of the geological importance of lime-secreting algae in reef-building and land-forming, he discussed in some detail a collection of fossil algae recently made in the Leeward Islands by Dr. T. Wayland Vaughan of the U. S. Geological Survey. Specimens and photomicrographs illustrating their structure were exhibited. The paper will form a part of a report on the geology of the Leeward Islands, which, it is expected, will be published soon by the Carnegie Institution of Washington.

Following this, Miss Margaret Slosson presented a paper on "A new *Stenochlaena* from Porto Rico," stating that this species

which will soon be published under the name of *S. amydrophlebia* is most closely related to Cuba's endemic species *S. Wrightii* and adds a third to the two species of *Stenochlaena* hitherto collected in Porto Rico.

A. B. STOUT,
Secretary

NOTES, NEWS AND COMMENT

Dr. N. L. Britton, Director-in-Chief, accompanied by Mrs. Britton and Mr. Percy Wilson, sailed for Cuba on January 29, the chief object of the expedition being a botanical exploration of the Isle of Pines.

Mr. F. S. Collins, of North Eastham, Massachusetts, spent several weeks in November and December in making collections of plants in Bermuda, giving special attention to the marine algae. Mr. Collins was assisted by a grant from the Maria De Witt Jesup Fund of the New York Botanical Garden, and he expects to send to the Garden herbarium a good set of the algae of Bermuda obtained on this and on previous visits to the island.

The library has recently received a copy of *Cactearum genera nova speciesque novae et omnium in Horto Monvilliano cultarum*, by Charles Antoine Lemaire, 1839. This flook is a photostatic reprint made in the office of Crop Physiology and Breeding Investigations, Bureau of Plant Industry, U. S. Department of Agriculture, from the original loaned by the Missouri Botanical Garden. It was presented to the New York Botanical Garden by Mr. Frederick V. Coville.

The abnormally mild weather of late January brought forward several evidences that many plants are all ready to develop spring activity. Among these, the snowdrop (*Galanthus Elwesii*) was seen in bloom in beds nos. 7 and 10 of the flower gardens in

front of the large greenhouse, and the black hellebore was in bud in the Herbaceous Garden, almost ready to open. In the Fruticetum, two kinds of pussy willows had pushed out their catkins, and were quite conspicuously white. The hazel (*Corylus Pontica*) was seen there, with its staminate catkins shedding pollen from its long drooping catkins.

On a recent visit, Dr. Cristóbal M. Hicken presented to the Garden a set of his publications. Dr. Hicken is one of the most distinguished botanists of South America and is a professor in one of its leading universities at Buenos Aires, Argentina. He has been in the United States as a delegate from Argentina to the Pan-American Scientific Congress recently held in Washington.

Dr. Fred J. Seaver spent three days during the early part of February in Albany looking over the valuable collections of Professor C. H. Peck. This collection contains a large number of types of American fungi. Microscopic preparations of the spores of such species were made, with the permission of the State Botanist, and filed away in the Garden collections.

One of the first shrubs in the Fruticetum to blossom is *Hamamelis japonica*, of Japan. Its flowers appeared this year late in January and one of the plants was still opening its blossoms when the snowstorm of early February occurred. It was interesting to see the yellow flowers with the surrounding mantle of white. The petals are a bright yellow with the inside of the sepals a deep claret. It is related to our own witch hazel, *Hamamelis virginiana*, distributed throughout eastern North America, but differs from that in its time of blossoming, which is in the fall or early winter. There are four known species of the genus *Hamamelis*. In addition to that referred to above, there is one other American species, occurring in Missouri, Louisiana, and Oklahoma. This is *Hamamelis vernalis*, which, as its name would indicate, puts forth its flowers in the spring. The fourth

species, a native of China, is *Hamamelis mollis*, closely related to *Hamamelis virginiana*, but with very pubescent foliage. These all belong to the witch hazel family, Hamamelidaceae. Other genera of this family represented in the Fruticetum are *Fothergilla*, *Corylopsis* and *Parrotia*. The sweet gum, *Liquidambar Styraciflua*, one of our finest native trees, also belongs to this family. Many fine specimens of this will be found in the grounds of the Garden.

Meteorology for January.—The total precipitation for the month was 1.18 inches. There were only slight traces of snowfall during the month. The maximum temperatures for each week were 55° on the 12th, 60° on the 22d, and *70° on the 27th.* The minimum temperatures were 10° on the 8th, *7° on the 15th*, 9° on the 19th, and 23° on the 29th.

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EDITOR
ARLOW BURDETTE STOUT
Director of the Laboratories

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Perpendicular side of large lime-sink or erosion-hole in a pineland hammock. The plant-covering of the wall is mainly of tropical ferns. In this case it is chiefly maidenhair, *Adiantum tenerum*. There are present also, *Tectaria heracleifolia*, *Dryopteris radicans*, and *Nephrolepis exaltata*. Some hammocks have many sinks, others are devoid of them. In some cases the plant covering is entirely of small filmy-ferns

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EXPLORATION IN SOUTHERN FLORIDA IN 1915

(WITH PLATES CLXVI-CLXVIII)

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF,

Sir: Exceedingly far-reaching and conspicuous changes are taking place with the southward advance of civilization in the little-known or until recently unknown parts of southern peninsular Florida and on the Florida Keys. In view of these developments and their consequences a few preliminary remarks in connection with my report of recent field work may be of interest.

Previous to 1903, when we began botanical exploration in southern Florida, the country southwest of Cutler and Perrine, then the frontier settlements on the eastern coast of Florida, was almost a *terra incognita*. At this time a preliminary survey for a projected railroad line from Miami to Cape Sable was in progress, and an exceedingly interesting map of some of that heretofore unknown territory was made by Mr. W. J. Krome, who is now constructing engineer of the Key West Extension of the Florida East Coast Railway Company. This was the first map to locate definitely the dry land in the Everglades between Miami and Cape Sable, which land proved to be a curved chain of limestone islands extending three fourths the distance from about the Miami River to the southwestern extremity of the peninsula.

A wagon road to the south of Miami, or Fort Dallas, as it was at one time called, connected that place with Cocoanut Grove and Cutler and terminated at Perrine, which was an old

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but scarcely at all developed settlement in the pine forest, situated about three miles west of Cutler and Bay Biscayne. Near Perrine the surveyor's trail entered the pine forest and extended toward the southwest through the unbroken wilderness until it met the open Everglades at a point called Camp Longview. This trail soon served as a means of entering that territory by the few homesteaders who early began to take up claims in the region beyond Perrine.

At that time Miami was the southern terminus of the Florida East Coast Railway. After the survey referred to was about completed, it was decided to extend the railroad to Key West instead of to Cape Sable, and as work on the road-bed progressed a rough trail developed parallel to the road-bed chiefly through the transportation of camp and construction supplies. This afforded us another and somewhat different route for penetrating the wilderness. By following this trail which ran into the open Everglades at a point called Camp Jackson, we made many additions to our already large list of discoveries. Shortly after this time many miles of the finest type of roads were built and at present they extend as far as the country has been settled. Furthermore, a highway from Miami to Cape Sable, a distance of about one hundred miles, is now completed at least as far as Royal Palm hammock which lies in the Everglades about half way between the two points just mentioned, and work on the second half is now in progress. The second portion of this highway will make accessible large areas of the southwestern portion of the Florida peninsula which have never been entered by man. A portion of this region was traversed by Mr. Krome in making the survey referred to above, and in a recent letter Mr. Krome says: "I do not know whether you have ever penetrated into the country lying north and east of Cape Sable, but if you have not there are still some treats in store for you, providing you make your investigations during the winter months. I think there are orchids and epiphytes enough in the Coot Bay region alone to keep a botanist busy for the term of his natural life, and mosquitoes sufficient to keep him miserable most of the time."

By means of these fine roads in place of the old surveyor's trails we are now able to accomplish as much exploration and collecting in a day or two as used to require a week's time.

Notwithstanding the inaccessibility of this region during the early period of exploration, we found scores of plants, either new to science or typical West Indian and Central American, not before known to occur naturally in the United States, not even on the tropical Florida Keys, and learned that these islands in the Everglades which we have designated the Everglade Keys are, so far as their vegetation is concerned, a portion of the West Indies isolated on the Florida peninsula. Although over one hundred miles north of the tropic of Cancer, their flora is tropical.

We were fortunate in getting into this field before or simultaneously with the homesteader, for his axe and firebrand, if not alone sufficient to exterminate hammocks, paved the way for the West Indian hurricanes to work double the usual amount of destruction in the unique pineland hammocks, and already some of the rare plants have apparently disappeared from the region.

Fortunately, however, civilization has not yet claimed all this interesting region, and the virgin field is yet more than equal in extent to that now wholly or partly devastated. The exceptional opportunity afforded both by this new rock highway running through unknown territory to Cape Sable, and the completed and proposed water highways through the Everglades should not be lost. Complete collections of specimens and photographs of this portion of our country so near at hand, and destined at an early day to have its natural features to a large extent, if not wholly, obliterated, will prove both valuable and interesting.

With your permission I spent portions of February and March, and June and July in further exploration of this region. On the first trip, I was accompanied by Mrs. Small, who participated in some of the field-work and who cared for the specimens at headquarters. On the second trip, I was accompanied by my son, George K. Small, who participated in all the field-work. Our collecting headquarters were, as usual, in the laboratory

building of the Plant Introduction Garden of the United States Department of Agriculture, at Miami. This we occupied through the kindness of Mr. David G. Fairchild, and Mr. Edward Simmonds, who is in charge of this Garden, did much to further our work.

The unusual success of the field-work was due to the interest and coöperation of Mr. Charles Deering, who placed means of transportation both by land and by water at our disposal. We were able to spend the whole or a part of every day in the field. Mr. Charles A. Mosier participated in nearly all the field-work and through his activity and his knowledge of the hitherto unexplored hammocks he contributed largely to our success. Our thanks, too, are due Mr. J. T. Gratigny for keeping our transportation facilities in almost constant motion, thus enabling us to cover large areas and long distances in the time spent in the field.

The following table will indicate the geographical extent of our operations and the character of the points visited.

EVERGLADE KEYS

PINELAND HAMMOCKS AND ADJACENT PINELANDS, Miami and southwestward.

- Addison
- Black Point Creek (twice)
- Brickell (twice)
- Brogdon
- Cocoanut Grove
- Costello (thrice)
- Cox
- Goodburn (twice)
- Hattie Bauer (thrice)
- Murden
- Nelson
- Nixon-Lewis (thrice)
- Ross (thrice)
- Royal Palm (twice)
- Shields
- Snapper Creek
- Sykes (thrice)
- Timms (twice)

EVERGLADES

PRAIRIE HAMMOCKS north of Miami.

- Freeman (twice)
- Merritt's Island
- Humbugus (twice)

PRAIRIES north of Miami.

- Humbugus (twice)
- Little River
- Arch Creek

PRAIRIES south of Miami.

- Cutler to Black Point
- Vic. Long Prairie
- Vic. Murden hammock
- Vic. Nixon-Lewis hammock
- Vic. Timms hammock
- Vic. Silver Palm
- Vic. Larkins

SAND–DUNES

- Near Crocodile Hole
- Opp. Lemon City
- Opp. Miami (twice)
- Key Biscayne

FLORIDA KEYS

- Sands' Key
- Pumpkin Key

Pineland with saw-palmetto, shrubs, and herbs in foreground. Sykes hammock, noted for its copious growth of air-plants, in background. In addition to epiphytic ferns and orchids, a dozen kinds of bromeliads, belonging to four genera, grow on the trees.

Large shrub of *Tetrazygia bicolor* in flower in the pinelands. This plant, which is related to the more widely known meadow-beauty (*Rhexia*), blooms profusely in the summer. It occurs on the Everglade Keys from below Peters Prairie to Long Key.

Old Rhodes' Key	Elliott's Key
Caesar's Rock	Big Pine Key
Adams' Key	Key West

These comprise distinct phyteographical areas. They are as follows:

EVERGLADE KEYS—Pineland hammocks and adjacent pinelands.

EVERGLADES —Prairie hammocks and prairies.

COASTAL SAND-DUNES—Hammocks.

FLORIDA KEYS—Hammocks and pinelands.

The first collecting trip was made to Royal Palm hammock. One of the most interesting discoveries there was a tropical vine heretofore known from our flora only from Elliott's Key, namely *Hippocratea volubilis*, the "bejuco prieto" of the West Indies. Besides thus discovering the first definite locality for this vine on our mainland, we found quantities of one of our very rare shrubs, the myrtle-of-the-river, or *Calyptranthes Zuzygium*. Royal Palm hammock is an island or key in the Everglades about three miles west of Camp Jackson and six miles southwest of Camp Longview, points already referred to, and which up to the end of 1914 were the limits of transportation, except by man on foot. It is different from all the other Everglade Keys, largely because it has for ages been isolated by two forks of the headwaters of an unmapped river. Referring to Royal Palm hammock and also to the sentimental feeling of one who visited it in former times, I will quote another paragraph from Mr. Krome's letter already referred to: "I recently visited Royal Palm hammock by automobile but cannot say that I enjoyed the trip. I have for so long felt that the hammock and the recesses of the 'Glades' and big mangrove swamp beyond were spots reserved for the pleasure of only those few who were willing and able to surmount the difficulties that encompassed them, that I am selfish enough not to relish their being 'thrown open to the public.'"

A second visit to Royal Palm hammock forcibly exhibited the advance of civilization. Up to this last year the flora of the key was natural and native; but a camp had been maintained

there for a short period in connection with road-building and we found among other exotics such plants as millet, oats, timothy, alsike, red-clover, and peanut. The introduction of these plants in an isolated and virginal flora seems sacreligious, not to say criminal. The only interesting point in this connection will be the observations as to how long or how vigorously the species may maintain themselves in perhaps as unnatural an environment as they have ever entered.

Six of the pineland hammocks cited in the preceding list of localities were not visited by botanists before, and they all yielded new or interesting plants. The most interesting of the new hammocks are Brogdon, Goodburn, Nixon-Lewis, Shields, and Sykes. In this connection I am sorry to report that two, and perhaps three, of the hammocks explored during our first incursion into this region have wholly disappeared. The interesting Caldwell hammock and Long-Prairie hammock no longer exist, and the small but prolific Scott hammock we were not able to locate, although it may still be in existence. The Cox hammock, with its numerous enchanting fern-lined lime-sinks, where a decade ago we discovered trees of the West Indian holly, *Ilex Krugiana*, growing in the United States and first found the wild-coffee, *Colubrina Colubrina*, growing as a tree, is doomed. The owner, not satisfied with the progress of destruction wrought by axe, fire, and hurricane, this year fenced it about and put in a half dozen goats in order to hasten the destruction of what vegetation then remained alive.

Among the recent discoveries are two trees new to our flora, these are *Colubrina cubensis* and a species of *Coccolobis*. The former tree was found growing plentifully in no less than four hammocks. One of the new hammocks yielded the tropical epiphytic orchid *Brassia caudata* and another the rarer *Epicladium Boothianum* known otherwise on our mainland only from the now extinct Long Prairie hammock. In several of the hammocks gigantic trees of the West Indian holly were in full bloom during February and March and the fragrance of their flowers filled the surrounding pine woods.

In the Goodburn hammock we were surprised to meet with the

Pinelands as they appear on some of the lower Florida Keys, Big Pine and Little Pine Keys, and on No Name Key where the above photograph was taken. There the pine trees are not accompanied by a copious undergrowth of saw-palmetto, *Serenoa serrulata* as on the Everglade Keys; but by an abundance of both the thatch-palm, *Thrinax microcarpa*, and the

first native plants of the sea-bean, *Mucuna urens*, found in the United States. I had been looking for this plant ever since we began exploration in southern Florida. In this hammock we observed one vine with a very thick trunk-like stem and greatly elongated branches spreading over shrubs and trees to the extent of fully three acres. The vine was covered with both its lemon-yellow flowers and its bright green fruits.

The lime-sinks and rotten logs in the newly visited hammocks maintained the most beautiful and abundant growth of filmy-ferns yet observed in the United States and the crowded masses of our rarer epiphytes, such as *Guzmannia* and *Catopsis*, not to mention many kinds of orchids, were marvelous. These hammocks harbored at least five species heretofore known from the Florida Keys new to the flora of the mainland. Mushrooms, liverworts, and mosses were in good condition in all the hammocks and were collected generously.

The pinelands about the hammocks yielded their share of new and interesting plants. The three most conspicuous in bloom in the summer season were two kinds of West Indian morning-glories discovered there some years ago, the one with numerous purplish flowers and the other with clusters of large crimson fuchsia-like flowers, and most showy of all a white-flowered shrub related to our northern meadow-beauty. This shrub is well worthy of cultivation. Two introductions following the path of civilization from further north in the state were collected, namely the may-pop, a passion-flower, *Passiflora incarnata* and the trumpet-creeper, *Bignonia radicans*.

The Everglades, including the prairies and the prairie hammocks, added much to our previous knowledge of their flora. Many groups of plants were in their best condition owing to recent rains, and our list of the plants hitherto known to grow in the Everglades was materially increased. Among the additions were both native and naturalized plants, the latter class evidently brought in and established there through recent farming activity.

The coastal sand-dunes opposite Miami, near Crocodile Hole, and opposite Lemon City were given some attention. These

interesting natural features are suffering the same fate as the hammocks. Large portions of the natural vegetation have already been obliterated. With this destruction of the dunes is disappearing one of our finest species of milkwort, *Polygala Krugii*, which is not now known to occur elsewhere, not even at its original locality, New Providence, Bahamas. These dunes added a Cuban rag-weed to our flora, *Ambrosia Rugelii.*

Eight of the Florida Keys were visited, six of the Upper Keys and two of the lower ones. In an area of original forest on the lower portion of Elliott's Key we found a terrestrial West Indian orchid, *Ibidium lucayanum.* This plant was first described from specimens collected in the Bahamas. On Key West we found the East Indian vine, *Cryptostegia grandiflora*, a member of the milkweed family, thoroughly naturalized in several places; but the most conspicuous native shrub of the old hammock areas was the little but showy hibiscus, *H. spiralis*, with its myriads of nodding deep-crimson flowers and drooping fruits. A search through the remains of the old hammock for full-grown specimens of an endemic species of cactus, *Cephalocereus keyensis*, revealed only two remaining plants. Several large plants had been cut down some years previous and many of the branches had taken root and were growing about the old stump. We collected many stems of small plants in the winter and in order to save the species from extermination Mr. Deering has had them planted in several hammocks near Miami, and in the spring he had a whole tree transplanted to his grounds near Miami. Big Pine Key as usual disclosed one or two new species, and in a portion of the hammock near the southern end of the island we met with dozens of large trees of the locust-berry, *Byrsonima lucida*, which we first found as a tree in the United States on Long Key in the Everglades. These trees were in full bloom in March and presented a sight not soon to be forgotten.

A brief summary of the more interesting discoveries in the collection of about 11,000 specimens, so far as studied, is as follows: First, over forty species of flowering plants comprising naturalized exotics and heretofore unobserved natives, added to the known flora of the Everglade Keys and vicinity. Second,

additions to the known flora of the United States: Mushrooms, two West Indian species and several new endemic species; liverworts, four West Indian species and three new species; mosses, several West Indian species; ferns, a West Indian species; flowering plants, ten West Indian species and several new endemic species.

Respectfully submitted,

J. K. SMALL

SPRING LECTURES, 1916

Lectures on horticulture will be delivered in the Lecture Hall of the Museum Building of the Garden, Bronx Park, on Saturday afternoons, at four o'clock, as follows:

April 8. "The Outlook in Horticulture," by Professor L. H. Bailey.

April 15. "How the Landscape Gardener Uses Plants," by Professor F. A. Waugh.

April 22. "The Gladiolus," by Mr. Arthur Cowee.

April 29. "Perennials," by Mr. Maurice Fuld.

May 6. "Rock Gardens," by Mr. Richard Rothe.

May 13. "Irises for American Gardens," by Mr. Arthur Herrington.

May 20. "Valuable Plants Introduced from China," by Mr. Frank N. Meyer.

May 27. "Plant Hunting in China," by Professor E. H. Wilson.

June 3. "Flowers from Snow to Snow," by Mr. J. Otto Thilow.

June 10. "The Mysteries of the Flowers," by Mr. H. W. Faulkner.

The lectures, which occupy an hour, will be illustrated by lantern slides and otherwise. Doors closed at 4:00; late comers admitted at 4:15.

The Museum Building is reached by the Harlem Division of the New York Central and Hudson River Railroad to Botanical Garden station, by trolley cars to Bedford Park, or by the Third

Avenue Elevated Railway to Botanical Garden, Bronx Park. Visitors coming by the Subway change to the Elevated Railway at 149th Street and Third Avenue. Those coming by the New York, Westchester and Boston Railway change at 180th Street for crosstown trolley, transferring north at Third Avenue.

WILD ANIMALS IN THE BOTANICAL GARDEN. II

One of the joys of a walk in winter in the Garden is to see the footprints of various wild creatures and to realize that we still have with us, living their natural lives, some of the descendants of the original inhabitants! Perhaps the most common of these are the gray squirrels, who during the summer have occupied the large bunches of dead leaves that still cling to the crotches of the trees, but whose winter homes are harder to find. One family lives in the big sweet gum near the eastern end of the Museum, and a large worn hole, low down in the trunk of the tree, shows where the entrance to their home is. We feed them with nuts and corn occasionally and they know their friends, though they keep an eye on any boy with "stone-throwing" propensities.

A family of red squirrels lives in the manhole of the big aqueduct pipes, crossing the lawn, south of the Museum and meet one of the foremen early in the morning, looking for their daily crust of stale bread. One of the janitors had been in the habit of sharing his lunch with a chipmunk, whose home was under a red-cedar near the Herbaceous grounds, and the little creature grew so tame that it would sit up on his hand and eat peanuts, but it did not like to perform for visitors. Mr. Ackerman, in the short time that he has been in charge at the Mansion, has tamed the squirrels so effectually that they scratch on the windows, asking to be allowed to come in and be fed and they have glorious games of tag on the piazzas and roofs. A black race of the gray squirrels lives on the east side of the river near the greenhouses of Range 2 and intermediate colors occur.

The winter rendezvous of the rabbits is not so easily discovered,

but sharp eyes occasionally see them, hiding in the brown leaves under the low-growing species of pines in the "pinetum" and tracks in the snow leading to the thickets back of the Museum and also near the tangle of herbs in the north meadows, show that they are still here with us, and we hope that no passion for neatness and order will entirely abolish the jungles of cat-brier and blackberry bushes that give them shelter. The children love them and the Brer' Rabbit and Peter Rabbit stories help us to protect them. In springtime, when the garden is full of bloom they are bolder, and often come out at twilight to nibble the clover or sit on a soft cushion of *Phlox subulata*, near the greenhouse and devour the blossoms. They hide their nests so successfully in such unexpected places, that it is only when mowing the grass on top of the terraces of the museum, that they are occasionally discovered.

The moles like "January thaws" and were busy on the 11th, a fine warm day, tunnelling the lawns, searching for crickets, and that pest, the white grub of the June bug. On those two days of record-breaking temperatures, the 27th and 28th of January, the frogs were reported to be croaking, the ducks migrating northward, or flying about in pairs, a bat and numbers of bees and flies were seen in the Garden and snow-drops, willows and alders came into bloom in a few warm days.

Last winter and also this winter, on the shore of the large lake, the muskrats have built their winter mound, and stayed there securely with the children skating and sitting around and above them. The winter before, our muskrat-catcher trapped 80 of them, two of them with black skins; the market-price for the ordinary skins was thirty and forty cents each and for the black ones eighty cents. I saw some of the fresh skins, such a soft, warm, close fur. It seems a pity to kill them, but they do much damage and fill up drains and pipes with their rubbish, besides eating rootstocks of the water-lilies.

Two years ago, a family of raccoons discovered Dr. Harper's plantation of pedigreed corn and visited it frequently at night. Neither dogs nor watchmen could stop them! They were trapped and converted into furs, so they presumably are still travelling around, perhaps in an automobile?

A wary old beaver, with three legs, escaped from the Zoological Park last summer, made his way up the Bronx River and a small tributary brook to the pool in the Herbaceous Grounds and proceeded to cut down several young maples and drag them into a convenient catch-basin nearby to build a home for himself. Various kinds of traps and keepers he was familiar with and it took one specially disguised and placed, to catch him! His life was worth too much to kill him.

An occasional red-deer visits the garden. Three or four times in our history, this has happened; the last one came in the spring and summer of 1915 and was reported by several people to have been seen between the Museum and the greenhouses early in the morning and was said to feed around the lily-ponds. The Zoological Park disclaimed all ownership, so it must have come down for a visit and to see how its civilized relatives live, and finding itself excluded from polite society taken to the woods again and disappeared. The storm of December 13, 1915, blew down so many trees, along the river and in the hemlock grove, that it seems a pity that some of the cooped-up creatures, at the Zoo, could not be allowed to roam around and brouse on them this winter, for several years ago they were begging for food of this sort for their elk or moose. In fact this winter's storms of snow and ice have been more destructive than some of the famous March blizzards of 1888 or 1914 and we have attributed it to the fact that the ground was not frozen and the trees readily toppled over in the soft earth, but this does not apply to the broken telegraph and telephone poles that strewed the path of these storms north of us and put the railroad out of commission. I often think of our birds and beasts during the night, when "King Winter is on the Rampage" and wonder if they are tucked away safe and warm somewhere in the Garden.

CONFERENCE NOTES FOR FEBRUARY

At this conference Dr. F. W. Pennell, under the title "Some Taxonomic Problems of Intra-specific Variation," discussed the types of variability in certain species. Many species are doubt-

less aggregate, composed in the same environment of constantly intercrossing and interblending races, forming networks probably impossible for systematic study ever fully to unravel. In many species, however, races are more or less geographically localized, often evidently in response to environment, and the systematist can and should recognize these, note their distribution and kinship to the parent or aggregate species. At times such geographic races are quite clearly defined. Illustrations of such were shown in *Chamaecrista*, *Monarda*, *Aureolaria*, *Agalinis* and *Buchnera*. It was the speaker's opinion that such geographic races can best be considered by treating them under the formal designation of geographic varieties or subspecies.

A. B. STOUT,
Secretary

NOTES, NEWS AND COMMENT

Professor E. A. Burt, mycologist of the Missouri Botanical Garden, visited the Garden February 12–17 to examine the collection of Thelephoraceae in the mycological herbarium. He has been publishing a series of papers on this important and difficult family, which he hopes to complete within the next three years. He will then prepare descriptions of the species for publication in *North American Flora*. Professor Burt's visit was made the occasion of a dinner to over twenty local mycologists and other botanists, given by Professor Harper on the evening of February 16 at the Columbia Faculty Club.

An article on the discovery of the chestnut canker in Japan by Mr. Frank N. Meyer appeared in *Science* February 4, 1916, contributed by C. L. Shear and Neil E. Stevens. About two years ago, Mr. Meyer discovered the chestnut canker in China. In a letter dated September 20, 1915, Mr. Meyer stated that the chestnut canker is quite common in Japan, at least around Nikko, Tokio, and Yokohama, both wild and cultivated trees being attacked but showing considerable power of resistance.

Mr. Meyer sent some of his collections to Dr. Shear, who found them to be absolutely identical with material collected in the United States on the wild chestnut tree. On January 8, 1916, Dr. Shear received a specimen of chestnut canker from Dr. Yamada, of the Morioka Imperial College of Agriculture and Forestry, who attributed his discovery of the disease to a familiarity with the fungus gained on a recent visit to the United States. *Endothia radicalis* is also indigenous in Japan on various hosts and has been confused with the true chestnut canker, which it very much resembles.

Mr. F. S. Collins of North Eastham, Massachusetts, visited the Garden on February 25 in connection with his studies of the algae of Bermuda. Mr. Collins and Dr. M. A. Howe have in press a joint paper on certain species of *Halymenia*, a genus of red seaweeds.

The February number of *Tree Talk* contains an article by Dr. Fred J. Seaver on "An interesting case of tree girdling." The article consists of a description and illustration of a tulip tree in the upper end of Van Cortlandt Park which is completely girdled and is still living. Although the girdling took place apparently about six years ago the tree has continued to increase in size above the point of girdling since that time, a condition which is almost unbelievable.

Dr. John K. Small spent January in southern Florida where he continued exploration in little-known areas. Especial attention was paid to the Addison Hammock, Royal Palm Hammock, and to Long Key in the Everglades. Several of the heretofore unexplored Florida Keys lying between Miami and Big Pine Key were also visited.

Several sets of specimens of grasses from Mexico recently received from the United States National Museum have been mounted and incorporated in the herbarium.

In the aquatic house, no. 9 of conservatory range 1, there is much to interest and attract. At the present time, early in March, one of the recently introduced water lilies, of hybrid production, known as Mrs. Woodrow Wilson, is coming into bloom. Its flowers are of a deep purplish blue. This belongs to the class of tender water lilies, of which a large collection is grown during the summer in the westerly pool in the court of conservatory range 1. Another water lily, of recent production, is known as Panama-Pacific. This is also putting forth its first flowers. Other interesting plants in the pool are: the water lettuce, *Pistia Stratiotes*, a floating plant, of tropical America and Florida; the floating fern, *Ceratopteris pteridoides*, of Florida and of tropical America; the parrot's feather, *Myriophyllum proserpinacoides*, a native of Chile, with its feathery floating masses of finely cut leaves; the water hyacinth, *Piaropus crassipes*, which has proven such a menace to navigation in the waters of Florida; and the Egyptian paper plant, *Cyperus Papyrus*, from which many of the ancients prepared their papyrus. A graceful fringe is formed for the pool by overhanging masses of bamboos, of which there are several species; and then there are the tall stems of the caña de Castilla, *Gynerium saccharoides*, from the lower altitudes of tropical America, forming an arch over the doorway. The pampas grass, with its silvery plumes, forms an attractive object on the north side of the pool—this is a native of the mountains of South America. Another decorative grass near this is *Thysanolaena maxima*, of tropical Asia. In the same side of the pool, near the west end of the house, is the sugar cane, which is the source of so much of our sugar supply. This is a native of the Old World tropics, but is largely cultivated in the southern parts of our own country, throughout the West Indies, and in many tropical lands. In addition to the large quantities of sugar produced, a great quantity of rum is manufactured also from the juice of this plant.

Meteorology for February.—The total precipitation for the month was 3.74 inches of which 1.5 + inches (15.75 inches snow measurement) fell as snow. The maximum temperatures for

each week were *58° on the 1st*, 42° on the 7th, 41° on the 17th, 44° on the 22d. The minimum temperatures were 14° on the 4th, *1° on the 14th and on the 15th*, and 5° on the 22d.

ACCESSIONS

PLANTS AND SEEDS

1 plant of *Opuntia Youngii*. (By exchange with U. S. National Museum, through Dr. J. N. Rose.)

2 plants of *Citrus Limonum*. (Given by Dr. Pando Y. Kamenoff.)

1 plant of *Nopalea inaperta*. (By exchange with U. S. National Museum, through Dr. J. N. Rose.)

8 plants for conservatories. (By exchange with Department of Parks, Bronx.)

35 bulbs of *Iris tripetala*. (Given by Dr. R. M. Harper.)

1 packet of seed of *Portlandia grandiflora*. (By exchange with the Jamaica, W. I., Department of Agriculture.)

6 packets of seed. (Purchased.)

1 packet of seed of *Iris tripetala*. (Given by Dr. R. M. Harper.)

1 plant of *Diosma odorata*. (By exchange with Mr. W. H. Bicklehaupt.)

2 plants of *Artemisia*, from Mexico. (Given by Mr. N. Dudyshyn.)

4 plants of *Opuntia*. (By exchange with U. S. National Museum, through Dr. J. N. Rose.)

3 plants of *Opuntia Arizonica*. (By exchange with Desert Botanical Laboratory, through Dr. D. T. MacDougal.)

2 plants of *Verbena citriodora*. (Given by Mr. H. W. Becker.)

4 cuttings of plants from Cuba. (Collected by Dr. N. L. Britton.)

1 packet of seed of *Citrus nobilis*. (Given by Mr. John Hartling.)

1 packet of seed of *Tripsacum* sp. (Given by Dr. H. H. Rusby.)

1 packet of seed of *Passiflora ciliata*. (By exchange with Department of Agriculture, Jamaica.)

2 packets of seeds of shrubs and trees. (Purchased.)

2 plants for Conservatories. (By exchange with Mr. W. A. Manda.)

3 bulbs of *Zephyranthes aphylla*. (By exchange with U. S. National Museum, through Dr. J. N. Rose.)

1 pound of seed of *Juglans Mandshurica*. (Purchased.)

LIBRARY ACCESSIONS FROM SEPTEMBER 1, 1915 TO FEBRUARY 29, 1916.

AMES, OAKES. *Orchidaceae . . Fasc. 5. The genera and species of Philippine orchids.* Boston, 1915. (Given by Mr. Oakes Ames.)

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BEAN, WILLIAM JACKSON. *Trees and shrubs hardy in the British Isles.* 2 vols. New York, 1915.

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COULTER, JOHN MERLE. *Evolution of sex in plants.* Chicago, 1914.

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HARTMAN, CARL JOHANN. *Handbok i Skandinaviens flora, innefattande Sveriges och Norriges vexter, till och med mossorna.* Ed. 3. Stockholm, 1838. Ed. 8. Stockholm, 1861. (Given by Prof. N. Wille.)

HARVARD UNIVERSITY—BUSSEY INSTITUTION OF APPLIED BIOLOGY. *Contributions from the laboratory of plant genetics.* Vol. 1. Boston, 1909–13. (Given by Prof. E. M. East.)

HOLLRUNG, MAX. *Der Mittel zur Bekämpfung der Pflanzenkrankheiten.* Ed. 2. Berlin, 1914.

LEMAIRE, CHARLES ANTOINE. *Cactearum, genera nova speciesque novae et ommium in Horto Monvilliano cultarum.* Lutetiis-Parisiorum, 1839. (Photostatic reprint given by Mr. Frederick V. Coville.)

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MÖBIUS, MARTIN. *Mikroskopisches Praktikum für systematische Botanik. (2. Kryptogamae und Gymnospermae.)* Berlin, 1915.

PASCHER, ADOLF A. *Die Süsswasser-Flora Deutschlands, Österreichs und der Schweiz.* Vol. 5. Chlorophyceae 2. Jena, 1915.

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SPESCHNEW, N. N. VON. *Die Pilzparasiten des Teestrauches.* Berlin, 1907.

STEINMANN, PAUL. *Praktikum der Susswasserbiologie.* 1. *Die Organismen des fliessenden Wassers.* Berlin, 1915.

STOUT, ARLOW BURDETTE. *The establishment of varieties in Coleus by the selection of somatic variations.* Washington, 1915. (Given by Dr. A. B. Stout.)

VAN ALDERWERELT VAN ROSENBURGH, C. R. W. K. *Malayan fern allies. Handbook to the determination of the fern allies of the Malayan Islands.* Batavia, 1915.

WAGNER, ADOLF. *Repetitorium der allgemeinen Botanik.* Leipzig, 1915.

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Vol. 3, part 1, 1910. Nectriaceae—Fimetariaceae.

Vol. 7, part 1, 1906; part 2, 1907; part 3, 1912. Ustilaginaceae—Aecidiaceae (pars).

Vol. 9, parts 1 and 2, 1907; part 3, 1910; part 4, 1915. Polyporaceae—Agaricaceae (pars). (Parts 1 and 2 no longer sold separately.)

Vol. 10, part 1, 1914. Agaricaceae (pars).

Vol. 15, parts 1 and 2, 1913. Sphagnaceae—Leucobryaceae.

Vol. 16, part 1, 1909. Ophioglossaceae—Cyatheaceae (pars).

Vol. 17, part 1, 1909; part 2, 1912; part 3, 1915. Typhaceae—Poaceae (pars).

Vol. 22, parts 1 and 2, 1905; parts 3 and 4, 1908; part 5, 1913. Podostemonaceae—Rosaceae (pars).

Vol. 25, part 1, 1907; part 2, 1910; part 3, 1911. Geraniaceae—Burseraceae.

Vol. 29, part 1, 1914. Clethraceae—Ericaceae.

Vol. 34, part 1, 1914; part 2, 1915. Carduaceae.

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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 Arthur Hollick and Edward Charles Jeffrey. viii + 138 pp., with 29 plates. 1909.

Vol. IV. Effects of the Rays of Radium on Plants, by Charles Stuart Gager. viii + 278 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.

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NEW YORK BOTANICAL GARDEN

BRONX PARK, NEW YORK CITY

Vol. XVII APRIL, 1916 No. 196

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The New York Botanical Garden

EDITOR
ARLOW BURDETTE STOUT

Director of the Laboratories

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LIVER-LEAF

JOURNAL

OF

The New York Botanical Garden

VOL. XVII April, 1916 No. 196

WILD PLANTS NEEDING PROTECTION*

10. "LIVER-LEAF" (*Hepatica Hepatica* (L.) Karst.)

(With Plate CLXIX)

This most delightful of early woodland blossoms is rapidly being exterminated from our hillsides by fires and the dying out and cutting down of the chestnuts which have sheltered them for many years. They prepare their lovely blossoms and silvery leaves the year before and are ready to come forth with the slightest encouragement, so that in sunny sheltered places they have even been known to blossom in December and are generally found in this vicinity in March and April, though sometimes lingering in cool places at higher elevations till May.

The plant derives its common name from the dark purplish, red color of the under side of the leaves, which are bluntly 3-lobed and hardy, lying flat on the ground during the winter, their upper surface green and shining and their leathery texture protecting them from the cold and snow. They are seldom more than 2–3 inches wide and 1.5 inches long, with 3 blunt lobes, though occasionally notched again on the lateral lobes. The young leaves, as they unfold, are covered with long silky white hairs as are also the stalks of the flowers. The stems are usually prostrate and subterranean, densely covered with strong fibrous roots, forming an underground rootstock; the growing tip being protected by a few large white sheathing bracts. The flowers

* Illustrated by the aid of the Stokes Fund for the Preservation of Native Plants.

[Journal for March (17: 37–53) was issued Apr. 3, 1916]

arise singly or in clusters from among these bracts, and vary in color from white, through pale shades of blue and pink to deep violet, with stalks also varying in length from 2–5 inches; they are subtended by three small sessile green leaves, forming an involucre to each blossom and enclosing it in the bud, so that both the leaves and blossoms are well protected during the winter by their silken covers. The colored segments of the flower are usually 6 in number and variable in length as are also the stamens. The anthers are white and the achenes are beaked and also covered with silky hairs.

The *Hepatica* is widely distributed in the east from Nova Scotia to Florida and west in the central part of Canada to Manitoba and in the United States to Iowa and Missouri. A closely related species, *Hepatica acutiloba* overlaps and intergrades with it and both are known from Europe and Asia. They take kindly to cultivation and increase in size and the number and color of their blossoms, but should be mulched only with well-rotted leaf-mold.

The hepaticas belong to the Crowfoot or Buttercup family, of which about 35 genera and over a thousand species are known mostly from the temperate regions of the world.

ELIZABETH G. BRITTON

SPHENOZAMITES ROGERSIANUS FONTAINE; AN ADDITION TO THE RHAETIC FLORA OF SAN JUANCITO, HONDURAS

(With Plate CLXX)

About twenty-seven years ago, Dr. J. S. Newberry (1888*a*) briefly described a collection of Triassic plant remains from the vicinity of San Juancito, Honduras. Subsequently (1888*b*) he elaborated this paper and in it listed altogether fourteen species, five of which were described as new.

Recently, while engaged in cataloging the type and figured specimens in the paleobotanical collections of the New York Botanical Garden, a fine specimen not specifically described by

Newberry was found. It had been broken in two pieces and each piece had been given a different museum number (9129G and 9130G). These are now fastened together and we are enabled, for the first time, to obtain an adequate idea of its specific characters as depicted in the accompanying natural size photograph of the restored specimen.

Although imperfect at the tip, the leaflet measures about six inches in length and two and three quarter inches in width. The nervation which is much more perfectly preserved in the upper portion of the leaflet is fine, parallel and apparently simple throughout, with no clearly marked indication of forking or of divergence. In the lower portion the nervation is much more poorly preserved and, while there are in the better preserved parts indications of bifurcation, its exact nature cannot be accurately ascertained. Between the veins and extending across from one to the other are what appear to be short bars, or veins, giving the impression of a very delicate lattice-work.

These characters, together with its shape, indicate that the specimen is a leaflet of *Sphenozamites Rogersianus* Fontaine. The strongly marked outline also tends to confirm this identification, for Fontaine in his description of the type says: "All are bordered by a very narrow cartilaginous rim which is formed by the thickening of the edge of the leaflets." When the character of the matrix with its exceedingly ragged and irregular mode of splitting, and its somewhat coarse texture is considered, it would seem as if only such a margin as Fontaine describes could be so sharply and perfectly preserved.

Furthermore, the Triassic floras of San Juancito, Honduras, Sonora, Mexico and the Richmond Coal Field, Virginia are much alike and were in fact so considered by both Newberry and Fontaine who described them. Thus Newberry (1888*b*, p. 342), writing about the San Juancito flora, states: "the flora as a whole has a great resemblance to that of the coal-bearing strata on the Yaki river in Sonora, Mexico." Fontaine (1883, pp. 83, 84) in discussing *Sphenozamites Rogersianus* says: "Dr. Newberry gives a figure on plate VIII, f. 5, of a plant found at Sonora, in his report on the Macomb Expedition. It seems to be

a fragment of a leaflet of a species like our plant. Its affinity with the Virginia plant is made more probable by the resemblance which many of the plants found in Sonora bear to some of the plants of the Richmond Coal field." Again Newberry (1888*b*, pp. 342, 343) notes the resemblance of the flora from San Juancito, Honduras to that described by Schenk in "Die Fossile Flora der Grenzschichten des Keupers und Lias Frankens" and to Nathorst's "Floran vid Bjuf." Fontaine (1883, p. 96) likewise notes the resemblance of his Richmond flora to these same floras in addition to others.

It seems reasonable, therefore, to consider the newly restored specimen as identical with Fontaine's species, thus adding a new species to the Rhaetic flora of San Juancito, Honduras and further emphasizing the similarity existing between the several North American Triassic floras.

The following general facts in regard to the plant here discussed may help the reader to a clearer understanding of it. The fossil cycad genus *Sphenozamites* was founded by Brongniart in 1844. It was considered by Schimper to bear some resemblance to the living genera *Zamia* and *Encephalartos*. The genus flourished throughout the whole of early mesozoic time, when the cycads as a whole enjoyed a much wider geographic range than they do today.

The leaves of *Sphenozamites Rogersianus* were large. According to Fontaine who founded the species they could not have been less than a meter in length.

In conclusion the writer acknowledges his indebtedness to Dr. Arthur Hollick for the kindly advice and criticism given during the preparation of this study.

EDWIN W. HUMPHREYS

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1888*b*. Rhaetic plants from Honduras. Am. Jour. Sci. 36· 342–351. *pl. 8*.

ADDISONIA

There have been several allusions in the *Journal* (**14**: 120, 121) and *Bulletin* (**9**: 14, 101, 102) to the provision in the will of Judge Addison Brown, late President of the Garden, for the establishment of "a high-class magazine devoted exclusively to the illustration by colored plates" of plants of the United States or cultivated in the Garden, "with suitable descriptions . . . notes and synonymy." In accordance with this provision, the first number of the new quarterly periodical, *Addisonia*, has appeared, and sample copies have been widely distributed. There are ten colored plates, each with accompanying text, in each number, and four numbers (40 plates) constitute a volume. In spite of the fact that the new publication is subsidized by the Addison Brown Fund, it will be necessary to secure a considerable number of subscriptions (at $10.00 a year) to insure its complete success in accordance with the plans now presented. Three contributors have supplied the text of the first number; and one species, *Begonia Cowellii* Nash, is here described for the first time. The following species are illustrated: *Rhododendron carolinianum*, *Cassia polyphylla*, *Robinia Kelseyi*, *Pachyphytum longifolium*, *Begonia Cowellii*, *Echeveria setosa*, *Columnea gloriosa*, *Fouquieria formosa*, *Maxillaria ringens* and *Nopalea Auberi*.

CONFERENCE NOTES

At the February conference of the scientific staff and registered students Mr. R. R. Stewart gave a report on "The Wild Plants of Western Tibet," of which the following is a brief summary.

The region included in the discussion is the part of the native state of Kashmir east of the "Great Range" of the Himalaya. This range stops the rain clouds from the plains and the part of the country on the Indian side has plenty of rain with an abundant alpine flora, while on the Tibetan side the transition is very abrupt to an arid climate with an entirely distinct flora.

Continuous plant formations of any kind are rare and only a fraction of the ground is covered with vegetation. Practically

the only annuals are to be found along the streams, in boggy places or as weeds in cultivated ground. In the deserts the plants are very dwarf with thick woody roots. There are practically no trees except those watered artificially around the villages or along the streams.

The flora resembles that of Turkestan and Tibet more than that of Kashmir and the Himalayas although where there is water from melting snow, Himalayan and cosmopolitan alpine types are to be found.

All of the larger genera but two, *Allardia* and *Sausswiea*, are found here in the eastern United States. Most of the species that are common to this country and western Tibet are weeds that have been introduced here.

The report was illustrated by herbarium specimens and photographs.

A. B. STOUT,
Secretary

NOTES, NEWS AND COMMENT

Dr. N. L. Britton, director-in-chief, with Mrs. Britton and Mr. Percy Wilson, returned to New York on March 28th after spending two months in botanical exploration of the Isle of Pines and Cuba.

Dr. B. L. Robinson, director of the Gray Herbarium, spent several days at the Garden recently in the study of herbarium material of the genus *Brickellia*.

In September, 1915, a poplar tree which was badly infested with the poplar borer (*Saperda calcarata* Say) was cut in the Garden and specimens preserved to show the destructive work of this insect. Other specimens of the infested wood were placed in glass cages and kept until spring. During March several of the adult insects emerged. The larva of the insect is a white grub nearly two inches in length while the adult beetle is a beautiful grayish insect more than an inch long. The work

of the insect is characterized by canals a half inch in diameter which ramify through the trunk of the tree. The insect attacks various species of poplars in some cases resulting in the local destruction of the trees.

Another bulletin on "Citrus Canker," by H. E. Stevens, has been published by the Agricultural Experiment Station of the University of Florida. This bacterial disease, caused by *Pseudomonas Citri* Hasse, has proved to be the worst plant disease that has appeared in Florida and seriously threatens the citrus industry of the state, as well as of the entire south. It affects all parts of the tree above ground and attacks most of the varieties of *Citrus* grown in Florida. The bacteria are capable of considerable desiccation and retain their vitality for long periods. The complete destruction of all infected trees is the only known effective method of checking the spread of the disease, and this must be done very promptly if it is to be successful.

Meteorology for March.—The total precipitation for the month was 2.77 inches of which 2.25 inches (22.5 inches snow measurement) fell as snow. The maximum temperatures for each week were 41° on the 1st, 52° on the 13th, 64° on the 26th, and *66° on the 31st.* The minimum temperatures were 17° on the 4th, 12° on the 12th, *5½° on the 18th*, 17° on the 24th and 34° on the 31st.

ACCESSIONS

MUSEUMS AND HERBARIUM

19 specimens of fungi from Alabama. (By exchange with Dr. R. P. Burke.)

2 specimens of fungi from New York. (Collected by Mr. Percy Wilson.)

1 specimen of woody fungus from New York. (By exchange with Dr. B. O Dodge.)

1 specimen of woody fungus from Alpine, New Jersey. (Collected by Mr. Percy Wilson.)

2 specimens of flowering plants from western North America. (Given by Dr. H. H. Rusby.)

12 specimens of flowering plants from Washington. (Given by Mr. J. M. Grant.)

1,354 specimens from the Local Flora region. (Collected by Mr. Percy Wilson.)

93 specimens of ferns from Jamaica. (Given by Mr. C. H. Farr.)

2 specimens of *Quercus* from Georgia and Mississippi. (Given by Mr. T. G. Harbison.)

6 specimens of flowering plants from Utah. (By exchange with Professor A. O. Garrett.)

3 specimens of *Polygonella* from South Carolina. (Given by Professor W. C. Coker.)

1 specimen of *Salvia verticillata* from Pennsylvania. (Given by Mr. J. P. Otis.)

108 specimens of ferns and flowering plants from Mexico. (By exchange with Prince Roland Bonaparte.)

1 specimen of fungus from Oregon. (By exchange with the Oregon Agricultural College.)

175 specimens of fungi from Banff, Alberta. (By exchange with the Dominion Government Museum, Alberta.)

7 specimens of fungi from Michigan. (By exchange with Dr. C. H. Kuffman.)

34 specimens of fungi from Montgomery county, Alabama. (By exchange with Dr. R. P. Burke.)

12 specimens of fungi from Chapel Hill, North Carolina. (By exchange with Professor W. C. Coker.)

300 specimens of flowering plants from Alberta. (Collected by Miss M. E. Moodie.)

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BLOODROOT

JOURNAL

OF

The New York Botanical Garden

VOL. XVII May, 1916 No. 197

WILD PLANTS NEEDING PROTECTION*

II. "BLOODROOT" (*Sanguinaria canadensis* L.)

(With Plate CLXXI)

This is another of the early spring flowers, whose stems are protected by being buried in the earth, forming a subterranean rootstock, abundantly nourished by strong fibrous roots. It is this red, underground, stem, which gives the plant its common name, for like many others of the Poppy family, to which it belongs, it contains a milky orange-colored sap, which flows freely from it when broken. The stems give rise, at intervals, to clusters of pale sheathing bracts, from which the leaves emerge and unroll, showing the white pearly blossoms within. The base and veins of the leaves and the stalks of the flowers are also tinted with the red coloring matter of the stems. When fully expanded, the leaves often measure 6–12 inches across, being wider than they are long, variously lobed or toothed and borne on stalks often 10–14 inches in height. The leaves are fleshy and pale green in color with a waxy bloom when young and disappear soon after the fruit matures. The blossoms open sometimes in March but usually in April and early May and the flowers are generally borne singly on stalks longer than the leaves, though rarely two are found on one stalk; they are large and usually pure white, though sometimes tinged with purple or pale pink, and measure from 1–2 inches across, having 8–12

* Illustrated by the aid of the Stokes Fund for the Preservation of Native Plants.

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petals, which last only a day or two. The calyx falls off as the bud expands, a characteristic of other members of the Poppy family. The anthers are bright yellow and the stamens numerous, varying in length and attached at the base of the ovary which later develops into a two-valved pod, at the top of which the persistent stigma remains till it ripens.

Owing to the variations in the lobing of its leaves *Sanguinaria* has been variously named, but it is generally considered a monotypic genus, widely distributed in the east from Nova Scotia to Manitoba and southward to Arkansas and Florida, occurring also at higher elevations in the Alleghanies.

The Poppy family is widely distributed in the north temperate zone and 26 genera and 200 species are recognized, many of which have been used medicinally and are popular in cultivation on account of their showy flowers and beautiful foliage.

ELIZABETH G. BRITTON

THE NATURAL VEGETATION OF THE ISLE OF PINES, CUBA

TO THE SCIENTIFIC DIRECTORS:

In continuation of botanical investigations in the West Indies, I visited the Isle of Pines in February and March, 1916, accompanied by Mrs. Britton and by Mr. Percy Wilson. We were fortunate in finding Professor A. D. Selby, of the Ohio State Agricultural College, in residence there during a part of the time, and Brother Leon, of the Colegio de la Salle, Havana, was a valued member of the expedition for several days. Professor Carlos de la Torre, of the University of Havana, kindly gave us letters of introduction and much important information. We also gratefully acknowledge aid and information from Mr. L. C. Giltner, of Nueva Gerona, Mr. Lester S. Brown, of Columbia, Messrs. E. P. Van Duzen, J. L. Baker, John M. Rogers and others of San Pedro, Mr. Ralph S. Bradley, of Los Indios, Mr. Edward A. Phippen, of Siguanea, Mrs. A. L. Robertson, of Vivijagua, and from many other residents.

Fossil leaflet of *Sphenozamites Rogersianus* Fontaine.

Accompanying the article on page 56.

The Isle of Pines (Evangelista of Columbus), situated about 60 miles south of west-central Cuba, across the shallow, key-dotted Bay of Batabano, and politically a part of the Province of Havana, is about 30 miles in length and breadth, with a long peninsula projecting northwestwardly from its southwestern part, terminating in Punta Frances. Climatically, the year is more or less sharply divided into a wet season, with frequent rains from May until November, and a dry season, with infrequent showers from December to April; the dry season may take on, as it has this year, the features of an acutely prolonged drought, desiccating vegetation in a destructive manner and endangering garden and agricultural operations unless a water supply is available, and furnishing fuel for grassland and forest fires which sweep over wide areas in an alarming and often dangerous manner. The winter climate is delightful; the island lies sufficiently south to intercept the Caribbean breezes, and heat is seldom oppressive, unless the wind is from the south, as it rarely is. Mosquitoes are few, but midges are irritatingly abundant, and ticks can be had in grassy grounds frequented by cattle. Other tropical pests are scarcely in evidence and neither alligators nor crocodiles can be seen now except after careful penetration of lagoon thickets.

The southern, little-known, one third of the island is effectually separated from the northern two thirds by mangrove swamps and lagoons of varying width, intersected by a network of channels termed "Cienega de Lanier" (Lanier's Swamp). A. H. Lanier was French consul of Trinidad, Cuba; he visited the Isle of Pines about 1831 and made the first collection of its plants, which was sent to Europe and studied by Achille Richard, forming part of the material used by this distinguished botanist in the preparation of the botanical volumes of Ramon de la Sagra's "Historia Fisica, Politica y Natural de la Isla de Cuba." At both the eastern and western ends of the Cienega are broad shallow bays; the swampy area is narrow at one place south of Santa Fe, and is there crossed occasionally by horsemen in the dry season. A motor-car road to the southern coast is now projected across this *pasacita*. This portion of the island south

of the Cienega and the greater part of the projecting peninsula are nearly level slightly elevated plains, composed throughout, apparently, except where broken by lagoons, of aeolian and coral limestone and covered by a dense and luxuriant forest of hardwood trees and shrubs of many species; some of these trees attain large size, up to at least 80 feet in height and 7 feet in diameter. This forest is rooted almost directly upon the rock and in rocky crevices, the soil being meager over large areas but very rich. Where accessible, timber has been taken from this forest, but much of it remains virgin. The southern coast is bounded by a nearly vertical rock wall along most of its extent, locally broken by a few bays and sand beaches. We made collections and observations at five points on the western part of this limestone area; its flora resembles that of other similar limestone areas of recent geological origin in other parts of the West Indies.

We found the same limestone to underlie parts of the coastal plain northeast of the Cienega, east of San Juan, where it supports a similar luxuriant hardwood forest, here abounding in orchids, bromeliads, and ferns of several species; this San Juan forest is readily accessible for study, intersected by roads and trails, and is at present being extensively cut for railroad ties and for charcoal burning; here we spent several highly interesting days under the guidance of members of the large Garcia family, who own this region. We are under special obligations to Don Bertrand Garcia and Don Domingo Garcia for aid and information; the forest is of maximum luxuriance where the limestone passes under the borders of the Cienega.

At San Juan, a series of limestone hills, "Cerro de San Juan," rise abruptly from the plain and support a hardwood vegetation, many of its elements the same as those of the plain above described, but with some highly interesting additions. This limestone is thinly bedded, its strata much contorted and its surface much weathered. The axis of the range lies nearly east and west; the limestone is quite different from that of the plains, evidently geologically older, and there are areas of arable land on the lower slopes.

The Loma Daguilla (Lace-bark Hill), an isolated mountain about 600 feet high, situated about 2 miles west southwest of the San Juan hills, is of exceptional interest. It takes its name from the lace-bark tree (La Daguilla), a near relative of the Jamaica lace-bark, here rather abundant; its inner bark is separable into a delicately beautiful netted fiber, and there are other rare and interesting species in the woodlands. The geological structure here seems to be complicated; near the northern base of the mountain, where the road to Santa Fe crosses an arroyo, a crystalline limestone outcrops; the slopes of the mountain are mainly sandstone and schist, while some limestone also occurs again toward the summit, at least in loose pieces. A critical examination of the stratigraphy of this mountain would be highly instructive. The top of this mountain is bare of vegetation and the best view of the island is had from this peak, every other elevation above the plain appearing in bold relief and most of the coast line being visible.

In the northeastern part of the island, rough hills and mountains of crystalline limestone, covered with hardwood forest, are conspicuous topographical features. The Sierra de las Casas, west and southwest of Nueva Gerona, reaches altitudes of about 800 feet (our barometric measurement) and trends nearly north and south. The Sierra de los Caballos, east and southeast of Nueva Gerona, ascends to about 1,000 feet.* Both of these mountains are picturesquely precipitous, some of the cliffs being nearly vertical and several hundred feet high, often thickly clothed by the maguey or century plant of the Isle of Pines (*Agave papyrocarpa*), and the steep slopes are dotted by the large and peculiar green-barked ceibon tree (*Bombax emarginata*), one of the few deciduous-leaved trees of the flora, essentially bare of foliage at the time of our visit; both lithographically and orographically, and in some floral features, these mountains resemble some of the mountains of Pinar del Rio. This crystalline limestone also forms the range of wooded hills about 300 feet high at Vivijagua (Cerro de Vivijagua), at the northeastern corner of the island, and the little hills (Cerro San Juan del Mar)

* Barometric measurement by Otto E. Jennings, *Amer. Fern Journ.*, 1: 130.

at Columbia. The land near the bases of parts of these limestone hills and mountains is arable and at points rich.

The numerous hills and mountains of the central and west-central districts are, apparently, all composed of sandstone and quartz-mica schist, with many segregated masses of quartz, some of it crystalline. These reach their greatest altitude in the Sierra de la Cañada, which is about 1,000 feet high, thus approximately the same height as the Sierra de los Caballos. The Sierra de la Cañada has been stated in local publications to be much higher, and even on the coast survey chart is given at 1,560 feet high. It was, however, barometrically measured by Otto E. Jennings in 1910 at 985 feet,* and our barometric measurement of 1,015 feet confirms this, essentially. These sterile elevations are almost all loosely clothed with pine, except where the hardwood vegetation of arroyos extends up the numerous valleys and, in places, where the slopes of foothills have a richer locally arable soil, indicated by hardwood trees and shrubs. Excepting the considerable areas of coastal mangrove swamps, the parts of the northern two thirds of the island not occupied by hills or mountains, and forming by far the greater part of the surface, are level or gently undulating gravel and sand plains, intersected by many brooks and small rivers, and are characterized by many species of plants which grow here and on the plains of Pinar del Rio. The gravel, appropriately termed the "Mal Pais" (Bad Lands) gravel, is colored yellowish and brownish-red by oxide of iron, and there is much limonite of poor quality in small, or sometimes quite large, masses on the surface or imbedded in the soil. The higher parts of the plains are pine-clad, the lower parts are savannas, characterized by the guana prieta or palmetto (*Paurotis Wrightii*), a beautiful palm, averaging perhaps 20 feet in height, which reaches its greatest development on the Isle of Pines, although locally abundant in Cuban savannas and growing also on Andros Island, Bahamas, and in extreme southern Florida. It differs from most palms in forming clumps, its trunks being connected underground so that more or less isolated colonies of from five

* *Journ. Geology*, 21: 368.

to twenty trees are very interesting features. In the west-central districts, the plain is formed of a nearly pure white silica-sand, and here grow the most characteristic plants of the wild flora, first studied and collected by Mr. Otto E. Jennings in 1910. I had the privilege of examining his collection, and our visit was partly induced by the extreme interest of many of the specimens brought back by him. A large number of kinds of diminutive flowering plants, of many families, inhabit this sand plain, together with some shrubs and a few kinds of small trees.

The vegetation of the river-valleys and the arroyos above saline influence is of many hardwood trees, shrubs, herbaceous plants, and ferns, nearly all of which grow also in Cuba, and the slopes and flood plains are underlain locally by arable soil.

A noteworthy fern locality, and one of the most beautiful places on the island, is at Majagua, in the valley of the Mal Pais River, near Columbia, which we were shown by Mr. Lester S. Brown. Here a tributary of the Mal Pais rises in a series of living springs of pure cool water, saturating a portion of the valley over several acres, densely clothed with manaca palms and royal palms, and supporting a rich and luxuriant vegetation of ferns, mosses, and air-plants of many species; three of the ferns were not seen by us at any other station, the most striking and elegant being a high-climbing species with large decompound leaves. It is earnestly hoped that this charming valley may be permanently preserved, as it is a most valuable natural feature. Another remarkable natural fern garden is on the Cerro la Jia, near El Canal, a few miles south of Santa Fé, where a truly wonderful colony of the fern *Blechnum occidentale* occurs, many thousand plants being densely packed together in a notch between two wooded hills, occupying an area of perhaps two acres. Here these ferns form almost a complete ground cover and, their leaves all curving downward in the same direction, form a striking and unusual natural feature. Associated with the *Blechnum* are three kinds of maidenhair ferns, *Adiantum*, in much smaller quantities, and there are also some flowering plants here which we did not observe elsewhere. This beautiful spot is also well worthy of permanent preservation. It would be

greatly to the advantage of the island if several such areas as these should be permanently reserved for the enjoyment of residents and tourists, by their ownership being obtained by some strong local organization which should hold them for the public good.

In the savannas and pinelands of the northeastern districts, many fresh-water lagoons occur, containing fine water plants, among them the West Indian white water lily (*Castalia ampla*), which grows also in some of the rivers, and a beautiful yellow-flowered *Nymphodes;* their shores provide a home for many small herbaceous plants, several species of bladderworts (*Utricularia*) being elements of special interest. During the wet season, these lagoon depressions fill to the brim; in periods of drought, many of them are completely dry or contain only small pools; their slopes, beyond the danger line of flooding, are available for garden or farm purposes; some of them have been drained.

Previous botanical collections on the Isle of Pines include:

1. That made by A. H. Lanier in 1831, referred to above.
2. A small collection made by José Blain about 1850, preserved at the Gray Herbarium of Harvard University.
3. A small collection obtained by Dr. C. F. Millspaugh, curator of botany in the Field Museum of Natural History, Chicago, who landed for a few hours at Punta Piedernales, on the southwestern coast, from the yacht "Utowana" in 1899.
4. A considerable collection made by William Palmer and J. H. Riley under the auspices of the Smithsonian Institution in 1900; the New York Botanical Garden has a partial set of this collection.
5. About 200 species obtained by A. A. Taylor, mainly in the vicinity of Columbia, in the spring of 1901, primarily on behalf of Cornell University; this collection was made up into sets, one of which is at the New York Botanical Garden. Professor W. W. Rowlee, of Cornell University, visited the Isle of Pines in the following winter, and added some species to Mr. Taylor's collection.
6. A large collection made by the veteran field botanist, A. H. Curtiss, principally in the vicinity of Nueva Gerona, in the

spring of 1904; this was also made up into sets after being studied at the New York Botanical Garden, where the most complete one is preserved.

7. Mr. Otto E. Jennings, to whose scientific work on the Isle of Pines I have already referred, was a member of the expedition sent there by the Carnegie Museum of Pittsburgh in 1910 and made a botanical collection aggregating over 600 numbers in the spring and early summer of that year; this was studied at the New York Botanical Garden, where a partial set is preserved; he visited many parts of the island.

These seven collections represented about 740 species. Our collection aggregates 1,657 numbers, and, taken with the others, indicates that the total natural flora of the island is not less than 1,500 species.

Before proceeding to the Isle of Pines, we spent the period from February 2 to February 11 in the examination of interesting localities in north-central Cuba, including several points in Havana Province, Matanzas, Cardenas, Varadero and Camarioca in Matanzas Province, and San Isidro and the Rio Mananteales in Pinar del Rio. Specimens under 208 field numbers were collected at these places. We gratefully acknowledge kind attention and aid from Dr. Luis Cuni, of Matanzas, Dr. Alejandro Neyra and Mr. R. H. Johnson, of Cardenas, and Don Joaquin M. Pèrez, of Cantel.

All together, the expedition obtained about 10,000 specimens for the herbarium, museum, and greenhouses, including many duplicates, available for exchanges with other institutions; it occupied the period from January 29 to March 28.

Respectfully submitted,

N. L. Britton,
Director-in-Chief

THE PRESERVATION OF OUR NATIVE PLANTS

In August, 1901, the Misses Olivia and Caroline Phelps Stokes presented to the New York Botanical Garden a fund of $3,000, for the investigation and preservation of our native plants, the interest of which has been used for the protection of our native plants.

Various methods have been tried, beginning with a series of three prizes for essays on this subject offered first to teachers, botanists and journalists and which has resulted in a number of good essays the best of which were printed in the *Journal of the New York Botanical Garden* in 1902 and 1904. The prize essays were written by Dr. F. H. Knowlton, U. S. National Museum, Washington, D. C.; Miss Cora H. Clarke, daughter of James Freeman Clarke of Boston; Dr. A. J. Grout, Boys' High School, Brooklyn; Miss Mary Perle Anderson, supervisor of nature study, University School for Girls, Chicago, Ill.; Miss Jean Broadhurst, of Teachers' College, Columbia University, and Mr. G. Gordon Copp, journalist.

In 1910 another series of smaller prizes were offered to students in high schools, and these were won by students from the Washington Irving High School, the Boys' High School in Brooklyn and the Morris High School, Bronx.

Finding that many of the wild flowers were gathered by the children for their teachers and that large quantities were supplied for the high schools of New York City, it was arranged through the members of the Board of Education that the following wild flowers should be eliminated from the list of botanical supplies in the New York public schools; trailing arbutus, wild columbine, hepatica, Jack-in-the-pulpit, moccasin flower, wake-robin, Solomon's seal, wild geranium, wild orchids, wild ferns, and fringed gentian.

During the years 1912 and 1913, the accumulated income of the Stokes' Fund was used for colored illustrations for a series of essays on "Wild Plants Needing Protection" and has included the Jack-in-the-pulpit, spring beauty, wild pink, wild columbine, bird's foot violet, wild azalea, moccasin flower, dog-wood and

laurel. In 1916, the bloodroot, hepatica and fringed gentian have been added. The essays have been reprinted and may be had at a nominal price from the New York Botanical Garden. Extra copies of the colored plates were made and in 1914–1915, arbor day competitions were held in the public schools and high schools of Greater New York, for which prizes of eight of these colored plates, framed, were offered to each school and schedules of trees, shrubs, wild flowers and ferns needing protection were furnished to the teachers. The best essays were printed in the *Journal of the New York Botanical Garden* and hundreds of reprints sent for distribution to the schools from which they came.

The attention of visitors to the wild parts of the Garden has been called to the preservation of our native plants by the following sign

"The picking of wild flowers is strictly forbidden."

Lectures illustrated by colored lantern slides have also been given under the auspices of the Garden by Dr. Britton in Washington and Chicago, by Mr. Pollard and Mr. Taylor in various cities and colleges and by Mrs. Britton to a number of the Garden Clubs in the vicinity of New York City. Visits have also been made to the schools to tell stories to the children about the animals and plants that are found in the New York Botanical Garden. In this way a general interest has been aroused, which, in coöperation with the work of the "Wild Flower Preservation Society of America" and the "Society for the Protection of Native Plants" has resulted in a large membership in various cities of the east and local chapters have been organized in several of them. Further information and literature may be had on application to

MRS. N. L. BRITTON

NEW YORK BOTANICAL GARDEN,
BRONX PARK, N. Y. CITY

SPRING INSPECTION OF GROUNDS, BUILDINGS AND COLLECTIONS

The Spring Inspection of the grounds, buildings and collections, took place on Thursday afternoon, May 4, from three to six o'clock. Although the season was unusually late, the day selected proved to be warm and fair and ideal in every way.

Over four hundred members of the Garden and their friends responded to the invitation sent out by the Women's Auxiliary and a Committee of the Board of Managers. The guests assembled in motor-cars at the Botanical Garden Station Plaza and visited in turn the Main Conservatory Range, the Flower Garden, the Pinetum, the Japanese Cherry Collection, the Magnolia Collection, the site of the new Rose Garden, and the Iris Garden, making stops and obtaining information regarding the collections at each point, under the guidance of members of the Garden staff.

Tea was served in the Museum Building at five o'clock, and between five and six the museums, library, laboratories, and herbarium were open for inspection. The first number of "*Addisonia*" was exhibited, together with a large number of paintings of flowering plants prepared for publication in succeeding numbers of this new magazine.

CONFERENCE NOTES FOR MARCH

The March conference of the scientific staff and registered students of the Garden was held in the laboratory of the museum building on the afternoon of April 5. Mr. W. A. Stowell reported on the results of his investigations of the oak hybrids of Cliffwood, New Jersey.

During the past summer Mr. Stowell made an intensive study of the tree population of Prospect Grove, near Cliffwood, which is the type locality for the hybrid *Quercus Rudkini*. A portion of the grove, about twelve acres in extent, was found to contain nearly all the oak hybrids of the region. A careful census and study of the *Quercus* population of this area was made with

reference to the identity, number and relative positions of the different species and hybrids. Collections of leaves were made from a large number of trees, thus affording a rather complete herbarium record of the section.

The most abundant species is *Q. Marylandica*, which comprised about half the total tree population; *Q. coccinea* and *Q. velutina* were next in abundance, and *Q. Phellos* composed about 7 per cent. of the total tree population. Fifteen trees of *Q. Rudkini* and three of *Q. heterophylla* were located.

The species varied much among themselves, *Q. Marylandica* being the most variable and *Q. Phellos* the least. Of *Q. Marylandica* there were hardly two trees alike in leaf-characters, but they could be grouped into three general classes: first, those with rounded, entire, or three-lobed leaves; second, those with three sharp lobes at the apex of the leaves; third, those with three lobes at the apex and two below.

Quercus velutina also occurred in three forms, one approaching *Q. coccinea*, another *Q. rubra*, and a third with five-lobed obovate leaves difficult to distinguish from *Q. Marylandica*. *Q. coccinea* occurred in a deeply lobed form and also in a less deeply lobed form which resembles *Q. velutina* or *Q. rubra*, but easily distinguished from the former by the reddish inner bark and from the latter by the deeper cup of the acorn. *Q. Phellos* varied only slightly and this only in respect to the size of the leaves. *Q. Rudkini* existed in two forms; one with a large elliptical entire leaf and one with smaller leaves in shape more or less intermediate between *Q. Phellos* and *Q. Marylandica*. The form with large leaves has been frequently confused with *Q. imbricaria* and *Q. laurifolia*. On a single tree of *Q. heterophylla* the leaves varied from entire to deeply lobed. No specimens were identified as *Q. rubra*, *palustris*, or *digitata*.

From the intermediate character of the leaves and acorns, and the fact that *Q. Rudkini* is never found except where *Q. Phellos* and *Q. Marylandica* grow together, there seems to be no doubt of the parentage of *Q. Rudkini;* but a comparison of the material collected with numerous specimens in various herbaria seems to show less certainty in regard to *Q. heterophylla*.

The conclusions reached so far in regard to the latter are:

1. That the various willow oaks hybridize with the many-lobed black oaks, producing forms which resemble the drawings of the original *Q. heterophylla* by the younger Michaux.

2. The *Q. heterophylla* of Cliffwood is a hybrid of *Q. Phellos* and either *Q. coccinea* or *Q. velutina.*

3. The thin leaves, small and nearly smooth winter buds, reddish inner bark, bark not bitter, indicate *Q. coccinea* rather than *Q. velutina* as one parent.

4. The apparent absence of *Q. rubra* and the deeper cups of the acorns eliminate *Q. rubra* as a possible parent in the Cliffwood forms.

The studies show conclusively that some of the hybrids are quite identical to *Q. heterophylla* and are suggestive that several different hybrids have been referred to this name.

The development of seedlings now being grown will, it is hoped, reveal the parentage of the particular hybrids at Cliffwood which are of the *heterophylla* type.

A. B. Stout,
Secretary of the Conference

NOTES, NEWS AND COMMENT

Among the visitors who have registered in the Library during the past month are Professor L. H. Bailey, of Ithaca, New York, and Professor Collier Cobb, of Chapel Hill, North Carolina.

One of the most difficult tasks in the routine of library work is the maintenance of complete files of Agricultural Experiment Station publications. During the past two months a persistent effort has been made to bring these files up to date, with good results in many cases.

Dr. George E. Stone, professor of botany at the Massachusetts State Agricultural College and Experiment Station, is spending some time at the Garden in research work in physiology.

Mr. A. S. Rhoads, assistant in forest botany at Syracuse University, visited the Garden April 20–23 to consult the collection of Polyporaceae in the mycological herbarium.

Dr. Fred J. Seaver spent two days during the first week of May at the Philadelphia Academy of Natural Sciences in Philadelphia looking over fungi in the collection there. This collection contains the types of many American species described by Schweinitz and the work done there is preparatory to the publication of the cup-fungi in *North American Flora.*

Miss Georgia Wharton, of the branch of research, Forest Service, Washington, has been at the Garden examining specimens in the herbarium for data to be used in compiling maps of tree species; and in the preparation of a check list of West Indian trees and important shrubs.

Dr. John K. Small spent part of April exploring in the Cape Sable region of southern peninsular Florida and in the Ten Thousand Islands. In addition to a collection of herbarium specimens, a large assemblage of living cacti was brought back for the Garden cactus collection, both from southern Florida and from Apalachicola in northern Florida.

Professor M. L. Fernald, of Harvard University, spent two days at the Garden in April examining the collection of specimens from Newfoundland made for the Garden herbarium by Messrs. Howe and Lang in 1901.

Dr. Rydberg spent April 24 at the Philadelphia Academy of Natural Sciences in the study of the types of *Artemisia* described by Nuttall and Pursh about a hundred years ago. These species have been much misunderstood, but the identity of all except one is now clear. The work was done in connection with the monographing of the group for the *North American Flora.*

A very important case of mushroom poisoning has just been brought to our attention by Mrs. Rufus Hatch, of Pelham Manor, New York, who served on her table specimens that appeared to grow from commercial spawn in her mushroom beds and were thought by her to be a new edible variety. Paralysis followed almost immediately, and the lives of the five persons at the table were saved only by prompt action on the part of the family physician. This indicates that it is unwise to eat any species appearing in mushroom beds except the commonly cultivated white mushroom with pink gills. A description of the above mentioned poisonous species appeared in *Mycologia* for May, 1916.

Dr. Marshall A. Howe has recently submitted a report on a collection of calcareous algae made on the shores of the Murray Islands, off the northeastern coast of Australia, by Dr. A. G. Mayer, director of the department of marine biology of the Carnegie Institution of Washington. The report will form a part of a larger one to be published by the Carnegie Institution on the corals and other reef-building organisms of the Torres Straits region of tropical Australia.

Meteorology for April.—The total precipitation for the month was 2.64 inches. Maximum temperatures for each week were 63° on the 5th, 64° on the 15th, 65° on the 19th, and *74° on the 29th*. The minimum temperatures were *32° on the 7th*, 34° on the 11th, 42° on the 22d, and 40° on the 27th. The month has been characterized by unusually low temperatures for the season accompanied by much cloudy weather. With the exception of the last few days of the month the maximum daily temperatures were about 20° lower than those of April, 1915.

ACCESSIONS

MUSEUMS AND HERBARIUM

15 specimens of flowering plants from Jamaica. (Collected by Mr. William Harris.)

18 specimens of grasses from Mexico. (By exchange with the United States National Museum.)

200 specimens of ferns and flowering plants from Washington. (Collected by Mr. J. M. Grant.)

60 specimens of flowering plants from Indiana. (By exchange with Mr. C. C. Deam.)

15 specimens of fungi from Cuba. (By exchange with the United States National Museum.)

230 specimens of flowering plants from Cuba. (Collected by Brother Leon.)

2 specimens of fossil coralline algae from Austria. (Given by Professor A. W. Grabau.)

10 photographs of marine algae from North Carolina. (Given by Dr. W. D. Hoyt.)

21 specimens of algae from Orient, Long Island. (Given by Mr. Roy Latham.)

2 specimens of marine algae from Connecticut. (Given b, Professor R. C. Osburn.)

2 specimens of hepaticae from Florida. (Given by Mr. Severin Rapp.)

2 specimens of hepaticae from New England. (By exchange with Miss Annie Lorenz.)

1 specimen of *Sargassum natans.* (Given by the United States National Museum.)

380 specimens of algae from Bermuda. (Collected by Mr. F. S. Collins.)

8 specimens of flowering plants from Nebraska. (Given by Rev. J. M. Bates.)

194 specimens of flowering plants from Missouri. (Collected by Mr. B. F. Bush.)

7 specimens of *Grindelia* from British Columbia. (By exchange with Mr. J. K. Henry.)

1 specimen of *Lesquerella* from southern California. (Given by S. B. Parish.)

1 specimen of *Chamaesyce glyptosperma* from New York. (Given by Mr. S. H. Burnham.)

PLANTS AND SEEDS

14 plants for *Cactus* collections. (By exchange with U. S. National Museum, through Dr. J. N. Rose.)

81 plants, all *Opuntia*, for conservatories. (Collected by Dr. J. K. Small.)

39 plants, all *Opuntia*, for conservatories. (By exchange with U. S. National Museum, through Dr. J. N. Rose.)

40 plants for nursery and conservatories. (By exchange with U. S. Bureau of Plant Industry.)

3 plants of *Erigenia bulbosa* for American Wood Garden. (Given by Miss Pauline Kaufman.)

3 plants for conservatories. (Given by Bro. Leon.)

63 plants for conservatories. (Collected in Isle of Pines by Dr. N. L. Britton and Mr. Percy Wilson.)

11 plants for conservatories. (Collected in Cuba by Dr. N. L. Britton and Mr. Percy Wilson.)

6 plants for nursery. (Given by Rev. J. M. Bates.)

2 plants for conservatories. (By exchange with Mr. W. H. Bicklehaupt.)

1 plant of *Magnolia* sp. for arboretum. (Given by Mrs. Alfred Kierschner.)

29 rose plants for rose collection. (Purchased.)

1 bulb for conservatories. (Given by Dr. H. H. Rusby.)

1 tuber of *Peniocereus Greggii.* (Given by Dr. W. B. James.)

10 packets of seeds. (Given by Dr. H. H. Rusby.)

1 packet of seeds of *Commelina virginica.* (Collected by Mr. J. B. S. Norton.)

1 packet of seeds of *Smilax Beyrichii.* (Collected by Dr. J. K. Small.)

1 packet of seeds of *Decaisnea Fargesii.* (By exchange with Board of Park Commissioners, Rochester, through Mr. E. H. Costich.)

186 packets of seed. (By exchange with Royal Botanic Garden, Kew, England.)

16 packets of seed. (By exchange with Botanic Garden, Cambridge, England.)

2 packets of seed. (By exchange with U. S. Bureau of Plant Industry.)

1 packet of seeds of *Luffa cylindrica.* (Collected by Mrs. N. L. Britton.)

1 packet of seeds of *Barosma betulina.* (Given by Dr. H. H. Rusby.)

1 packet of *Castalia* seed. (Given by Mr. Louis Brace, through Mrs. N. L. Britton.)

1 packet of seeds of Dahlia Madam J. Coissard. (Given by Mr. George L. Stillman.)

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BRONX PARK, NEW YORK CITY

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OF

The New York Botanical Garden

EDITOR

ARLOW BURDETTE STOUT

Director of the Laboratories

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FRINGED GENTIAN

JOURNAL

OF

The New York Botanical Garden

VOL. XVII June, 1916 No. 198

WILD PLANTS NEEDING PROTECTION*

12. "FRINGED GENTIAN" (*Gentiana crinita* Froel.)

(With Plate CLXXII)

All lovers of wild flowers, love the "*fringed gentian*," love it to death! and ask, innocently enough, why they do not find it where it used to be abundant. How can an annual grow again in the same place, if all the flowers are taken and none allowed to go to seed? Pull up one of the plants and see the small roots, note that there are no fleshy root-leaves or rosettes, and that all the strength of the plant has been thrown into those showy flowers with fringed, purple petals to insure pollination by insects; and also remember, that of all the wild flowers, gentians last the longest when picked, opening and closing for weeks after they are brought home from the country, in a last vain effort to set their seed on which they have staked their whole life! Bumble-bees often rob them of the nectar by piercing through the flattened, sheathing calyx, and thus defeat the object of that exquisite 4-leaved table spread so temptingly for the last floral feast!

The fringed gentians used to grow in large colonies around the lake in Van Courtland Park and in the swamp at the southern end of Woodlawn Cemetery, usually among goldenrods near the tall bushes of winter berries, that once fringed those bogs, but with the moccasin-flower and other lovely wild flowers they

* Illustrated by the aid of the Stokes Fund for the Preservation of Native Plants.

[Journal for May (17: 63–80) was issued June 22, 1916]

have all disappeared from the parks of the Bronx. The last that I saw were sent to the Garden by a well-intentioned Scotch foreman of Van Courtland Park, who had great sods of them dug up hoping that we might be able to preserve them.

The plants are often 1 to 3 feet high, usually much branched, with the branches erect and 4-angled, with opposite ovate-acuminate leaves. The parts of the flower are in 4, including the white stamens, and the stigma is also white, 4-parted and sessile on the tapering ovary; the seeds mature in October or November. The flowers bloom late and all are familiar with Bryant's exquisite lines:

> "Thou waitest late and com'st alone,
> When woods are bare and birds are flown."

The plant is eastern ranging from Quebec to Minnesota, south to Iowa and Georgia.

The genus was named for King Gentius of Illyria and 300 species are known, mostly natives of the north temperate zones, ranging into alpine regions of Europe and America, also in the Andes of South America. They are not often found in cultivation and are rapidly becoming rare or extinct. Besides many alpine genera, various other beautiful and showy species and genera occur at sea-level and in the tropics, notably the Sabbatias or star-pinks, which are also rapidly disappearing from our eastern sea-coasts. A few are aquatic or semi-aquatic. Some of the plants have a bitter sap, which renders them a valuable tonic, and they are still in use medicinally.

ELIZABETH G. BRITTON

COLLECTING PLANTS IN PORTO RICO

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF,

Sir: I beg to present for record the following account of my Porto Rican collections and collecting trips:

The collections are arranged in two series. The first consists of some 6,700 numbers which were nearly all collected in the year 1914 during the latter half of my deanship of the Porto

Rican College of Agriculture. The second series of some 2,500 numbers was collected during seventy-one days of the summer of 1915. The numbers of the first series were collected in duplicate; those representing vascular plants were sent to the New York Botanical Garden and a duplicate placed in the Mayaguez college collection; the fungi and lichens were placed in the college collection at Mayaguez and a duplicate and the surplus stock in the University of Illinois Herbarium, and a second duplicate of these has been placed or will eventually be placed in the herbarium of the New York Botanical Garden. The second series is similarly placed except that no specimens have been as yet placed in Porto Rico.

My main object has been the collection of parasitic fungi with incidental attention to the lichens (especially the foliicolous lichens), the foliicolous algae, and the saprophytic fungi.

The two collections comprise between 5,000 and 6,000 numbers of parasitic fungi. The number of species which they represent cannot now even be estimated; but preliminary study shows that many of them are of extreme interest and that there is a considerable number of undescribed species, some of which are of very unique forms.

The plant rusts of the first series, consisting of 650 numbers and 109 species, have already been studied by Dr. J. C. Arthur and reported upon in *Mycologia;* and several genera of leaf-spot fungi in this series have been studied by Miss Esther Young and Mr. Philip Garman, and their results published in the same journal. The rusts, notwithstanding the small number in previous collections, prove to be both numerous and interesting. The first series of collections increases the previous number of 35 known species to a total of 109 species with the second series as yet not reported upon.

The smuts, however, seem to be really few in number and no additions to previous collections have been made.

The percentage of interesting forms in many of the other groups is surely much larger even than is shown by the studies referred to above. Only complete careful study of the collections can reveal the true relations of the Porto Rican fungous flora.

The most striking feature is the abundance of the black superficial fungi: the Perisporiales, particularly *Meliola*, *Perisporium*, etc.; the Capnodiaceae, which occur in great profusion and in bewildering complexity; and the Microthyriaceae, rich in genera and species, of wonderful beauty and presenting very interesting problems of taxonomy and phylogeny. The black imbedded fungi, usually crustose, are also numerous.

The crustose lichens are very abundant and of numerous genera and species, though they appear to be of little economic significance. Many of these have already been placed with specialists for determination.

True parasitic algae abound in most sections of the island, particularly *Cephaleurus virens*, which occurs in a wide range of hosts. Epiphytic algae on leaves also are common and in many instances so closely resemble fungi that the high power microscope is needed to make identification certain.

The downy mildews are also very poorly represented. The powdery mildews are comparatively few and most careful search failed to reveal perithecial material of any of the species that were found, which makes identification in most cases impossible.

One striking feature of the fungous flora is the abundance of superparasites, one parasite growing upon another often to the second-third degree. Thus it is not at all uncommon to find five or six spore-forms upon one square centimeter of leaf surface.

The Fungi Imperfecti are numerous, the Moniliales in particular, and their classification presents many difficulties.

My collections were made from representative areas of the whole island of Porto Rico and of Mona and Desecheo Islands, though no region can be said to have been exhaustively or even thoroughly collected. The wet regions of original growth presented the best collecting grounds, such regions as Monte Alegrillo, El Alto de la Bandera, etc., with their typical Palma de Sierra forests. Wet ravines or waterways in any section of the island were almost equally good. The "Pepino" hills of the northern coast region with their own characteristic plants gave fungi not found elsewhere. The dry regions, though poor in species, owing to their special phanerogamic flora gave many characteristic species.

All the passable roads of the island were traversed by automobile, and collecting stops of long or short duration were made at interesting localities. Foot-trips were made from Maricao to Sabina Grande, Maricao to San German, Monte Alegrillo via Rosario to Mayaguez, to the high mountains near Jayuya, from Adjuntas to El Gigante, up to the Rio Tanama from Arecibo, from Barros to Juana Dias, and from Boqueron across the headland to the lighthouse.

The Pepino hills, the haystack hills of Berkey, offer particularly interesting though often difficult collecting. For this formation Vega Baja is a good central location as is also the Rio Tanama or the cliffs on each side of the Arecibo-Utuado road.

The coastal region from Boqueron to Guanica and around to Ponce presents a limestone formation and has an exceedingly dry climate. The foothills throughout the island are quite uniform in vegetation, especially in the coffee regions, and are generally less interesting. High altitude collecting in original Palma de Sierra forest is best at El Yunque and westward, Monte Alegrillo, the high points between Caguas and Cayey, and Cayey and Guayama, and especially the high divides both east and west of the junction of the Jayuya road with the Arecibo-Ponce road.

The regions most deserving of further study seem to me to be, first, the triangle between Utuado, Arecibo and Lares; second, the Mata de Platanos between Adjuntas and Peñuelas and, third, the region between the river junction below Utuado and Florida Adentro.

F. L. Stevens

University of Illinois,
Urbana, Illinois

AN INTERESTING ARUM FROM INDIA

A peculiar bulb-bearing plant, *Amorphophallus bulbifer*, may be seen during the summer season in Conservatory Range 1, house 11, on one of the side benches. The large, calla-like flower appears first, followed about four weeks later by the single

compound leaf, which is three feet or more in height and bears conspicuous bulbs. It was these bulbs that first attracted my attention, because they very much resemble the common hard-skinned puffball, *Scleroderma aurantium*, in size and general appearance.

There are several species in the genus *Amorphophallus* and the flowers of most of them are extremely malodorous, as in the fungous genus *Phallus*, the spores of which are distributed by means of flies. Some species of *Smilax*, known as cat-briar or carrion-flower, also attract flies seeking suitable places for depositing their eggs.

The species in question occurs in Bengal, India, where it flowers in the wet season, and is called by the natives "Umber Bale." A colored plate of it appeared about a century ago in Curtis's Botanical Magazine (**46**: *pl. 2072*), with the following statement:

"*Arum bulbiferum*, root tuberous, leaves compound, bulb-bearing, native of Bengal, plentiful in the woods in the neighborhood of Calcutta, flowering in May. Soon after the decay of the flowers, the leaves make their appearance and continue during the rainy season. The plate was drawn in 1813, the flower in May and the leaf some weeks later, in the greenhouse of James Vere of Kensington-Gore, England."

A few years later, the same magazine published a better drawing of the plant (**51**: *pl. 2508*), with the following notes:

"This magnificent species of Arum, of which we believe no figure has been hitherto published, was communicated to us in flower by Mr. Brooke of Ball's Pond, Islington, in May, 1820, at which time it showed no appearance of foliage, nor had we an opportunity of adding this to our drawing till March, in the present year, 1824.

"The flower was drawn of its natural size, but the leaf, which was nearly three feet high, and spread over an area of several square feet, was from necessity extremely diminished. Bulbs are formed always at the primary, and sometimes at all the divisions of the leaf, from whence the specific name was derived."

W. A. MURRILL

BEQUEST OF EMIL C. BONDY

The Garden has received from the executors of the will of the late Emil C. Bondy, his bequest of five thousand dollars. Mr. Bondy was a New York merchant, and a resident of Summit, New Jersey; he died on February 7, 1915, at the early age of forty-two. He bequeathed over two hundred thousand dollars to twenty-four different educational and charitable institutions and associations, his largest legacy being one to Columbia University, one hundred thousand dollars, for researches as to the cause, prevention, and cure of cancer and the publication of the results of such researches.

Mr. Bondy was an annual member of the Garden since 1912. By order of the Board of Managers, this bequest has been added to the principal of the Endowment Fund for Science and Education.

N. L. Britton,
Secretary.

SUMMER LECTURES, 1916

June 17. "Floral Features of the American Equatorial Belt," by Dr. H. H. Rusby.

June 24. "Floral Features Observed in a Journey to and from California," by Dr. H. H. Rusby.

July 1. "Wild Flowers of Summer," by Dr. N. L. Britton.

July 8. "Botanizing in Sweden," by Dr. W. A. Murrill.

July 15. "The State Park at Devil's Lake, Wisconsin," by Dr. A. B. Stout.

July 22. "The Plant Life of the Sea," by Dr. M. A. Howe.

July 29. "Popular Books on Botany," by Dr. J. H. Barnhart.

August 5. "Destructive Insects," by Dr. F. J. Seaver.

August 12. "The Summer Flower Garden," by Mr. G. V. Nash.

August 19. "Among the Cañons and Deserts of Southeastern Utah," by Dr. P. A. Rydberg.

August 26. "From the Colorado Foothills to Yellowstone Park," by Dr. F. W. Pennell.

The lectures, which occupy an hour, will be illustrated by lantern slides and otherwise. Doors closed at 4:00; late comers admitted at 4:15.

The Museum Building is reached by the Harlem Division of the New York Central and Hudson River Railroad to Botanical Garden Station, by trolley cars to Bedford Park, or by the Third Avenue Elevated Railway to Botanical Garden, Bronx Park. Visitors coming by the Subway change to the Elevated Railway at 149th Street and Third Avenue. Those coming by the New York, Westchester and Boston Railway change at 180th Street for crosstown trolley, transferring north at Third Avenue.

THE MAY FLOWER SHOWS

The flower shows were given by The Horticultural Society of New York, in coöperation with the New York Botanical Garden; they were held in the Museum building. The first occurred on the 13th and 14th, Saturday and Sunday. The premiums were offered by the New York Botanical Garden, from the income of the William R. Sands Fund, to be awarded by the Exhibition Committee of The Horticultural Society of New York. The prizes were for cut blooms of herbaceous plants, shrubs and trees, tulips, narcissus, orchids, sweet peas and antirrhinums, and for plants of *Pelargonium* and *Calceolaria*. Features of the exhibition were the large collection of flowers of shrubs and trees exhibited by Mr. T. A. Havemeyer, and the collection of early tulips and narcissus displayed by John Scheepers & Co., Inc. The attendance was large, especially on Sunday.

The first prize for a collection of the flowers of herbaceous plants was won by Mr. John F. Orr, of Rye, N. Y. For a collection of the flowers of shrubs and trees Mr. T. A. Havenmeyer, Glen Head, Long Island, A. Lahodny, gardener, was awarded the first prize for a fine display of fifty vases, the second prize going to Mr. John F. Orr. On account of the unusual excellence of the display made by Mr. Havemeyer a special prize of a silver medal was awarded to his exhibit by The Horticultural Society of New York. Mrs. W. G. Nichols, Rye, N. Y., Geo. N. Sulli-

van, gardener, was awarded the first prize for a collection of tulips, and also the first prize for a collection of narcissus. All the above were in classes open to all.

The following prizes were awarded in classes restricted to non-commercial growers. A fine display of fifty-five vases of tulips brought the first prize to Mrs. A. M. Booth, who also won the first prize for a collection of narcissus, the second prize in the latter class going to Mr. John F. Orr. A fine vase of Antirrhinum gave the first prize to Mrs. F. A. Constable, Mamaroneck, N. Y., James Stuart, gardener. In the classes for six calceolarias, the first was won by Mr. Ralph Pulitzer, Manhasset, Long Island, Frederick Hitchman, gardener, the second by Mrs. F. A. Constable.

The following special prizes were awarded by the New York Botanical Garden unless otherwise specified: John Scheepers & Co., Inc., for a display of tulips and narcissus, silver medal, by The Horticultural Society of New York; Bobbink & Atkins, for a collection of flowers of herbaceous plants; Mrs. A. M. Booth, for vases of gladiolus and *Pancratium*.

The New York Botanical Garden made a display, for exhibition only, of the flowers of shrubs and trees, and another of flowers from the collection of Japanese cherries.

The judges were J. A. Manda, E. Fardel, and J. P. Sorenson.

The second was a special exhibition, on the 20th and 21st, primarily for a display of lilacs from the large collection of Mr. T. A. Havemeyer, Glen Head, Long Island, and for another of Darwin tulips. On account of the lateness of the season the lilacs were not fully developed, but there was enough to show their beautiful coloration and form which elicited much admiration. The specimens exhibited were large and showed unusual excellence in cultivation. The collection was awarded a special prize of a gold medal by The Horticultural Society of New York.

The display of tulips was made by John Scheepers & Co., Inc. It was the finest collection ever seen around New York, embracing about two hundred kinds, mainly Darwin and cottage, with a few breeder tulips. A special prize of a gold medal was awarded to this exhibit by The Horticultural Society of New York.

GEORGE V. NASH.

NOTES, NEWS AND COMMENT

Dr. J. N. Rose, of the Carnegie Institution, Washington, D. C., spent a large part of May at the Garden in continuation of the cactus studies which he and Dr. Britton are interested in.

The large collection of herbarium specimens recently secured in the Isle of Pines, Cuba, by Dr. and Mrs. Britton and Mr. Percy Wilson, are being mounted, studied, and incorporated in the permanent collections.

Living plants and herbarium specimens representing many of the rarer plants of the local flora range were secured for the Garden on the recent Torrey Botanical Club field-meeting at the palisades of the Delaware River, Sparrowbush, New York, by Mr. Wilson and Dr. Pennell of the Garden staff.

Professor H. H. Whetzel and Dr. Edgar Olive spent a considerable part of May at the Garden in consulting herbarium material and library in determining a large and important collection of rusts and other parasitic fungi obtained in Porto Rico. Professor J. C. Arthur was at the Garden on May 6 and 7 to participate in the studies.

An attempt is being made to renew the labels upon the books in the library, many of which have become nearly illegible through fading and long use.

Miss A. Hibbard, of West Roxbury, Massachusetts, visited the Garden during the latter part of May to consult the mycological herbarium and library. She is accustomed to spend her summers in New Hampshire collecting and studying the larger fleshy fungi. *Lactaria Hibbardae* was named for her by Dr. Peck.

A National Botanic Garden has been established near Cape Town, South Africa, which bids fair to become world-famous, for the reason that the site, under the shadow of Table Moun-

tain, combines a great variety of soil, while the land lies at such varying altitudes that it also enjoys considerable climatic differences as to temperature. It is thought that the collection of cactus and ferns in this garden will compare favorably with any similar collection in any part of the world.

A number of egg cases of the Japanese walking-stick sent to the Garden during the spring began to hatch the latter part of May. The young insects were turned loose in the border north of the museum building. This insect is supposed to be of considerable economic importance since it preys upon other insects which are harmful to vegetation.

Volume 9, part 5, of North American Flora, by W. A. Murrill, containing descriptions of species of *Omphalia*, *Collybia*, *Mycena*, and other genera in the white-spored series of fleshy gill-fungi, appeared June 7, 1916. The number of species published as new in this part is 133.

Nature-study Lectures to Public School Children

The nature-study lectures, with accompanying demonstrations, to pupils of 4B and 5B grades of the public schools of the Bronx were given in the lecture hall of the Museum Building of the Garden during May.

The course includcd six lectures, by Dr. N. L. Britton, Dr. H. H. Rusby, Dr. M. A. Howe, Mr. G. V. Nash, and Dr. F. J. Seaver, assisted by six teachers as demonstrators. One lecture was abandoned on account of inclement weather.

The following indicates the attendance at these lectures:

May	8	408
	11	352
	15	366
	22	349
	25	37
	Total	1,845

During the greater part of June, one of the shrubs in flower is *Daphne Genkwa*, a native of China. Its flowers are of a bluish lilac, much the same color as those of another shrub now also in flower, *Sophora viciifolia*. This latter has the calyx of a bluish lilac, and the flowers white, flushed with the same color. It is infrequent in cultivation, but is well worth a place in any collection. The fringed tree, *Chionanthus virginica*, a native of the southeastern United States, is a mantle of white. Among the syringas or mock oranges, the first to blossom is *Philadelphus hirsutus*, in profusion of white flowers at the present time. For the past week certain of the Viburnums have been particularly attractive: *V. tomentosum* and its variety *plicatum*, the Japanese snowball, have been unusually fine, and the Guelder rose, or snowball, *V. Opulus* var. *sterile*, has been covered with its balls of white.

A touch of bright color has been added to the collections by *Robinia Kelseyi*, a native of North Carolina, inhabiting rather sunny exposures on comparatively dry ridges, and found associated with other ericaceous plants such as huckleberries and azaleas. There are two plants of this in the Fruticetum which are covered with a profusion of rose purple flowers. It is closely related to *Robinia hispida*, a much more common plant and of wider range, but differs in its much brighter flowers and narrower firmer leaves. It is worth more general cultivation.

Another shrub, not yet quite in full bloom is *Benthamia Kousa*, of China and Japan. This is a relative of our own flowering dogwood, but has the large white bracts pointed instead of blunt, giving the flower cluster more of a star-like shape.

Meteorology for May.—The total precipitation for the month was 3.24 inches. The maximum temperatures for each week were 79° on the 2nd, 84° on the 11th, 78° on the 21st, and *86° on the 25th*. The minimum temperatures were 49° on the 2nd, 45° on the 10th, *41° on the 19th*, and 53° on the 23d.

ACCESSIONS

MUSEUMS AND HERBARIUM

1 specimen of *Rhizina inflata* from Minnesota. (By exchange with Mr. James R. Weir.)

21 specimens of *Drosera* from Australia. (By exchange with the Royal Botanic Garden, Edinburgh.)

82 specimens of flowering plants from Patagonia. (Distributed by Mr. Charles W. Furlong.)

74 specimens of mosses from western North America. (By exchange with the United States National Museum.)

25 specimens of ferns from Long Island, New York. (Given by Miss Minnie E. Watson.)

23 specimens of calcareous algae from Australia, Bahamas, and Florida. (By exchange with the United States National Museum.)

52 specimens of flowering plants from Quebec, Canada. (By exchange with Brother Victorin.)

2 specimens of *Rhizina inflata* from Montana. (By exchange with Mr. James R. Weir.)

1 specimen of *Urnula craterium* from Oregon. (By exchange with Mr. James R. Weir.)

200 specimens, "Fungi Columbiani," centuries 47 and 48. (Distributed by Mr. Elam Bartholomew.)

1 specimen of fleshly fungus from Arkansas. (By exchange with Mr. W. H. Long.)

1 specimen of fleshy fungus from Colorado. (By exchange with Dr. H. L. Shantz.)

1 specimen of woody fungus from Florida. (By exchange with Mr. P. L. Ricker.)

29 specimens, "Fungi Dakotenses," fascicle 15. (Distributed by Dr. J. F. Brenckle.)

44 specimens of fungi from various localities. (By exchange with the State Museum, Albany, New York.)

1 specimen of woody fungus from Virginia. (By exchange with Mr. P. L. Ricker.)

1 specimen of fungus from New York. (Given by Professor George F. Atkinson.)

84 specimens of fungi from western United States. (By exchange with Mr. James R. Weir.)

197 specimens of fungi from New Mexico. (By exchange with the Smithsonian Institution.)

114 specimens, "Fungi Malayana." (Distributed by Mr. C. F. Baker.)

200 specimens, "North American Uredinales," centuries 15 and 16. (Distributed by Mr. Elam Bartholomew.)

10 specimens, "Fungi Wisconsinenses Exsiccati," decade 2. (Distributed by Dr. J. J. Davis.)

57 specimens of fungi from various localities. (By exchange with the United States National Museum.)

122 specimens of plant rusts from New York. (Collected by Mr. Percy Wilson.)

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JOURNAL

OF

The New York Botanical Garden

EDITOR
ARLOW BURDETTE STOUT
Director of the Laboratories

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Two ash trees; the one to the left in a normal healthy condition; the one to the right showing the effect of serious infestation of the ash borer.

JOURNAL

OF

The New York Botanical Garden

VOL. XVII July, 1916 No. 199

BORERS INFESTING THE ASH

(With Plates CLXXIII and CLXXIV)

Few of our park trees are subject to more depredation from boring insects than the white ash (*Fraxinus americana* L.). Were it not for this fact the ash would be one of the most valuable trees for city parks as well as a street tree. Its natural distribution is from Nova Scotia to Minnesota and southward to Florida, Kansas and Texas. Under favorable conditions it attains a height of 120 feet and in aged specimens has a columnar form and affords a dense shade.

Since the introduction of the leopard-moth from Europe, the ash appears to be one of the favorite trees for the harboring of this insect, which causes a great deal of damage especially to the young trees. A full account of the appearance and habits of the leopard-moth has been published in a previous number of the *Journal*.* The leopard-moth and the common ash-borer (*Podosesia Syringae* Harris) are close rivals so far as the destruction of the ash is concerned.

SYMPTOMS OF THE ASH-BORER

The first evidence of the presence of the ash-borer is the appearance of strings of sawdust-like particles and rather loosely compact pellicles of wood. These are often present in large numbers and may remain in part hanging from the bark or may fall to the ground at the base of the tree. When the insects are

* JOUR. N. Y. BOT. GARDEN 13: 155–160. pl. 100–102.

[Journal for June (17: 81–93) was issued July 14, 1916]

present in large numbers, a heap of sawdust and wood pellicles may be found entirely surrounding the tree at its base. With a little experience it is possible to distinguish the wood pellicles of the ash-borer and those of the leopard-moth. The latter are a little larger, more compact and seldom remain hanging to the tree in any numbers but fall to the ground in little isolated heaps.

In serious infections of the insect the foliage of the tree is affected, the leaves especially at the top of the tree appearing stunted, giving to the top branches a naked appearance. The leaves also lack the dark-green color characteristic of the healthy foliage.

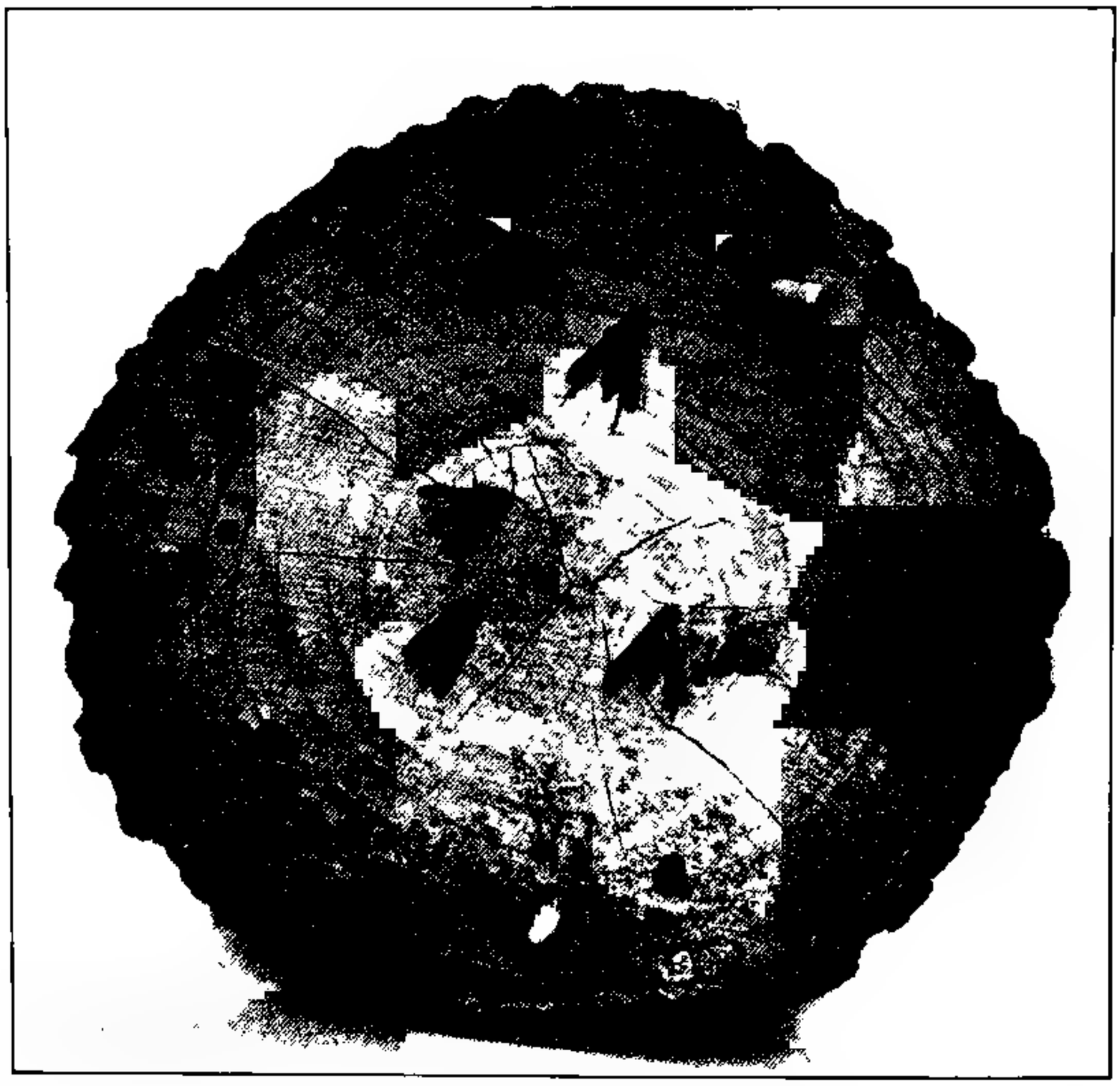
A transverse section of the trunk of an infected tree shows it to be thickly perforated with holes a little smaller than an ordinary lead pencil. These holes run more or less longitudinally about an inch or two beneath the bark. When affecting the smaller branches of the tree the bark often becomes decayed, giving rise to unsightly scars which both disfigure and weaken the branches and in extreme cases cause their death.

Life History of the Insect

The eggs which are very minute and inconspicuous are deposited in crevices in the bark.

The larva which at maturity consists of a caterpillar nearly an inch in length is almost entirely whitish with the exception of the head, which is brown. Each segment bears a few short inconspicuous hairs. The damage to the ash is done by the insect while in the larval stage, the larva becoming active in the early spring and continuing its work until late summer, when the adults emerge, leaving the brown shining pupa cases protruding about half their length from the old holes in the side of the tree.

The adult insect is a moth about three quarters of an inch in length, with a very slender wasp-like body and rather narrow forewings. Both the wings and the body have a beautiful purplish glint. The legs and antennae are barred with a few broad bands of rust-red or yellow. The insect has an expanse of a little more than an inch.



A cross section of the diseased tree shown on the previous plate, showing the work of the borer, and the larvae, pupa cases and adults of the ash borer. The insects shown here were hatched under glass in the laboratory.

Means of Control

Like most boring insects, the ash-borer is very difficult to control by artificial means, since in the larval stage they work within the wood, where it is difficult or impossible to reach them.

In the case of badly infested trees, they should be cut down and destroyed in order to prevent the emerging adults from attacking healthy trees.

Probably the best general means of protecting this as well as other trees from the depredations of insects is to encourage their natural enemies, the birds. It has been stated on competent authority that birds do ten times as much in the protection of trees and plants in general from the attacks of insects as can be done by spraying and other artificial means and with no expense. The destruction of the adults of such insects as the ash-borer will go far toward eliminating this pest. The adults of the ash-borer are medium large and so conspicuous that they would naturally be picked up by almost any of the insectivorous birds. Great emphasis should be placed on the value of birds in combating this and other insect pests.

Fred J. Seaver

PRACTICAL SUGGESTIONS REGARDING THE FUMIGATION OF GREENHOUSES

The use of various fumigants, especially of hydrocyanic gas, has become one of the most effective means of controlling various insects that are injurious to plants grown in greenhouse culture. Fumigation, however, very frequently results in more or less injury to the plants through the so-called "burning" of leaves and flowers, so that judgment and care must be exercised in the application of fumigants. A greenhouse may be fumigated at one time without injury to the plants whereas the same dosage applied a few days later under apparently the same conditions will cause serious burning to the foliage. This often proves very perplexing to gardeners, and while the condition of the plants may appear the same and present the same relative degree of

development in both instances, they are, it would seem, in a different condition. The cause of this, however, is not difficult of explanation. Plants, and especially various organs of a plant, are never under precisely the same conditions on any two consecutive days for the reason that they are not developed under the same environment. The different factors essential to plant growth are constantly varying in intensity and the optimum for any one, and more especially for the proper balance of them all, is scarcely maintained for any length of time.

The light, temperature, moisture and ventilation, etc., conditions are always variable, hence there occurs corresponding variation in the development of the organs. If absolutely identical conditions could be maintained, susceptibility to burning in one case would not be different from that in another, except in cases where variations associated with intricate life-cycle periods are involved for a plant or an organ. Any agency which affects the development of plants is likely to render them more or less susceptible to burning, and this is true of light and of soil moisture. Experiments have shown that when plants are grown under different light intensitites or in different percentages of soil moisture they become greatly modified in their structure, and such modifications in their development are very frequently associated with susceptibility or nonsusceptibility to burning.

In some experiments made in a greenhouse during the spring months under cloth screens where the relative light intensity to which the plants are subjected was controlled for different intensity, the susceptibility to burning from fumigating with hydrocyanic acid gas was greatest in the plants developed under poor light conditions and the amount of burning decreased proportionately as the light conditions improved. For this experiment five sets of cucumber plants were grown under different degrees of light intensity for a period of several days, but with all other conditions as near uniform as was possible. The following tabulation indicates the noteworthy differences in the growth of the different sets, when tested for susceptibility to burning by fumigation. The measurements given are in centimeters.

	Series				
	1	2	3	4	5*N*
Relative light intensity (per cent.)	24.00	26.00	48.00	74.00	100.00
Average height of plants	22.30	23.30	17.30	19.90	15.50
Average diameter of stem	.44	.53	.53	.66	.78
Average length of internodes	17.30	7.00	5.90	4.30	4.00
Average length and width of leaves	70.90	90.30	62.60	80.20	85.50

The more nearly normal plants designated as 5*N* which are taken as 100 per cent. were exposed to the regular light conditions which existed in the greenhouse, and which averaged about 18 per cent. less intense than those outdoors. The other plants, series 1 4, were grown under cloth screens, their relative light intensity exposure being given under their respective numbers. It will be observed that very marked differences exist in the configuration of the plants due to the variation in light intensity.

There occurred a general decrease in burning from the use of hydrocyanic acid gas from No. 1, where the light intensity is represented by 24 per cent., up to 5*N*, where it is taken as 100. The leaves of the plants developed in the poorest light were burned badly and in some cases killed, whereas in 5*N* no burning occurred and in 2, 3, and 4 burning was proportionate to the light condition under which they developed.

In this experiment the larger and more vigorous plants, which were grown under the higher light intensities were more resistant to the burning effects of gas.

Definite results were also obtained with cucumber plants which were grown in soils with varying percentages of soil moisture ranging from 10 to 70 per cent. of their total water-retaining capacity. The burning resulting from fumigation with hydrocyanic acid gas was the most marked in the plants grown in the soil containing the highest percentage of soil moisture and the burning decreased proportionately as the soil moisture was diminished. Here there were marked differences in the relative growth of the six sets of plants, as will be seen in the following tabulation.

In respect to nearly all average measurements there was increased size with increased water supply. After giving these

	Series					
	1	2	3	4	5	6
Soil moisture per cent	10.00	15.00	20.00	50.00	60.00	70.00
Average height	6.20	7.5	10.2	13.00	17.50	21.2
Average length of internodes	4.20	4.5	5.2	5.50	7.50	8.2
Average length of petioles	1.30	1.7	2.2	3.20	4.00	3.2
Average diameter of stem	.30	.3	.4	.45	.55	.5
Average length and width of leaf	6.25	39.5	67.5	162.50	225.00	285.00

sets the same exposure to gas it was found that in Series 1 and 2 there was no burning; Series 3 showed slight burning; while in Series 4, 5, and 6 the leaves were all burned. The burning was most marked in Series 6, which was grown in pots containing the largest amount of soil moisture.

These results show very clearly how different conditions with respect to such factors as light and moisture may very decidedly influence the susceptibility of a plant or of such individual organs as leaves to the burning effects of gas used in fumigation.

In respect to the influences of light alone, it appears that the largest and most vigorous plants were most resistant; but in respect to moisture supply the smaller slow-growing plants that developed with the lower water supply were most resistant. Such results indicate clearly that the general conditions under which plants develop, or under which different organs such as leaves develop, are of decided influence in determining the susceptibility of the plant or the organ.

Another point of considerable importance is the particular degree of activity of a plant at the time of fumigation. The susceptibility of a particular plant varies according to its activity. For this reason gardeners and florists have for some time held the idea that fumigation must be done at certain times of the day in order not to cause burning, and most fumigation is done at night or early in the morning on the supposition that less burning is likely to occur to plants at such periods than during bright sunshine. The effect of sunlight and atmospheric moisture, etc., on the burning of tomatoes and cucumbers has been studied by investigators who have found that sunlight, cloudy weather, moonlight, drops of water remaining on the foliage,

and too high a moisture content of the atmosphere, were all conducive to burning, and that less burning occurred on cloudy nights or on clear nights without moonlight. The best results were obtained by fumigating on clear starlight nights, with little or no moonlight, or on dry cloudy nights with a temperature ranging from 55° to 65° F.

The prevailing idea long held by most greenhouse managers, that less burning occurs at night from the various fumigants, is supported by recent investigations relative to injuries to vegetation from smelter smoke. It has been found that plants are much more susceptible to burning from gases during bright sunlight than in diffused light or darkness, and that burning occurs more severely in southern exposures and to the tops of the trees in forests where they are exposed to more intense light than elsewhere. Moreover burning is intimately associated with the assimilative process taking place in the leaves which is at its maximum during bright sunlight.

Susceptibility to burning is also associated with the degree of the development of the foliage, as is shown by injurious results of illuminating gas in greenhouses and also from smelter smoke. The young immature leaves are generally not affected by illuminating gas while the older ones are burned and killed, and this is probably true of all gases. The nature of the burning from the use of various fumigants in greenhouses varies much as regards species as well as the nature of the substances employed for fumigating. In many instances only the tender edges of the leaves are burned, in others large masses of the tissues are involved, while in others a mere curling of the leaves occurs and burning may be absent.

The burning caused by tobacco fumes, for instance, is different from that caused by volatilized sulphur, which often causes numerous small white spots on the leaves of such plants as cucumbers. This type of burning would seem to indicate that the sulphur gas enters the stomata of the leaves and is there confined, hence causing a local effect. To what extent the conditions of the stomata are involved is not at present known, but numerous observations have shown that most gases close

stomata immediately, at least in some plants, although they may subsequently open again, as is indicated by the fact that the transpiration curve suddenly rises shortly after the exposure of plants to gases, after which transpiration or the exhalation of water vapor falls off quite rapidly.

While experiments at the present time do not solve all the factors involved in susceptibility to burning, they do demonstrate that burning from various gases is correlated with the degree of development of the tissue, whether brought about by inferior light conditions or excessive moisture in the soil, the more poorly developed tissue, such as that produced under poor light or relative high soil moisture condition being more susceptible to burning than that developed under conditions more nearly approaching the normal. The moisture content of the air appears also to be an important factor in killing insects such as aphis, as fumigation is apparently more effective in a moist atmosphere than in a dry one.

The most important feature to be borne in mind in fumigation is that it should be done during the night and not in the daytime and especially not during bright sunshine. Furthermore, fumigation should be done only when the plants are in the best condition as regards development. The intelligent gardener can determine at a glance whether his plants are developing normally, and under glass it is possible for him to modify his conditions to a large extent. Special care should be taken not to fumigate during or directly following periods of cloudy weather, as under these conditions the same type of resistant tissue is not developed as on days when the sun is shining. Low night and day temperatures, as well as a decrease in the soil moisture, counteract the bad effects of cloudy weather, but sunlight is the most important factor in developing resistant tissue. There is every reason to believe that any stimulating factor affecting plant development whether physical or chemical in its nature has a bearing upon susceptibility to burning from gases. Fumigation will cause less injury following bright than cloudy weather, and should not be done for two or three days after a cloudy period. By that time the plants will have an opportunity to harden up.

The same care and attention should be given to prevent injury from fumigation that is used by lettuce growers in preventing topburn. Top or tip burn, as its name signifies, is a burning of the tender edges of the lettuce leaves and is induced by bright sun on too tenderly developed tissue. Topburn in lettuce is, however, counteracted by properly adjusting the heat and light conditions under which the crops are growing, or, in other words, by obviating the production of tender and spindling plants. This is accomplished by utilizing lower night temperature during cloudy periods and also by giving the plants more air either during the night or day time.

A difference of a few degrees in the night temperature has a marked effect in the development of the texture of tissue, especially in a rapidly growing crop. Lettuce growers generally maintain a night temperature of 50° to 55° F. when the crop is first transplanted, at which time there is no danger from top burn. But after the plants have become established and commence to form a head, the night temperatures are reduced to 45° F. or even lower. This night temperature induces a firm texture, and with proper regulation of the day temperature there is no danger from topburn.

Some plants are more susceptible to injury from fumigation than others. Plants with tender foliage or those that have been forced are more likely to suffer injury. The injury to any plant, however, may be greatly decreased or entirely obviated by the due consideration of the conditions of development and the daily periodicity of the plant's activity in the regulation of the dosage and the time of application.

G. E. STONE

AMHERST, MASS.

NELSON SMITH

Mr. Nelson Smith, one of the original incorporators of the New York Botanical Garden, died at his home in New York City on February 28, 1916, in his eighty-eighth year. He was born in the township of Middletown, Delaware County, New York,

and was a descendant of ancestors, on his father's side, from an English family which settled in Hempstead, Long Island, prior to 1700. He was educated at the Delaware Academy at Delhi, New York, and studied law at Delhi, removing to New York City in 1852, where he practiced law for over sixty years. He gave much attention to public matters, serving in the legislature of the state, and was a member of the New York Constitutional Convention of 1894. During his legislative service, he took charge of obtaining the original charter of the New York Botanical Garden, in consultation with Judge Charles P. Daly and Judge Addison Brown. Mr. Smith visited the Garden occasionally, and was always much interested in its progress and development.

N. L. BRITTON,
Secretary

A NATIONAL FLOWER

Several attempts have been made to adopt a national flower, but without success. The difficulty is that owing to the extent of territory and diversity of climate and flora, no wild flower grows in all the states or could be grown if chosen!

Among the various plants that have been advocated, the Indian corn and the pumpkin, perhaps, lead in the greatest popularity, on account of their economic importance, though in neither case are they native in the United States. The wild columbine also has been suggested and various fanciful reasons given for its adoption; but this is a plant that flourishes only in mountain regions.

An attempt was made a few years ago to adopt the laurel as the state flower of Pennsylvania and Mr. Asa K. McIlhaney, of Bath, Pa., sent out a leaflet, in which he had compiled a series of letters and poems from various prominent citizens accepting this flower as a most appropriate emblem, but the governor vetoed the bill. However those who loved the laurel felt almost sure that its extermination was arrested for only a brief period. At the meeting of the Federation of Women's Clubs held in

May of this year an attempt was made to adopt the laurel as the national flower, but was defeated by a majority of the members present.

On June 1st of this year, Mr. Stephens, of Texas, introduced the following bill in the House of Representatives prefacing it by a "*Joint Resolution.*"

"To officially recognize a floral emblem for the United States of America.

"WHEREAS the United States of America have no national flower, and the adoption of the mountain laurel would open up a wide field of interest for artists in many lines of creative and original work. It is in bloom on three of our greatest national holidays—Independence Day, Decoration Day, and Flag Day. Its flowers are red and white, two of the colors in our flag, the red for courage, the white for purity, and the leaves combining as they do yellow for wisdom and blue for truth, blended together, forming the green of fruitfulness, are surely typical of our country. The seed pod on opening forms a perfect five-pointed star. The flower is wonderfully formed like a chalice, with five delicately curved edges, the blossoms clustered together like the constellation of the States, and would mean 'The Union forever': Now, therefore, be it

"*Resolved* by the Senate and House of Representatives of the United States of America in Congress assembled, that on and after the approval of this resolution the official and recognized floral emblem of the United States of America shall be the flower commonly known as the mountain laurel.

"A BILL

"Designating the American mountain laurel the national flower of the United States.

"Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, that after the passage of this Act the national flower of the United States of America shall be the American mountain laurel."

This has the same objection as the columbine and its distribution is even more limited, being found only in the eastern United States, except along the coastal plain!

The selection of the mountain laurel as a national flower would mean that many of the ropes used for Christmas decorations (churches and hotels use enormous quantities of them) much of the trimmings for fruit-stands and baskets and almost all the brier-wood pipes would be made from the laurel. The supply must come from wild sources, none of it being cultivated for these purposes! If we more than double the demand and add anumber of other reasons for its destruction, the end is surely in sight.

The golden-rod has been adopted by five different states, is native and widely distributed, but is lacking in sentiment and refined beauty.

The following list of state flowers is more or less indefinite and may be inaccurate, but no complete list appears to be available. Personally, it would seem as if the pine tree which has just been adopted for the new fifty cent piece would be more widespread in its distribution and more eminently suitable as our national emblem:

LIST OF STATE FLOWERS *

Alabama	Golden rod	Nebraska	Golden rod
Arkansas	Apple Blossom	New Jersey	Violet
California	Golden Poppy	New York	Rose
Colorado	Blue Columbine	North Carolina	Daisy
Connecticut	Mountain Laurel	North Dakota	Wild Rose
Delaware	Peach	Nova Scotia	Arbutus
Florida	Orange Blossoms	Ohio	Red Carnation
Georgia	Cherokee Rose	Oklahoma	Mistletoe
Idaho	Syringa	Oregon	Oregon Grape
Illinois	Native Violet	Pennsylvania	Laurel?
Indiana	Carnation (Pink)	Rhode Island	Violet
Iowa	Golden rod	South Dakota	Pasque Flower
Kansas	Sunflower	Tennessee	Daisy
Kentucky	Golden rod	Texas	Blue Bonnet, Lupines
Louisiana	Magnolia	Utah	Sego Lily
Maine	Pine Cone and Tassel	Vermont	Red Clover
Maryland	Black-Eyed Susan	Washington	Rhododendron
Massachusetts	Arbutus, May Flower	West Virginia	Rhododendron
Minnesota	Moccasin Flower	Wisconsin	Violet
Mississippi	Magnolia	Wyoming	Gentian
Missouri	Golden rod	Hawaii	Lehua
Montana	Bitter Root		

* See the World Almanac and Encyclopaedia, p. 561, 1916.

ELIZABETH G. BRITTON

NOTES, NEWS AND COMMENT

The Garden has recently become a subscriber to the following periodicals:

Annals of Applied Biology, *Annals of the Bolus Herbarium*, and *The Journal of Ecology*, back numbers of which are now on file in the library.

Among the visitors who have registered in the library during June are Dr. Emmeline Moore, of Vassar College, Mr. C. A. Weatherby, of East Hartford, Conn., Prof. L. H. Pennington, of Syracuse University, Dr. Walter Swingle, of Washington, D. C., and Mr. Frederick Le Roy Sargent, of Cambridge, Mass.

Dr. Fred J. Seaver spent the most of the month of July at Portland, Connecticut, making observations and collections of local fungi.

Mr. C. A. Schwarze, of the New Jersey Agricultural Experiment Station, recently spent several days at the Garden looking up information in the herbarium relating to parasitic fungi.

The large collection of ferns made incidentally in South America by Dr. Rose in connection with his cactus investigation in that region has been mounted and is being incorporated in the herbarium.

Mrs. W. S. Jennings, Mrs. Kirk Munroe, Mrs. Edgar Lewis, and Miss Kate V. Jackson, delegates from Florida to the recent convention of Womans Clubs and all interested in the conservation of natural areas of botanical interest and value in Florida, recently spent a day at the Garden.

Mr. Wilson Poponoe, of the Bureau of Plant Industry, United States Department of Agriculture, spent several days at the Garden examining herbarium specimens of tropical fruit-bearing shrubs and trees.

Several adult specimens of the European pine shoot moth have been hatched in the laboratory during the spring. This

imported moth is doing a great deal of damage to the pines, especially the dwarf pines. A large number of infected shoots have been gathered and destroyed with the hope of checking the insect.

The American Genetic Association is offering $100 for information regarding the best specimen of the papaw (*Asimina triloba*). Fifty dollars will be paid for data of the largest tree and a like sum for the tree, regardless of size, which produces the best fruit. The conditions for the awards are fully given in the July issue of *The Journal of Heredity* together with a very interesting and well illustrated article on the papaw, which is designated as "the most neglected American fruit."

Dr. P. A. Rydberg spent two weeks during June at the National Herbarium in the study of the tribe Anthemideae of the Compositae and the tribe Psoraliae of the Papilionaceae. The results of these studies will be embodied in future numbers of *North American Flora*.

About four hundred biology pupils from the Evander Childs High School, accompanied by their teachers, came to the Garden on June 22 for special study of certain collections, following a schedule and series of exercises prepared by Mr. Paul B. Mann. They were met at nine o'clock by several members of the Garden staff and conducted in groups of forty through the public conservatories, herbaceous grounds, economic garden, and a portion of the museum, after which they enjoyed an illustrated lecture on forestry given in the lecture hall by Mr. George E. Hewitt. Before leaving the museum building, the pupils handed in reports of their work. They showed great interest in it and were very earnest and very orderly. It will be a pleasure to have them again in the autumn.

Meterology for June.—The total precipitation for the month was 4.05 inches. Maximum temperatures for each week were 81° on the 6th, 83° on the 13th, 76° on the 23d, and *86° on the 29th*. The minimum temperatures were 50° on the 10th, 53° on the 16th, *45° on the 22d*, and 55° on the 27th. The unusually

low temperatures and cloudy weather which prevailed during the preceding month continued throughout the month.

ACCESSIONS

MUSEUMS AND HERBARIUM

1 specimen of *Rhizina inflata* from Idaho. (By exchange with Mr. James R. Weir.)

8 specimens of coralline algae. (By exchange with Professor W. G. Farlow.)

50 specimens "Phycotheca Boreali-Americana," fascicle 42. (Distributed by Messrs. Collins, Holden & Setchell.)

8 specimens of coralline algae from California. (By exchange with the University of California.)

16 specimens of hepaticae mostly from Canada. (By exchange with the Carnegie Museum.)

1 specimen of *Artemisia atomifera* from Washington. (By exchange with the United States National Museum.)

9 specimens of hepaticae from Connecticut. (By exchange with Miss Annie Lorenz.)

100 specimens of fungi from Porto Rico. (By exchange with Professor J. F. Stevenson.)

14 specimens of fungi from Pennsylvania. (By exchange with Mr. L. O. Overholts.)

1 specimen of *Pholiota* from Arizona. (By exchange with Mr. W. H. Long.)

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

1 specimen of fungus from Pennsylvania. (By exchange with Dr. D. R. Sumstine.)

3 specimens of woody fungi from New Jersey. (Collected by Mr. Percy Wilson.)

22 specimens of *Clitocybe* from Colorado. (By exchange with Mr. L. O. Overholts.)

21 specimens of fungi from Porto Rico. (By exchange with Mr. J. R. Johnston.)

1 specimen of fungus from Arkansas. (By exchange with Mr. W. H. Long.)

1 specimen of fungus from China. (By exchange with the United States Department of Agriculture.)

1 specimen of fungus from Washington. (By exchange with the United States Department of Agriculture.)

5 specimens of fungi from Peru. (By exchange with the United States Department of Agriculture.)

10 specimens of fungi from Florida. (By exchange with the United States National Museum.)

1 specimen of *Marasmius Sacchari* from Porto Rico. (By exchange with Mr. J. R. Johnston.)

PLANTS AND SEEDS

1 plant of *Magnolia Norbertiana*. (Purchased.)

5 plants, *Opuntia* and *Stylophyllum*. (By exchange with U. S. National Museum through Dr. J. N. Rose.)

1 plant of *Cercis canadensis alba* for Fruticetum. (Given by Mr. Henry Natho.)
1 Laelia for Conservatories. (Given by Mr. H. W. Becker.)
8 palms for Conservatories. (Given by Mr. P. A. B. Widener.)
10 plants of *Lupinus texanus.* (Given by Miss Mary E. Eaton.)
123 plants, all cacti, for Conservatories. (Collected by Dr. J. K. Small.)
3 plants for Conservatories and Nursery. (Given by Mr. Henry Natho.)
2 plants, *Opuntia* sp., for Conservatories. (Given by Miss Laura M. Bragg.)
3 plants for Rose Collection. (Purchased.)
357 plants for New Iris Garden. (Given by Mr. T. A. Havemeyer.)
4 plants of *Galeorchis spectabilis.* (Collected by Mr. P. Wilson.)
9 plants for Museum Fountain. (Purchased.)
47 plants for Rose Collection. (Purchased.)
378 plants for New Iris Garden. (Given by Bobbink & Atkins.)
197 plants for Cons. Beds, and Decorative Collection. (Purchased.)
3 plants of *Odostemon aquifolium* (Given by Dr. Ulman.)
9 plants for Conservatories. (By exchange with U. S. National Museum, through Dr. J. N. Rose.)
1 plant for Conservatories. (Given by Mr. Henry Natho.)
19 plants of *Nephrolepis.* (By exchange with Brooklyn Botanic Garden.)
17 magnolias for Arboretum. (Purchased.)
15 plants for American Wood Garden. (Collected by Dr. F. W. Pennell and Dr. A. B. Stout.)
1 *Opuntia* for Conservatories. (Collected by Bro. Leon.)
5 plants of *Glycine Priceana.* (Given by Mr. J. B. Norton.)
9 plants, all cacti, for Conservatories. (Collected by Mr. W. H. Long.)
32 plants of *Osmanthus aquifolium.* (Given by Mr. E. D. Adams.)
2 Vandas for Conservatories. (By exchange with Lager & Hurrell.)
1 plant of *Cedrus Libani.* (Given by Mr. Everett P. Martin.)
2 plants of *Cedrus Libani.* (Given by Mr. G. L. Van Dusen.)
3 plants of *Cedrus Libani.* (Given by Mr. Rintleman.)
3 plants of *Magnolia rustica.* (Purchased.)
12 plants, all cacti, for Conservatories. (U. S. National Museum, through Dr. J. N. Rose.)
38 plants for Conservatories. (By exchange with the Bureau of Plant Industry.)
2241 plants for Conservatory Beds. (Purchased.)
18 packets of seeds. (By exchange with the Botanic Garden, Upsala, Sweden.)
35 packets of seeds. (By exchange with the Botanic Garden, Christiania, Norway.)
1 packet of seeds. (Given by Mr. Henry Natho.)
65 packets of seeds. (By exchange with the Botanic Garden, Zurich, Switzerland.)
20 packets and 1 pound of seeds. (Purchased.)
145 packets of seeds. (By exchange with the Botanic Garden, Petrograd, Russia.)
1 packet of seeds of *Pentstemon secundiflorus.* (Collected by Dr. F. W. Pennell.)
14 packets of seeds. (By exchange with the Botanic Garden, Groningue, Holland.)
1 packet of seeds. (Given by Mr. Albert Maillard.)

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EDITOR

FRANCIS WHITTIER PENNELL

Associate Curator

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A Rose Garden Entrance

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THE ROSE GARDEN PLANS

(WITH PLATES CLXXV–CLXXVII)

A large rose garden is among the features planned for the additional land granted last year by the city for the use of the Garden. At the meeting of the Board of Managers held April 15, 1915, the cooperation of The Horticultural Society of New York in establishing this feature was accepted, this Society offering to supply all the rose plants necessary. At the meeting of the Board of Managers held June 17, 1915, the Director-in-Chief was authorized to invite Mrs. Beatrix Farrand to cooperate with Mr. John R. Brinley, Landscape Engineer, in preparing detailed plans for the rose garden; this study was at once commenced and plans were prepared after critical surveys and the location of path approaches and path surroundings had been determined, aided by the advice of Mr. Frederic R. Newbold, representing The Horticultural Society of New York, and by that of expert rose growers. A general plan for the development of the additional land prepared by Mr. Brinley, which included the rose garden location and its path and driveway surroundings, was approved by the managers at the meeting of November 18, 1915, and at that meeting Mrs. Farrand's plans for the rose garden itself were referred to a committee for consideration and report. Pursuant to a report of this committee a ground plan submitted by Mrs. Farrand was approved at the meeting of January 10, 1916, and its architectural features were approved at the meeting of April 20, 1916, thus completing the approval of these plans by the Board of Managers.

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The plans were then submitted to the Municipal Art Commission and received the approval of that body on May 8, 1916. The work of grading and drainage of the site was at once commenced.

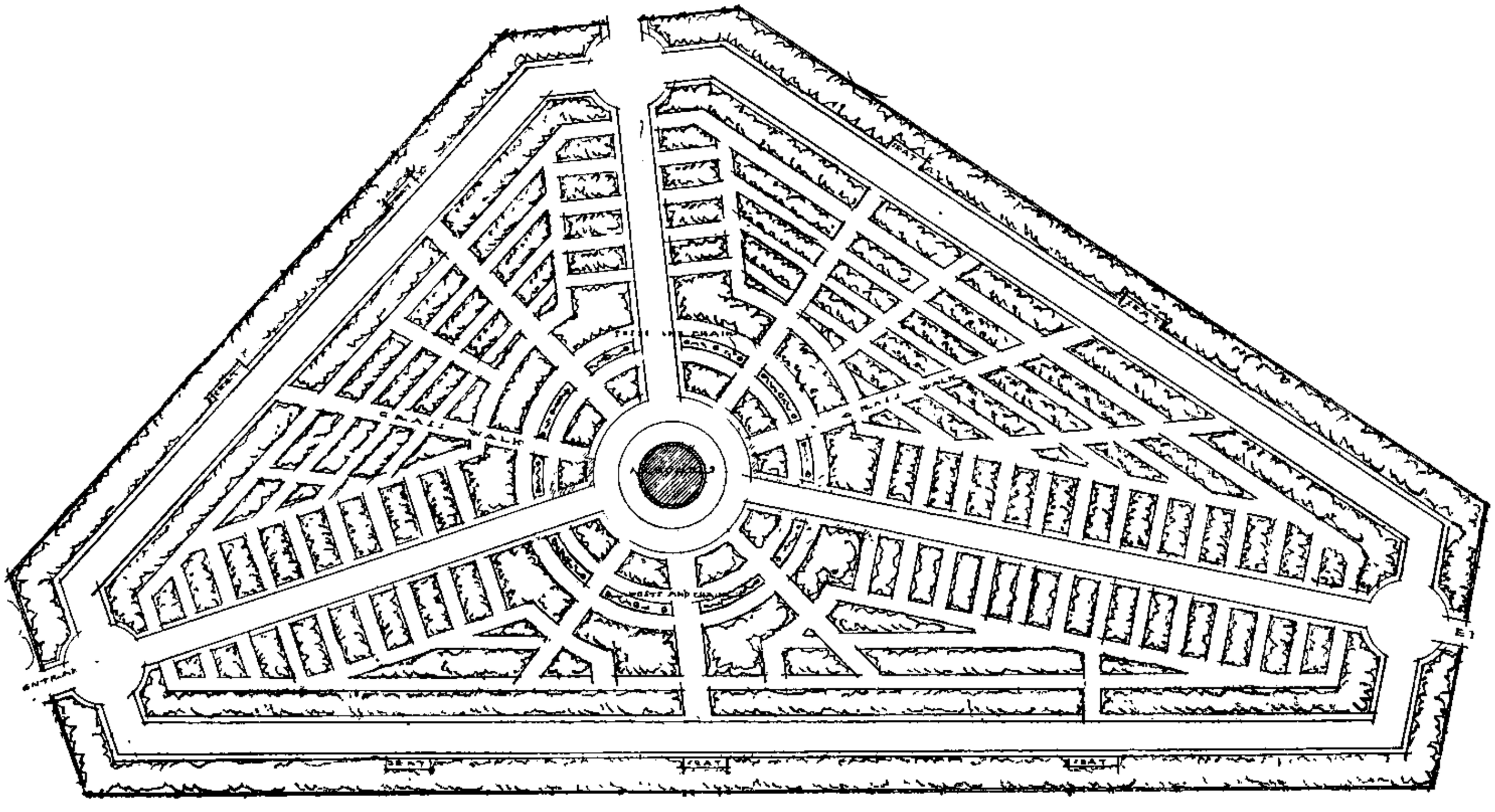
The site selected is part of a valley situated south of the mansion and just east of the driveway approaching the mansion from Pelham Avenue. The land here has been used by the Park Department during several years as a mixed flower garden; it is bounded to the east by a densely wooded rocky ridge; southward it narrows rapidly into a rocky wooded gorge and just north of the rose garden site it is crossed by a driveway and path system now under construction, which leads eastward into the arboretum and to a park entrance on the Bronx Boulevard. The general level of the valley is a few feet lower than that of the driveways; visitors in vehicles will thus have a good view of it; parts of the surrounding path system will also be at high levels so that pedestrians will be able to overlook the plantation. The space within the enclosure planned is about three hundred and fifty feet long and at its widest point about two hundred feet broad, approximately one and one quarter acres in area. The total area designed for roses is, however, considerably larger as it includes the surrounding banks and ledges.

The following description of the scheme is taken from notes and suggestions made by Mrs. Farrand when submitting the plans on November 18, 1915:

"A certain valley, crossed by a road, and of irregular shape, in the southern, newly acquired part of the Botanical Garden, having been chosen as the site for a rose garden, the accompanying plans were made, and the following suggestions are submitted for its treatment."

"As the roses to be grown in the garden may be separated into two distinct divisions,—the natural wild species and the horticultural varieties,—it has been thought appropriate to exhibit these two classes in two different ways,—the first division in a purely naturalistic and informal manner and surrounding the second division in the more formal frame of an enclosed garden."

"The valley of the rose garden may be entered from three



Ground Plan of Rose Garden

directions, each of which has been studied with regard to the general system of walks of communication."

"The walk to the west of the valley will be on a level considerably above the enclosed garden, and this will give an attractive bird's-eye view over the top of the lattice into the enclosure."

"The other walks will be on a lower level, giving a good opportunity to display the botanical species of roses, grouped according to their native countries, so that students may have the opportunity to study the horticultural varieties within the enclosure, and the botanical species outside, on the surrounding banks and rocks and alongside the walks of communication."

"In the irregularly shaped valley in which the rose garden is to be placed, no regular and balanced design could be adapted to the natural conditions. The natural lines must be taken as the necessarily dominant factor, if the garden is to look as though it had been made to fit the ground."

"An enclosure has been thought essential, not only as a means of protecting the many valuable plants from possible pilfering, but as a means of displaying many of the climbing roses."

"In order to give the level appearance necessary to the enclosure, it will be necessary to make such alteration in grade as will give the appearance of its being level, and this will necessitate a cut on the western side of the valley and a fill on the eastern."

"An iron lattice has been thought to be the most suitable for the trellis, as it is less perishable than wood and offers a permanent and practical construction on which to train the plants. Three gates have been provided which may be locked at night if it be thought advisable."

"Three main walks to the three entrances have been designed to meet at a central arbor, thus giving easy passage through the garden in various directions. A walk inside the lattice has also been designed which will give access to the bush rose border inside the enclosure and to the whole system of smaller beds. These three main walks and the surrounding walk may be paved with flagstones, and in the other walks grass may be used, where the foot-wear will not be so great."

"The central arbor is designed to show the stronger growing

sorts of climbing roses, and should be an attractive feature of the scheme. The beds around it are designed for a display of the smaller so-called ever-blooming roses of the Hermosa or Perle d'Or types, and on the outer circle of these beds a collection of the smaller growing climbing roses, grown on iron standards and chains, would give a background to the lower growing kinds and a setting to the summer house."

"Certain divisions of the rectangular beds may be used to grow roses of a type such as hybrid teas or hybrid perpetuals, thus keeping these classes together."

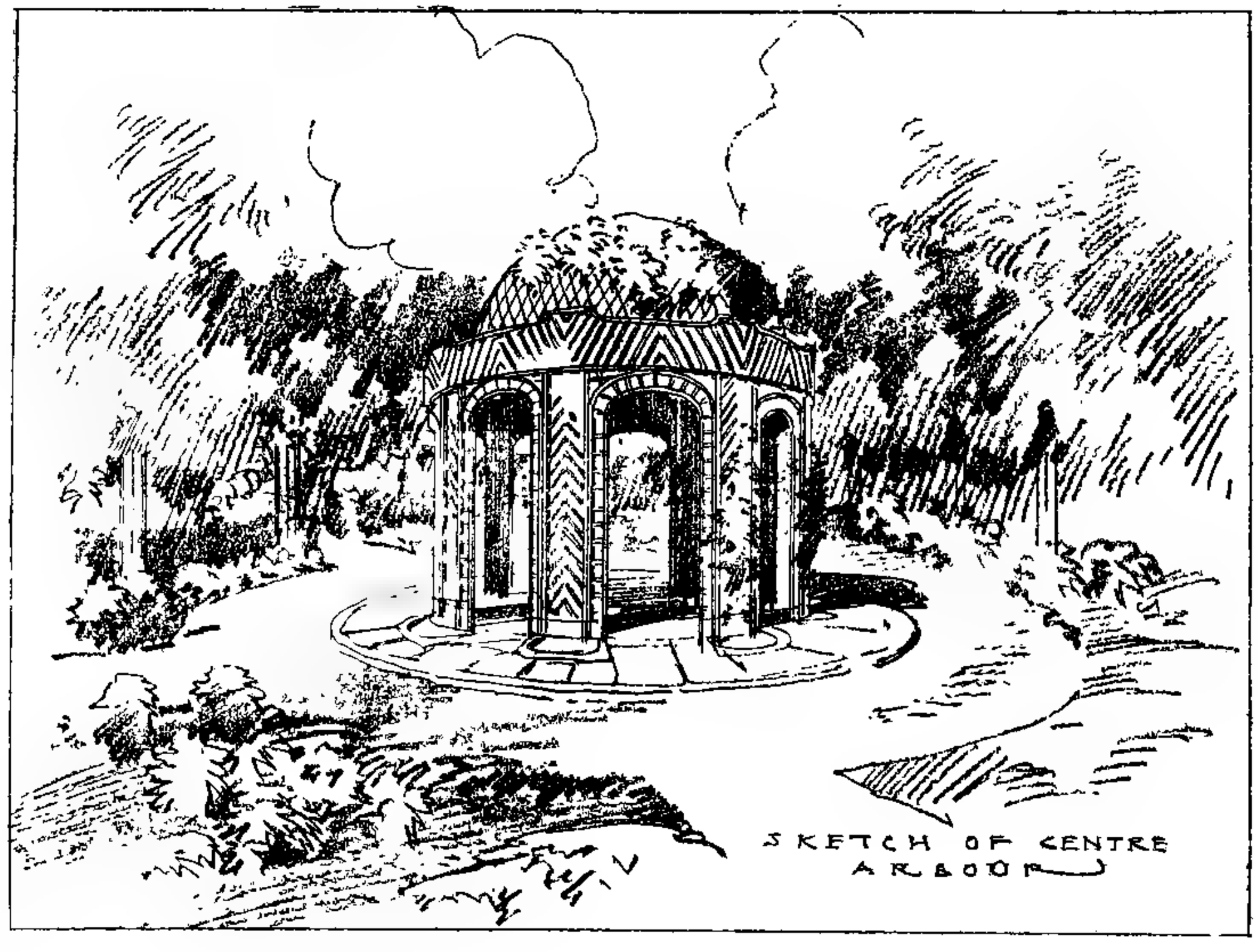
"The outer border is designed for the larger growing horticultural varieties of bush roses, such as the hybrid rugosas, sweet briars, Scotch roses, etc."

"The designs presented have been made with the main idea of trying to exhibit the various sorts of roses in the way that seemed best suited to them,—the natural species in informal surroundings, and the horticultural varieties in a more formal frame."

In establishing the grades it was found necessary to cut into the western bank of the valley an average depth of about two feet and to fill along the eastern and northern side an average of about eighteen inches. Under all planting spaces within the planned enclosure a depth of not less than two feet of topsoil is being provided. In grading near the western entrance considerable rock excavation, requiring blasting, has been found necessary, and this had best be done during the winter when visitors to this part of the grounds are few.

The number of plots planned within the enclosure for hardy bush roses is over one hundred and those toward the borders of the plan are large enough to be divisible in planting; it is estimated, therefore, that at least two hundred horticultural varieties of these will readily be accommodated with an average of ten individual bushes or more; the enclosing fence and the central architectural features will provide climbing accommodations for all hardy climbing types, and the surrounding banks are ample for the display of the hardy natural species.

The collection of so many different roses, completely labelled, will have great educational and scientific value; it will also be a test garden for the trying-out of new kinds as they are developed.



Central Features, Rose Garden Plans

The formal breaking of ground for the rose garden was accomplished during the Spring Inspection of Grounds, Buildings and Plantations on the afternoon of May 4th, Mr. Francis Lynde Stetson, for the Board of Managers, driving the team, and Mrs. George W. Perkins, for the Women's Auxiliary, holding the plough.

The work has been aided by contributions of money from members of the Garden, but considerably more than the amount thus far subscribed is needed to make the rose garden and its approaches complete.

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

FLORAL FEATURES OF THE AMERICAN EQUATORIAL BELT*

The term "equatorial belt," as used in this lecture, is not limited to the immediate line of the equator, but includes the greater part of the torrid zone. My personal acquaintance with it was gained during a journey along the Pacific coast, and one from a point upon the Pacific in S. Lat. 18° to a point upon the Atlantic underneath the equator; also from a summer's collecting along the lower Orinoco, in about 6° N.

We have the following distinct regions to consider:

1, The Pacific plain; 2, The west Andean slope; 3, The great Andean tableland; 4, The east Andean slope, and 5, The great Atlantic plain, more than 2,000 miles in width.

The Pacific plain must be subdivided. Its northern part, represented by the region about the mouth of the Guayaquil River, is verdant, the waves of tropical vegetation almost meeting those of the ocean. The dense vegetation rises as high as one can see up the mountain slope, from the sea. The wall of green is dotted with brilliant masses of color, as where a tree, perhaps a *Ceiba*, is densely covered with its own rose-colored flowers, or else is hidden beneath some climbing yellow-flowered *Senecio* or *Bidens*. A little south of Guayaquil the coastal plain

*Lecture delivered at the New York Botanical Garden, June 17, 1916.

becomes a desert, varying in width from nothing, where the Peruvian cliffs descend straight into the ocean, to some 40 miles or more to the southward. Most of this portion exhibits only barren sand, except where *Distichlis* or some other salt-marsh grass binds the sand in place. Cactuses are the first plants to find a support, and they are in great variety. Huge candelabrum-shaped forms occur very near the shore of the Peruvian coast. Portions of this desert frequently go several years with no rain at all. The seeds, and great numbers of tubers and bulbs, have great drouth-resisting powers. Immediately upon the commencement of the rains, they start into life, and mature their flowers and fruits with incredible rapidity. At many points mountain streams reach the lower valleys, even though they may not cross the plain, and here amidst cultivated crops we find many cosmopolitan weeds, such as *Leptilon* and *Verbena*. Tessarias border the streams, just as shrubby willows do in this country. Ascending the mountains, we encounter, at an altitude varying with the latitude, a belt that is moistened by heavy mists and, somewhat higher, by frequent rains. Among the first plants to show themselves here are the shrubby *Solanaceae*,—Dunalias and Lyciums. There are also half shrubby and herbaceous species of *Solanum*. *Caiophora* and related Loasaceous twiners bind these shrubs together and form dense masses of bristly stinging growth. Toward the summit, these Caiophoras become low, stout, erect herbs, with handsome large scarlet cup-shaped or saucer-shaped flowers.

Little collecting was done before attaining the summit, as this part of the journey was made rapidly. Traversing a pass through the western marginal range, at about 15,000 feet, we descend rapidly to a great plateau of variable width, its transit on horseback on the road from Arica to La Paz requiring four days. It is inhabited by the Aymara Indians, who are engaged largely in raising sheep, llamas and alpacas. They raise some cattle also and considerable poultry. Potatoes are small, but of excellent quality. These are remarkable for their shining surface and brilliant shades of yellow, purple, blue and brown. Barley is raised for fodder, but produces little grain. The chief crop

is quinoa (*Chenopodium Quinoa*), the growth of which is not checked by the frequent snows, and which produces enormous crops of seed in a few weeks from sowing. When cooked, it resembles oatmeal porridge and has the flavor of spinach. It is cheap and very nutritious and wholesome, containing a great amount of iron, an important element of the blood at this great altitude. It might well become a staple crop in Alaska and Labrador.

The tableland is much broken and is crossed by numerous low ranges. Cold rain or sleet is of very frequent occurrence, and there are many shallow lakes and a great abundance of small streams. Some larger streams which cross the plateau are of glacial origin.

The floor of this plateau is peculiar and interesting. There are no trees and the shrubs, usually very low and sprawling, are mostly spiny or thorny. A species of *Pilocereus* is known as old-man cactus, and is a striking feature. It is commonly of about the size of a man and has a thick crown of long, perfectly white, waving hairs. Those which I first saw in the distance I thought were old men with waving hair. No species that I have seen figured or in cultivation appears to me the same.

Among the most curious plants of the table-land are a group of species in the genus *Azorella*. These plants take the form of large rounded moss-covered stones, sometimes reaching a diameter of two or three feet and a height of eighteen to twenty-four inches. The surface consists of a dense mass of short stout branchlets terminating in rosettes of minute green leaves, a cluster of yellowish flowers in the center of each rosette. It is difficult to persuade oneself that they are not moss-covered rocks, but on striking an axe into them we find that the body of the plant is a short condensed tree trunk, its wood serving as an important fuel to the inhabitants of these treeless and often shrubless plains.

Many species of *Adesmia* contribute largely to the plateau flora. All have conspicuous papilionaceous flowers, and many of these are very pretty, with blotches and stripes of several colors. They are collectively known to the natives as *Flor de*

vicunya. Some of these plants are extremely thorny and form dense little clumps. These clumps catch and hold the loose soil that is blown against them and thus come to form hummocks or mounds. These hummocks then become inhabited by a great variety of dwarf condensed plants, the leaves and branchlets of which interlock to form a dense covering upon the soil. Most of these plants might even be called diminutive. They are of diverse origin. Species of Malvaceae, Caryophyllaceae, Umbelliferae, Compositae, *Astragalus*, *Adesmia* and other Papilionaceae may be disentangled from a single clump a few inches in breadth, and none of them above an inch or two in height. These plants are mostly more or less densely gray-hairy. Other species of *Adesmia* are herbaceous and closely creeping, having the habit of our white clover. These contribute a large part of the food of the grazing animals. Looking over the level plains, one often sees great areas resembling a grassy lawn, thickly dotted with dandelion-like flowers, oftener white than yellow. Upon investigation, we find that this is not a sod, but a dense mat of composite plants, *Hypochaeris*, *Werneria*, and some *Perezia*. The more or less upright radical leaves are usually spine-tipped, so that walking over these plants is often far from pleasant. Here we observe the llamas and other grazing animals feeding with their noses in the shallow waters of brooks which form large networks in the valleys. We find that in such localities there is a dense growth of aquatic and semi-aquatic grasses or grass-like plants, which constitute the food that they are seeking.

The table-lands are beset with shallow lakes, some of them of great size, where water-fowl of many species and genera occur in great flocks. In many of these lakes there exists a dense growth of Potamogetons, Myriophyllums and similar plants. Upon the shore of Lake Titicaca there are herds of milk cattle, which supply a great part of the butter for the cities of the plain. These cattle are fed largely on the aquatic plants above mentioned, which are raked up from the bottom of the lake where the water is from eight to twelve feet deep. The shores of these lakes are fringed with bulrushes, very closely related to those which sheltered Moses. From these the boatmen construct the

rafts and boats with which they navigate the lake. These bulrushes are also used for very many other purposes. The young tender shoots and the succulent bases of the stems are utilized as food.

Reaching the City of La Paz, we are within a few hours' walk of the eastern edge of the plateau, which supports another high mountain range, much of which is perpetually ice-covered. At La Paz we spend a long time and do considerable collecting, so that we can gain a fairly good idea of the character of the flora. Since the city lies in a pit some 2,000 feet deep, and this contributes a small river which emerges to the lowlands, our opportunities are greatly enhanced. Except at the very bottom of the basin, mostly occupied by the city, there is very little land that is level enough and with sufficient soil to admit of cultivation. The cliffs, ravines and benches of the walls are rich collecting grounds. Our first ferns are found here, at an elevation of some ten or eleven thousand feet, being species of *Adiantum*, *Cheilanthes* and *Polypodium*. Growing with them are a few terrestrial bromeliads, several species of scarlet Gerardias, and dense fields of *Fagelia*, still known to gardeners as *Calceolaria*, of several species, all with plain yellow flowers. Beautiful Daleas, both red- and blue-flowered, are intermingled, and many of the shrubs are Psoraleas. Although there are many species of *Gnaphalium*, the related genus *Achyrocline* largely replaces it, both here and lower down. Helianthoid Compositae, especially *Viguiera*, *Encelia* and *Verbesina*, cover the ledges. Growing with them are acres of half-shrubby Labiates, *Hyptis* and *Bystropogon*, one species smelling rankly of pennyroyal. A little below the city the slopes are beset with large columnar cacti, resembling the organ cactus of Mexico. Their white flowers are of enormous size and very fragrant, and one may awake in the morning to find thousands of them in view.

One of the most interesting as well as beautiful groups of plants of the high table-land is the Mutisiaceae, a tribe of the daisy family and without any close relatives in our region. The type of the tribe is the genus *Mutisia*, consisting of woody or half woody climbers, the tips of the mostly pinnate leaves

tendril-bearing and the flower heads very large, pendulous and of a brilliant scarlet or orange. Many of the genera, *Chuquiragua*, *Barnadesia*, *Proustia* and *Plazia*, are shrubby, often very thorny, and have magnificent flower heads of yellow and white. Although very brilliant, these flowers are, so far as I know, wholly odorless.

Leaving La Paz, we climb steadily but gradually for some 2,000 feet, to enter a pass which will lead down into the tropics. The higher slopes are gay with stemless and caespitose flowering plants, Perezias, Wernerias and related genera. Among them gentians grow in abundance and variety. Some have the habit of *Hepatica*, with large saucer-shaped erect blue flowers. *Gentiana sedifolia* has a myriad of tiny tufted stems, resembling a bed of *Polytricum* beset with tiny funnel-shaped pale blue flowers. From this point, down to an elevation of seven or eight thousand feet, the variety of gentians is almost bewildering. On open grassy slopes we have tall, slender species with bell-shaped pendulous flowers of scarlet or orange. In moister and more shaded places are erect branching species, like our own, the flowers ranging from white and pink to purple or deep blue. The family is represented by other genera of much larger plants, *Chelonanthus*, *Rusbyanthus* and *Symbolanthus*. The latter are peculiarly handsome and would make a great sensation could they be introduced to cultivation. They are half shrubby, ramose-branching, and form compact masses, four or five feet high and broad. The foliage is dark and glossy and the large mimulus-like flowers range from orange through scarlet to crimson. They would doubtless show great variation and improvement under cultivation. Growing among the gentians are many Bartsias and related plants.

Emerging from the short pass, we look straight down a steep, deep valley into a tropical luxuriance of vegetation. On each side and a little above us are the glaciers, and from them are falling many little streams, to be bordered a little lower by mossy and ferny banks, beset with violets, valerians of many species, Cerastiums and Stellarias, *Alchemilla*, *Acaena*, *Sisyrinchium*, *Hypericum*, and an unbelievable number of species of

Relbunium and *Galium*. Very rapidly, as we descend, the vegetation becomes fruticose and then arborescent, and we now find ourselves in a region the floral richness and beauty of which are probably not exceeded anywhere in the world. An enchanting volume could be written descriptive of the flora of a hundred square miles of these ridges and valleys. I can find space for only the most striking features.

Solanaceae probably predominate in the valleys. New species of *Solanum* are encountered at every turn. They range from small herbs to very large shrubs and the variation in characters is the widest possible. Numerous other shrubby species in the same family occur, especially of Cestrum. The Pœcilochromas are handsome and interesting. *Markea* has a strange fruit, the epicarp disappearing as it grows, until it becomes a mere seedy mass of soft pulp. *Juanulloa* is very similar. The generic lines between *Solanum*, *Cyphomandra*, *Bassovia* and *Brachistus* become faint and indefinite. Many species of blackberry and raspberry are seen. Most of these are inedible, but one raspberry appears of phenomenal value for cultivation. A single cane will drop for many yards over the steep slope or cliff, branching widely, its branches terminating in huge clusters of delicious fruits, as large as large strawberries. It is called *Frutilla del monte* (mountain strawberry). The Sauraujas are lovely, looking at a distince like *Aesculus* shrubs. Clethras are of similar habit and equally handsome. Among these are very handsome scarlet-flowered Desfontaineas and related Buddleias. There are Viburnums and Corni, and numerous species of *Weinmannia*, having inflorescences like those of *Clethra*, and lovely pinnate glossy foliage. The Fuchsias require special mention. They are of exquisite beauty. One of them becomes a small tree. Some grow with dense corymbs of very large and brilliantly colored flowers. Others grow among the dry rocks and have few leaves, but dense masses of tiny, rose-colored or scarlet flowers. There is still another group which has few scattered flowers of enormous size and very scanty foliage. These are prostrate in the moss or rotting vegetable debris.

Upon these slopes, from eight thousand feet downward, we

find frequent growths of bamboo. They are densely branched, very slender, strongly drooping and bear a graceful feathery foliage of very light green. Their presence in the landscape intermingles with that of several species of palm of similar habit and the two harmonize most gracefully. The palms of this region are almost stemless and have immense leaves, which rise only for a short distance and then droop over the faces of the steep banks, so that their tips are often many feet lower than their bases. There are other species which grow only a few feet in height, with lovely crowns of slender leaves. Growing with these a little higher up, are many handsome species of *Berberis*.

Growing close along the banks of the streams, in the bottoms of the valleys, which are bordered by the plants just described, we have a number of giant species of *Cleome*, of which genus one species is common in our gardens under the name "love in a mist." These Andean species are tall, slender and erect growers, reaching a height of eight or ten feet and with soft woody trunks two or three inches in diameter. As they rise, the lower leaves fall, leaving large conspicuous scars which give a very peculiar appearance to the trunks. At the summit, there is a canopy of immense digitate leaves on very long petioles and a dense cluster of gigantic long-stemmed flowers. There are many species of *Abutilon*, *Pavonia*, *Wissadula* and related Malvaceae. The genus *Meibomia* is enormously represented, and most of the species are strikingly similar to our own. The related genus *Aeschynomene* inhabits lower altitudes, but the Meibomias do not give way to it, although their forms become more robust and erect in habit. *Centropogon* and *Siphocampylos* are freely represented and are very showy lobelia-like genera, their elongate flowers mostly in terminal clusters, varying from white through yellow, orange and scarlet to crimson, often combining several of these colors. As we descend into the strictly tropical regions, the abundance and variety of the ferns become very great, so that a specialist in this group of plants would be able to devote his whole time to their collection and study.

There is a certain point upon the eastern slope, at an elevation of six or seven thousand feet in 18° south latitude, where the

profusion of ornamental plants, a great number of them representing the decorative plants of cultivation, far exceeds anything that I have ever seen elsewhere. One sits in the convexity of a stupendous amphitheatre that descends and stretches out beyond the reach of the most powerful telescope. The walls are densely verdant, but stretch up to the glaciers on either side. A score of water-falls leap out to lose themselves among the trees and again appear lower down. With all its grandeur, the grand cañon of the Colorado appears bleak and poor when one views it with this picture in his memory. Here I have eaten my lunch under the shade of a small fuchsia tree, its trunk some five or six inches in diameter, my back resting against this and the flower- and fruit-laden branches drooping overhead. The fruits are about as large as cranberries, of a deep blackish purple, glossy and edible, though by no means delicious. I am sitting in a bed of *Fagelia* of two or three species and most interesting in habit and structure. The rocky banks about me bear several showy species of *Oxalis* of various shades of pink, rose and yellow. One of them is a very large plant, the bases of its stems as thick as my wrist, and its branches drooping for several yards over the rocky ledges. Here also are numbers of species of *Begonia*. Some of them are little erect herbs with tuberous roots, others slender, one species twining around tree trunks and bearing continuous masses of white and fragrant flowers. There are two or three species which grow very tall, six to ten feet high, with slender stems bearing immense leaves and umbels of flowers at the summit.

These are the localities where many species of terrestrial orchids, mostly Oncidiums and Odontoglossums, are to be found. These grow on steep banks and have long flower scapes sometimes several yards in length, simple or branched, depending over the rocks. There are also many species of erect growers, related to and resembling our *Liparis*, *Ibidium*, *Peramium* and *Habenaria*. The arboreal orchids are not abundant at these altitudes but become quite frequent below five or six thousand feet. Many of them are white and exceedingly fragrant, while others are more brilliantly colored, but are wanting in fragrance. One species of *Epidendrum* has scarlet flowers.

Exceeding in beauty all other plants of the region, in my opinion, are the tree ferns which often grow among the palms. Any attempt to describe the exquisite delicacy of these trees, as to the general effect in the landscape, or the appearance of their fronds on close inspection, is quite hopeless. We are to consider ourselves extremely fortunate in having such a fine display of them as we have in the fern-house of this Garden.

Standing upon a projecting point on the side of one of the steep slopes of a deep valley in the early morning, one may often see a belt, extending as far as the eye can reach, densely covered with the flowers of the moon vine, their delicate and delicious fragrance perfuming the air for miles.

As we reach the lower elevations, from four to six thousand feet, we come into a region of rather heavy forest, and there is an impressive change in the general effect of the floral formation. The country is still profoundly mountainous, but there are more relatively level spots, and there is more soil, so that even steep slopes support a continuous forest of rather large trees. The soil is not deep but the roots display a marvellous capacity for finding crevices in which to fasten themselves. Traversing these forests, one does not encounter the dense growth of shrubbery and herbs that I have been describing. There is a tangle of woody climbers that hold the trees together while being supported by them, and there is no scarcity of subarboreal shrubbery, yet one is not immersed in that sea of verdure that has previously surrounded him. Here we encounter the only conifers that we shall find in these mountains, one or more species of *Podocarpus*, handsome trees with Taxus-like leaves.

When one can gain an abrupt elevation, he can readily make out the principal elements in the forest flora. Perhaps the greatest number of trees in a single family are in the Lauraceae, Nectandras predominating. These are mostly good-sized trees, with highly aromatic bark and foliage, their dense mass of inflorescence usually of a dull yellow. The wood is hard, tough and durable. The Eugenias, Myrcias and other Myrtaceae are almost equally numerous, decidedly smaller and far more handsome. Their leaves are mostly rich and glossy, often brilliantly

silvery or golden underneath, and when in flower whole trees will often appear as a creamy or snowy mass. Nearly equally abundant and still smaller, as a rule, are the Melastomaceae, represented here at home only by the tender herb *Rhexia*. These small trees and shrubs, because of their splendor when in flower, are called the Rhododendrons of the Andes. The first of these plants to be encountered, at about eight thousand feet, is the *Brachyotum microdon*, a large shrub loaded with fuchsia-like flowers and strikingly beautiful. As we descend, we encounter the greatest variety and abundance of Tibouchinas, Merianias, Axinaeas, and other genera, their flowers usually of some shade of rose or purple, but occasionally white or yellow, and forming masses of bloom, as do our Azaleas. The Miconias are the most numerous and abundant of this family. Their flowers, of almost all colors, are individually very small, but form masses of bloom. The fruits also are in huge masses and are often brightly colored. The leaves of all these, and a host of other genera, are as handsome as the flowers, and they disclose fresh beauties the more closely that we examine them, even when we cut into them and examine their tissues with the compound microscope. The monograph of this family by Dr. Cogniaux is one of the finest pieces of botanical work ever performed. Shrubs and trees of similar habit and appearance are the Befarias, very closely related to *Azalea*.

Here and there we may see a huge tree rearing its symmetrical crown above its companions, and presenting an unbroken surface of pink or rose. It is a *Ceiba*, not distantly removed from our garden hollyhock. Occasionally a smaller tree, exhibiting a similar surface, but of golden yellow, may be seen. This is a *Vochysia*, a relative of our *Polygala*. There are other trees similarly covered with flowers, but not their own. Climbing *Senecios* or *Bidens* will often cover a tree with yellow. The Combretums, huge woody climbers, with no relatives in northern climes, bear very long slender branches which are veritable ropes of scarlet or yellow flowers, and which twine about and drop from the limbs of tall trees. Their inflorescence is densely covered with shining scales. Many species of Malpighiaceae, a family also here un-

known, are woody climbers, covered with peculiar flowers having long-clawed, usually yellow, petals. Those in the genera *Tetrapterys*, *Heteropterys* and *Banisteria* have winged fruits like those of our maples. The fruits of *Hiraea* have circular wings like the elm fruit, often very large. Sometimes the foliage is brilliantly silvery-silky. Some trees in the ivy family, *Sciadophyllum*, *Dendropanax*, *Didymopanax* and *Oreopanax*, are of elegant appearance, somewhat resembling our horse-chestnut. Their wood is soft, almost fleshy, and one wonders how the trees can maintain themselves.

In these forests the Cinchonas are at home. In their natural forest habitat they grow with tall, graceful trunks, develop handsome crowns of lustrous foliage and are densely covered with lilac-like panicles of fragrant flowers, white, rosy, lilac or violet. Humming-birds gather among them in flocks and transfer the pollen, this resulting in free hybridization. They are now cultivated in large plantations, growing thus with a spreading habit like a peach or cherry tree. They have many handsome relatives among the forest trees and shrubs. *Pogonopus*, *Warscewiczia*, and some others have large handsome bracts of scarlet, white or yellow. *Psychotria* is a very large genus, its shrubs as common in the forest as oaks are in ours. There are many related and similar genera of shrubs. *Coccocypselum* is a slender prostrate shrub, bearing clusters of the most brilliant blue fruits which lie bedded in the moss. Such a region as this is known as a "Yungas," and one Bolivian state bears this name. Here the *Coca* plant, source of our cocaine, is extensively cultivated. Its cultivation antedates the most ancient legends, and its history includes that of the religion and government of Peru and Bolivia. It also occurs wild here, but whether native or wholly as an escape will probably never be known. Various other species of *Erythroxylon* are common in these regions.

Growing in the coca plantations and placed there in order to afford a partial shade are various species of *Inga*, the *pacay* tree of the Bolivians. This tree is in the *Mimosa* family and has the size and form of a large apple tree. It has huge pinnate leaves and clusters of white feathery flowers which are produced

in great abundance and are fragrant. The pods are bean-like, sometimes reaching a foot or two in length. Their seeds are embedded in a white filamentous mass resembling absorbent cotton. This mass, however, is very juicy, almost watery, and melts in the mouth with an agreeable sweetish taste and a cooling sensation. It is a favorite fruit with the ranchmen.

Other cultivated shrubs, represented by numerous native relatives, are the several cherimollas, custard-apples, and sweet and sour sops, of the family Annonaceae. Some of the wild ones have delicious fruits. *Bocconia* is a very strange shrub, a small tree in the poppy family. With large poppy-like leaves, it bears drooping masses of blood-root-like fruits and exudes a thick blood-red juice. The Indians wrap fevered infants in its heated leaves. If the latter turn black, it is a favorable indication, but if not, the child is expected to die. There is probably much truth and a sound scientific basis for the tradition.

Baccharis, a genus of shrubs whose northernmost representative grows with us, has a great number of species, with leaves of odd forms, growing along streams and in other damp places. All have a rank resinous odor. The Vismias are fragile shrubs or small trees related to *Hypericum*, and bear a profusion of pretty and interesting glandular flowers.

Of trailing and climbing plants there is a great abundance and a perplexing variety. The most interesting and beautiful, perhaps, are the passion-flowers. They occur from an elevation of seven or eight thousand feet clear to the base of the mountains and out across the great forested plains. Their flowers are of widely variable size and shade of color and are handsome beyond description. Some of these flowers are enclosed in bracts which are each divided into the most beautiful network—one might almost say a web—of filiform divisions. More curious and interesting than anything else about them is the odd form of their leaves, which are lobed in the most peculiar manner and in rich variety. A number of species yield edible fruits. These fruits are oval in shape, have a crustaceous epicarp like a mock-orange and are completely filled with a mass of small seeds in a translucent jelly-like pulp. In some cases this pulp is deliciously sweet, while in others it is almost as acid as that of the lemon.

Growing with the passion-flowers, and of similar habit, are many plants in the cucumber family, the Cayaponias and Guranias being specially interesting.

In the same regions which produce the two last mentioned groups occur a great variety of shrubs of the huckleberry family, many of them twining around trunks of trees. To the botanist these plants offer as interesting a study perhaps as any other Andean alliance. Their relationship indicates that they are the relics of a former dominant or largely prevalent group, of which most of the members have become extinct. The genera have but few surviving species. I have now awaiting study several species of these plants, all in distinct genera, but none apparently belonging to any genus yet described. The flowers are, for the most part, exceedingly handsome, growing mostly in ropes of a coral-red or more brilliantly scarlet hue. Unlike our own plants in this group, they rarely bear edible fruits. One species in the genus *Thibaudia* develops a cluster of tall erect stems, six to ten feet in height, with leaves and flowers borne in an umbrella-shaped canopy at the top; its berries, although somewhat mawkish, are considerably eaten by the natives.

All through these mountain valleys, but more especially at the lower elevations and toward and upon the great plains, we have a vast number of Mikanias, twining herbaceous or semi-woody vines in the daisy family, not distantly related to our common boneset or thorough-wort. The flowers are mostly white, although often purplish.

The Apocynaceae, Asclepiadaceae and Convolvulaceae, all contribute large numbers of twining plants. Many of those of the first named family, especially the Mandevillas, are strikingly handsome. They climb widely and bear racemes of large morning-glory-shaped flowers of white, pink, or lilac hue. *Echites* is another genus in this family that is largely represented. *Tabernaemontana* and *Plumiera* are trees in this family. One species of the latter, a large tree, bears a crop of huge banana-like fruits and presents a peculiar appearance as these swing in the wind, the tree at this time bearing few leaves. The vines of the milkweed family are almost innumerable. Sometimes two of them,

although in different genera, will exhibit almost no specific difference when viewed superficially.

Mention must not be omitted of some of the plants occupying the forest floor. Polygalas and Monninas are in great variety and abundance and often very pretty. Heliotropes, of many species, grow in all open places and cultivated fields, as do the related Cordias. In all moist and shaded places Pileas, Peperomias and Selaginellas are in great variety, as are ferns, mosses and hepatics. The Siparunas and Mollinedias are peculiar shrubby plants, not distantly related to the nutmeg, and like it, aromatic. They somehow offer a sort of suggestion of being out of place in the world's present flora. The Gesneriaceae are often strikingly handsome plants and show at once by the brilliant colors and velvety surface of their flowers that they are related to the gorgeous Gloxinias of cultivation. *Columnea* is the prevailing genus, although there are many species of *Alloplectus*, *Gesneria*, *Seemannia*, *Achimenes*, *Isoloma* and *Besleria*. These plants, rarely seen in quantity, usually are found singly or a few together. Mostly they are more or less concealed in thickets and hidden among partially decayed vegetable matter. Such is also the occurrence of species of *Siparuna* and *Nollinedia*. Among the smaller and softer shrubs, members of the *Acanthus* family are largely represented, although such specially favor the lower elevations. *Ruellia* is the predominant genus, but *Beloperone*, *Aphelandra* and *Justicia* are freely represented.

Reference to the parasitic and epiphytic flora must not be omitted. True parasites, in the mistletoe family, are numerous and abundant, although here they rarely if ever occupy the great part of a tree-crown with the brilliant patches of color that one sees in the valleys of northern Mexico. Epiphytes develop in great abundance upon almost all large trees which are sufficiently exposed to the sun and air. Limbs a foot in diameter will often appear two or three times as thick from the solid mass of vegetation with which they are covered. The epiphytes belong to widely different families. *Tillandsia* probably predominates. The common Florida-moss is abundant. Most of the

species however are erect growers; their flower scapes rise from a cluster of leaves varying from filiform in the smaller species, scarcely so large as the first joint of a thumb, to bayonet-shaped in the more huge species, often as large as a flour barrel. There are other genera in this family, the Bromeliaceae, although most of them are terrestrial. Great numbers of ferns and small inconspicuous orchids, especially *Notylia*, grow in such locations. As many as seventy species of epiphytes have been collected from a single fallen tree. One of my most interesting tropical experiences consisted in watching the fall of such a tree, due wholly to its huge load of water-soaked epiphytes, upon the steep slope of a mountain near Coroico. It was a misty day, with the air so charged with moisture as to precipitate freely upon every object. On my morning journey, I paused to observe a giant tree, its trunk five or six feet in diameter and with widely spreading limbs, like a white oak. Every available point upon its branches was clothed and draped with other plants. Woody vines like great grape vines bound its branches together and held it firmly to a number of the surrounding trees. All the living and decaying vegetable matter that covered it was water-soaked and still the water continued to gather. I returned in the late afternoon, eager to again observe it and perhaps to secure some specimens of orchids from its branches. Just as I came opposite to it and about on a level with its middle branches, I heard a sharp snap and saw water fly from one of its small branches. There was perfect silence for an instant, and then a louder crack as a small vine connecting it with another tree gave way. Guessing at what was about to occur I watched intently as another and larger vine gave way and the monster shuddered and sent down a shower of drops. Then it sagged slightly and the top of a neighbor tree snapped off. It settled farther and then came a series of single and combined snaps and crashes, and the giant tree, perhaps a thousand years of age, settled to its fate. As it struck the mountain slope, which had an angle of not less than 65 degrees, it commenced to slide. Rocks, shrubs and trees which were in its path were swept away and in turn started other slides until within a minute there was such an avalanche

of vegetation and rock debris as had never occurred to me as possible, and as, I think, very few persons have ever seen. The slide grew wider as it descended, until the whole mass disappeared with a deafening roar in the lower valley. A village would have been obliterated had there been one in its track. I spent the next forenoon in climbing down, nearly 2000 feet, to where a stream was partly dammed, and found it almost impossible to believe that such destruction had been caused by the fall of a single tree.

Where the forest has been cleared for any purpose, we find dry sunny hillsides or mountain slopes, known to the natives as *Pajinales*. All the plants growing here are distinctly different from those of the forests. There are shrubby Cinchonas and related genera, Byrsonimas, Luheas, Davallias and related genera, and Helicteres, so-called because of their twisted pods. Galactias are erect shrubs with terminal umbels of handsome sweet-pea-like flowers. There are Crotalarias and lupines, Tournefortias, Cordias and a host of Borrerias and their relatives. Sidas are abundant and varied, and there are many milkweeds which are not to be found elsewhere, especially species of *Metastelma*, *Vincetoxicum* and *Ditassa*. Here the valuable drug *Krameria* may be found, and one's clothing becomes covered with the burs of several species of *Triumfetta*. On one such hillside, I have encountered a tangled, waist-high growth of *Lycopodium* that was almost impossible to penetrate. Elsewhere, Gleichenias offered a still worse obstruction.

Still descending, the changes already observed continue to increase in regular gradation. At about 2,000 or 2,500 feet the modification is sufficient to again present a distinctively different plant formation. The mountains are less precipitous, the streams are navigable for rafts or small boats, and small plains are of frequent occurrence. The atmosphere is more sultry, insects more numerous and many signs of an approach to a different climate are insistent. There are far more very large trees than heretofore, and there is much less verdure underneath them. The forest floor is littered with fallen trunks and branches. The sunlight is mostly excluded and there is a musty odor of

decay. Here there occurs an extensive tree flora of the Mimosa family. Species of *Piptadenia*, *Pithecolobium*, *Calliandra*, *Mimosa* and *Acacia* will sometimes compose the greater part of a forest of considerable size. They do not attain a great size, as do the species of *Prosopis* of the Mexican table-lands and the Argentine plains, yet they are good-sized trees with hard and durable timber. They are extremely difficult of classification.

Arborescent members of the related family Caesalpiniaceae also occur quite freely, but it seemed to me that these favored the lower elevations. Cassias, both herbaceous and shrubby, are everywhere abundant, and in great variety. The genus *Piper* of the Piperaceae is abundant both in the foothills and out upon the forest plain, but probably reaches its highest development between 2,000 and 6,000 feet.

Two very interesting trees, both of painful memory, are *Urera* and *Triplaris*. The former is a low tree about as large as a peach tree and branches widely and freely from near the base. All parts are densely beset with needle-shaped prickles, many of them six inches in length, orange and red, very pretty and more slender and sharp than the finest needles. Desirous of obtaining the flowers, I worked my way to the trunk, a few inches in diameter, and proceeded to chop. At the first blow the ax went clear through the trunk, much of which was almost as soft as cheese, and the tree fell upon me, piercing me with many of the needles. I learned upon the instant, without any floral dissection, that this was a giant nettle, each needle as much more severely stinging than that of a common nettle as its size was greater. The agony of the following hour or two distinctly retains a place in memory's records. The *Triplaris* is related to our common brook-side smart-weed or water pepper, but is a large tree. Its trunk and branches are hollow and are inhabited by millions of red ants, known as the *Palo santo* ant, which are veritable fiends for stinging. My first experience with this was gained on proceeding to climb a small tree to collect its flowers. One such ant would be quite enough for a sample, and to be covered with them from head to foot may be called an excess of gayety. This tree is among the most common for a long way

out from the mountains, and one must be stung almost daily, frequently many times in a day, so long as he travels through this region.

The woody vines at this elevation. and also lower, are largely of the maple alliance, Serjanias, Paullinias, Urvilleas and Cardiospermums, one of the latter being the balloon vine of our gardens. This very large group of plants is most interesting from every point of view. They have exactly the habit of our wild grape vines, thickly covering the shrubbery along streams and on exposed banks with a profusion of white flowers, looking at a distance much like our virgin's bower when in full bloom. Their stems are often bluntly triangular in outline and on section exhibit three wood cylinders enclosed in the back. They are very rich in saponin, and the crushed stems of some of them have an important use for the intoxication and capture of fish, being thrown into pools where the latter have congregated. Another group of vines of similar habit is *Gouania*. Their flowers are mostly of a dull or yellowish white. Papilionaceous vines, *Dioclea*, *Mucuna* and others, are frequent. They bear great panicles of large flowers, resembling *Wistaria* on a gigantic scale. These plants increase in abundance as we reach the foot-hills and plains.

Huge aroids, Philodendrons, Anthuriums, and related plants, are abundant in all of the hot and moist regions. Many if not most of them are more or less climbing in their habit, by the aid of false or true roots. Many of them are poisonous and some are used in the manufacture of arrow poisons. There are also a great many erect growing species resembling our *Calla* and *Peltandra*. One of the former is among the most fragrant of the Andean plants, its fragrance exhibiting itself only for a few hours in the evening, beginning just at dusk.

The base of the foot-hills of the eastern Andes is reached at an elevation of about 1,500 feet, and here the flora undergoes another very complete and striking change. Very heavy forests inhabit the river valleys, the width of this forest belt varying greatly. Beyond it, the higher ground is covered with shrubbery, constituting the "chaparral" region. There are also vast prairies,

some rolling, some nearly level. Their grassy covering is very imperfect, an extensive flora of shrubbery and herbaceous plants constituting more than half of the growth. The shrubs belong very largely to the mimosa family, many of them being true Mimosas. The predominant flowering plants are Vernonias and Eupatoriums, the number of species of both of which is truly astonishing, as is the extreme variation in their habit. Some in both genera have solitary terminal heads of great size, so that one can scarcely believe that they belong to the same genera as the myriad flowered forms. Most of the Eupatoriums have long cylindrical or lanceolate involucres, very unlike those of our species. Many related genera grow among them, but there is a noticeable scarcity of the helianthoids seen in the mountains. Gnaphaliums and Achyroclines are common. There is here a vast representation of the Amaranthaceae.

Here begins the labyrinth of shallow lakes and sluggish streams that will increase in complexity as we go toward the Atlantic, 2,000 miles away. Here there is a wealth of aquatics, which I cannot even begin to describe. They grow erect in the margins, so densely and so tall and strong as to make approach to the open water exceedingly difficult. The canoe cannot be pushed among them; they are too dense for swimming and the depth of mud and water prevent wading. Collecting here is truly perilous. Even the native savages dread these lagoons. Poisonous serpents swarm, but fortunately are sluggish. Alligators and crocodiles often upset boats and not infrequently attack human beings, as I have myself seen them do with great ferocity. The carib-fish is everywhere and offers a greater danger than all else combined. Finally, if one is long exposed without protection to the attacks of poisonous insects, he may easily succumb, and deadly fevers are always impending.

The giant water-lily, *Victoria*, is common. The natives say that the flower opens three times, first white, then pink, then deep red. I would gladly have made my principal collections in this prairie-forest-swamp region, but fever is not here to be avoided and much of my work was performed with great suffering, and for a time with little hope of final escape. In spite of

these painful memories, the experience, as a whole, is remembered with delight, for this is certainly the paradise of one interested in the study of ecology and plant-distribution.

In the sandy plains of the lower river valleys the peanut plant has firmly established itself and covers large areas almost as exclusively as does the clover of our cultivated fields. The fruit does not reach a high development in this wild state, but is nevertheless considerably collected. It is utilized for the making of a beer or similar fermented drink. In the same regions, but farther back, in the forest edge, the chocolate tree has become extensively naturalized, or perhaps represents a native growth. It rarely fruits in this wild state.

From this point onward, there is no great or sudden change to be observed in the flora, except when we cross the central mountain range that marks the series of Falls of the Madeira, occupying about 250 miles of the course of that river. It is not to be understood, however, that there are no variations. One of the most inexplicable things to me has been the extent of the general variations in a local flora in that country, with no apparent corresponding variation in the environment. Travelling a day's journey along a small stream—the variation in elevation so slight that the water may flow in opposite directions on different days—one may find a strikingly novel flora, and an equal change in the insect, bird, and even in the fish fauna. It is difficult to see, under such circumstances, how anything can be responsible for the variation, other than the mutual influence of association of the living beings themselves. To determine such a question would require a long stay and a close study of all the life of the locality.

Only in the most general way can I touch upon the floral features of this vast region. I think it is true that the trees increase steadily in size until we near the Atlantic. It is almost impossible, even when among them, to get a clear idea of their size. Rarely do we see anything except their bases and lowermost branches, as the entire upper portion of the forest is an inextricable tangle of interlacing branches and intertwining vines, the stems of many of the latter as thick as small tree trunks.

a growth of *Pontederia*, *Alisma*, *Sagittaria* and similar plants, then sedges and, at the very water's edge, Heliconias in great variety. These curious and characteristic plants are a very interesting feature of the river flora. Their great oval leaves are about as large as a man, and stand in endless rows, looking at a distance like a rank of soldiers standing shoulder to shoulder upon the shore. Their inflorescences are brilliant combinations of yellow, blue and red. Many are erect or ascending, while others, a yard or more in length, are wavy, pendulous racemes. Next comes shrubbery and small trees in great variety. These are all draped more heavily than one would suppose possible with woody and herbaceous vines, representing many families, although certain families are more or less characteristic of certain localities. Along the Beni and upper Madeira, Sapindaceae, Papilionaceae, Passifloraceae, Cucurbitaceae and Convolvulaceae are very prominent. Upon the lower Orinoco, Bignoniaceae, in confusing numbers of genera and species, obscure all others, and are wondrously beautiful, forming in some places a wall of flowers. Next comes a growth of Cecropias, the "ambaibas" of the natives, their whitish trunks, often with a few branches at the top, being very conspicuous. This genus is closely related to the fig and bread-fruit. The tree grows with a tall straight trunk bearing a handsome crown of immense digitate leaves on long foot-stalks. Their trunks and branches are hollow and are almost always inhabited by colonies of stinging ants. So numerous are these ants that if one's clothing brushes against the trunks in passing he is almost certain to carry enough ants to give him a painful experience for some time afterward. Flocks of ant-eating tanagers, many of them among the most brilliantly plumaged birds in the world, are frequently found feeding here, especially when the trees are in flower. Numerous other trees and shrubs, notably the Hecastophyllums, similarly shelter these fiercely stinging ants. Some species of *Tococa* (Melastomaceae) have blisters upon the sides of their leaf-stalks, which contain ant-colonies. On one occasion, I placed such a leaf in my hat, intending to examine its hairs when I came to camp. Its stem bore two blisters each about as large as a kidney bean. These

contained enough ants, almost too small to be seen with the naked eye, to cover me from head to foot within an hour. Fortunately their stings were too mild to cause more than an itching sensation.

Among the Cecropias, and back of them, will always be seen a number of very tall palms, their slender trunks rising high above their neighbors. At many points, more especially upon the western and higher portions of the plains, the playas are backed by bamboo jungles. There are many species, probably several genera of these, and their habits are most interesting. Some of them have huge thorns, commonly in three's, the central one larger, at the nodes. These thorns will reach six inches in length, and nearly an inch in thickness at the base. They are very hard and strong, and quite sharp. Travel among them is most forbidding. Others have their hollow stems, several inches in diameter, filled with potable water. At first, as one cuts his way among them, it is curious and interesting to see the water gush out, but this constant and forcible drenching becomes oppressively annoying when kept up hour after hour.

Many species of Jussieuas, some of them gigantic herbs, grow along the river banks and in the swamps. Here, too, is a vast flora of sedges, *Cyperus* being the most abundant genus. There are also grasses or sedges of enormous size which grow up from the bottoms of streams and small lakes, covering the surface with such a dense and tangled mass of stems and foliage that it is often with the greatest difficulty that a canoe can be forced through or over them. As a matter of fact, I have traveled by imperceptible degrees from a heavily grass-covered prairie or "savannah" until I was walking upon a support consisting wholly of a dense tangle of plants of the same kind, floating over deep water, and where, at length, I found my feet sinking to such a dangerous extent that I was obliged to return.

The finest rubber trees (*Hevea*) grow thickly upon the plains and slopes beside these rivers, and have been one of the greatest sources of wealth to both Brazil and Bolivia. Their economic reign is now about ended, as the Java plantations are able to produce rubber more cheaply than it can be supplied by the

wild-growing trees. Among the shrubs of the rubber forests, Crotons, Pipers, Ourateas, Coccolobas, and especially Acalyphas, probably predominate. The last-named are in great number, as to species as well as to individuals. They are most difficult of study. While the different species are closely similar, there is great variation within the species, a condition which is always a source of difficulty to the taxonomist. Also they are well adapted to hybridization, and this may yet be found to have caused many of our difficulties.

Passing down the River Madiera to the lower Amazon, we come into a region of such grandeur in its vegetation that it is difficult of comprehension, even by one who is an eye witness. Everything is in such proportion that one is apt in its size to miss the gigantic. Many of the trees of this region are undoubtedly many centuries old and appear to be good for many centuries more. Most of them have enormous buttresses at the base, and these buttresses often begin as high above the ground as are the tops of ordinary forest trees in our land. In the swampy regions, especially where subject to tidal flow, the trees are smaller, a great variety of palms existing among them, some with digitate, others with pinnate, foliage. All are bound together with an impenetrable mass of tough vines. Running through these swamps are the most beautiful little bayous or canals. Nothing can exceed in interest and delight a day's canoeing among these narrow waterways, although there is great danger that the inexperienced boatman will hopelessly lose his way. Even the so-called highlands, near the mouth of the Amazon, are such only in the dry season. In the rainy season this river rises sixty feet or more above its low water mark and the boatman travels among the tree-tops which a few weeks before were high above his head.

H. H. Rusby.

AUTUMN LECTURES, 1916

Lectures will be delivered in the Lecture Hall of the Museum Building of the Garden, Bronx Park, on Saturday afternoons, at four o'clock as follows:

Sept. 2. "Plants of the Danish Islands, St. Croix, St. Thomas, and St. John," by Dr. N. L. Britton.

Sept. 9. "Across Mexico from Vera Cruz to Colima," by Dr. W. A. Murrill.

Sept. 16. "Farming in the Middle West," by Dr. G. C. Fisher.

Sept. 23. "Through the Mountains of Utah and Colorado," by Dr. F. W. Pennell.

Sept. 30. "Flowers for Fall Planting," by Mr. G. V. Nash.

Oct. 7. "Botanical Cruises in the Bahamas," by Dr. M. A. Howe.

Oct. 14. "Destructive Fungi," by Dr. F. J. Seaver.

Oct. 21. "Autumn Coloration," by Dr. A. B. Stout.

Oct. 28. "The Potato Family," by Dr. H. H. Rusby.

Nov. 4. "The New York Botanical Garden," by Dr. N. L. Britton.

Nov. 11. "Planning Next Year's Flower Garden," by Mr. G. V. Nash.

The lectures, which occupy an hour, will be illustrated by lantern slides and otherwise. Doors closed at 4:00; late comers admitted at 4:15.

The Museum Building is reached by the Harlem Division of the New York Central and Hudson River Railroad to Botanical Garden station, by trolley cars to Bedford Park, or by the Third Avenue Elevated Railway to Botanical Garden, Bronx Park. Visitors coming by the Subway change to the Elevated Railway at 149th Street and Third Avenue. Those coming by the New York, Westchester and Boston Railway change at 180th Street for crosstown trolley, transferring north at Third Avenue.

NOTES, NEWS AND COMMENT

Through the kindness of Mrs. Britton, the library has received a set of The Encyclopaedia Britannica, eleventh edition, handy volume issue. This set will be placed in a specially prepared case which will stand at the left of the entrance to the stack room.

Professor W. C. Coker, of the University of North Carolina, visited the Garden late in July and remained during a part of August to consult the herbarium and library. Professor Coker is especially interested at this time in the larger fungi of North Carolina.

An excursion to the Garden for some of the students at the Summer School of Columbia University was arranged by Mr. L. W. Crawford for July 27. The visitors, over fifty in number, were met by four members of the Garden staff and conducted through portions of the grounds and buildings.

The ravages of the tussock moth are unusually severe this year on nearly all deciduous trees. Since there are two broods of the insect each season, the eggs, which are deposited in conspicuous white masses, should be destroyed to prevent the hatching of the second brood. The eggs for the spring brood are deposited in September and should be destroyed during the winter.

A set of plants from the northwestern Himalayas has recently been incorporated in the Garden herbarium. These specimens are from high altitudes—9,000–17,000 feet—in the region of Kashmir, Ladak, and Lahoul. They were collected in 1912 and 1913 by Mr. Ralph R. Stewart, of Gordon College, Rawalpindi, India, and were studied at the Garden, where Mr. Stewart has been a student for several years.

Dr. J. N. Rose, of the Carnegie Institution, spent July at the Garden, devoting the time to studies in cacti, with the coöperation of Dr. Britton.

The second (June) number of *Addisonia*, the new Garden periodical, contains colored illustrations, with descriptive text, of the following flowering plants: *Crinum americanum*, *Clethra alnifolia*, *Echeveria carnicolor*, *Mina lobata*, *Clerodendron trichotomum*, *Notylia sagittifera*, *Exogonium microdactylum*, *Vitex Agnus-castus*, *Opuntia macrorhiza*, and *Commelina communis*.

A large colored chart of edible and poisonous mushrooms, prepared and published by Dr. W. A. Murrill, appeared early in August, 1916. The handbook to accompany this chart appeared in June.

A splendid white oak over a hundred years old, which stands near Conservatory Range 2 on the driveway along the Bronx River, was struck by lightning during the violent storm of July 13 and a wide gash torn in its trunk for fifty feet or more. It is doubtful whether it can survive the shock. During the same storm, a red oak four feet in diameter and at least a hundred years old, standing in the forest at the north end of the Economic Garden, was killed by a bolt which ripped the bark from the main portion of the trunk in strips two feet wide at some points.

The National Education Association held its annual convention in New York City during the first week in July, and on the afternoon of Thursday, July 6, the Biology Teachers in attendance were invited to visit the New York Botanical Garden. They were met at the Elevated Railway Station by several members of the Garden staff and conducted through Conservatory Range 1, the Herbaceous Garden Valley, the Hemlock Forest, and the Museum Building. Dr. and Mrs. Britton met and welcomed the teachers at the Aquatic Garden, where the hardy water-lilies were in full flower.

Dr. Eugenio Cuesta y Torralbas, who was professor of Natural Sciences in the Institute of Pinar del Rio, died in March, 1916, in his sixtieth year. He deeded all his scientific collections,

library and water-color sketches of Cuban plants to the school of which for sixteen years he was a member of the faculty. The library includes four hundred volumes and pamphlets, and the collections cover a wide field in zoology and botany. For many years Dr. Cuesta has been a correspondent of the New York Botanical Garden, sending plants for naming, and facilitating in every way the work of various collectors who have visited Pinar del Rio. He practised medicine in Santa Clara and had charge of the hospital in that City, spending his vacations there and also making collections in various parts of that province. His collections and library will make a suitable memorial to him in the institution with which he was so long associated!

Meteorology for July.—The total precipitation for the month was 3.09 inches. The maximum temperatures recorded at the Garden were *95° on the 12th*, 88° on the 19th, and 84° on the 27th. The minimum temperatures were 58° on the 16th, 64° on the 19th, and *55° on the 29th.* Cloudy damp weather with frequent showers prevailed throughout most of the month; only seven days during the month were clear for the entire day.

ACCESSIONS

MUSEUMS AND HERBARIUM

1 specimen of *Rhizina inflata* from British Columbia. (By exchange with Mr. James R. Weir.)

362 specimens of flowering plants and ferns from Oklahoma. (Collected by Professor G. W. Stevens.)

1 specimen of *Quercus Rudkini* cultivated at Carmel, California. (Given by Dr. Arthur Hollick.)

735 specimens of flowering plants from Arkville, New York. (Collected by Mr. Percy Wilson.)

167 specimens of flowering plants from China. (By exchange with the Bureau of Plant Industry, Washington, District of Columbia.)

7 photographs of type specimens. (By exchange with the United States National Museum.)

62 specimens of fossil plants from the Cleveland shales, Ohio. (Given by the American Museum of Natural History.)

3 specimens of flowering plants from British Columbia. (By exchange with the Geological Survey of Canada.)

2 specimens of flowering plants from Colorado. (By exchange with Professor T. D. A. Cockerell.)

84 specimens of flowering plants from Nebraska. (By exchange with the United States National Museum.)

1 specimen of *Cryptoporus volvatus* from California. (By exchange with Dr. F. E. Lloyd.)

470 specimens of fungi (rusts) from Porto Rico. (Collected by Professor F. L. Stevens.)

10 specimens of fungi from Wisconsin "Fungi Wisconsinensis Exsiccati" decade 2. (Distributed by Dr. J. J. Davis.)

8 specimens of cup-fungi from Hudson Falls, New York. (By exchange with Mr. Stewart H. Burnham.)

3 specimens of cup-fungi from Syracuse, New York. (By exchange with Professor L. H. Pennington.)

1 specimen of *Discina ancilis* from Ithaca, New York. (By exchange with Professor H. M. Fitzpatrick.)

1 specimen of *Ascobolus stercorarius* from Indiana. (By exchange with Professor H. W. Anderson.)

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EDITOR

FRANCIS WHITTIER PENNELL

Associate Curator

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From left to right, branches of *Quercus lyrata*, *Quercus glandulifera* and *Quercus* "Golden Oak," showing three periods of annual growth as indicated.

JOURNAL

OF

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VOL. XVII September, 1916 No. 201

THE INTERMITTENT ANNUAL GROWTH OF WOODY PLANTS

(WITH PLATE CLXXVIII)

With most woody perennials the extent of annual growth in the elongation of branches for several years previous to one's observations may readily be traced by the more or less well-defined zones of bud-scale scars, by the branching, and by differences in the color and maturity of the bark. Also with deciduous trees and shrubs the fact that only the new growth bears leaves makes it easy to determine the extent of elongation while a season of growth is in progress.

Among trees and shrubs of temperate regions the rule of annual development in respect to elongation of branches may be stated as follows. In spring various terminal and lateral buds shed their scales and the seasonal elongation of shoots from these buds is a rather continuous process of growth. There is, however, considerable variation in the length of the period of elongation. With most species of *Catalpa* growth is continuous until late in summer and ceases scarcely in time for the proper ripening of wood and buds to withstand winter conditions. With some woody plants, for instance sumach, the growing period is so prolonged that the ends of twigs, unable to endure winter conditions, are killed, giving what is called an indeterminate woody growth. Perhaps the opposite extreme is seen in the hard-maple in which the period of continuous growth as a rule is so short that long before midsummer has arrived the elongation

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of twigs has ceased and winter buds are formed, the latter as a rule remaining dormant (as far as active elongation is concerned) during the greater part of the summer.

A modification of this type of annual growth is often seen in the development of lateral branches from the new growth. Such branches arise in the axils of new leaves and give what may be called a deliquescent annual growth. This is often seen in young vigorously growing trees or shrubs and in the growth of sprouts from living stumps of trees. In such cases the growth of terminal and lateral branches may be practically continuous, quite as it is in branched herbaceous plants. The tulip-tree exhibits, quite generally, this mode of growth. In the older and flower-bearing trees of this species this development may bring to maturity flowers on lateral branches of the new growth, thus giving two periods of bloom. The principal crop of flowers is produced from main terminal buds of the new growth and is followed some few weeks later by a smaller second crop developed from certain lateral buds on the new growth.

A further variation in the annual growth of branches, often to be observed, is what may be called the intermittent elongation of a main branch. This is well illustrated by the behavior of several species of oaks. The first period of elongation extends only over a few weeks of early spring and is general for all branches developing on the tree. Then a rather brief period of dormancy ensues after which terminal buds, and often lateral buds as well, resume growth. If the terminal alone develop, the seasonal growth for the twig is unbranched or excurrent; if laterals also develop the seasonal growth for the branch is deliquescent. The particular point of interest is that such seasonal growth is intermittent or discontinuous and involves the resumption of growth by fully formed winter buds during the same season in which these have been formed.

The new growth of such branches is usually conspicuous, at least during the early stages when the leaves are expanding. Of *Quercus palustris*, for example, during the greater part of July of the past summer, there were many trees growing in the New York Botanical Garden which possessed thousands of

branches with newly developing twigs. The lighter green of the new crop of leaves was in marked contrast to the darker green of the earlier growth. With *Quercus rubra* the new crop of leaves on such branches was of a bright red color, so conspicuous in contrast to the green of the older leaves as to be most noticeable. By the middle of August, however, the appearance of these leaves was quite indistinguishable from that of the leaves of the first period of growth. However, in such cases closer examination revealed certain differences in the segments of the branches quite comparable to those existing between the growth of different years.

It does not appear that we have in our language an appropriate name for the new shoots or segments which develop in the second (or later) period of intermittent seasonal growth. The peasant folk of Germany long ago observed such branches, and noting that these frequently appeared about St. John's day they became accustomed to use the term "Johannistrieb" for such a shoot; the term thus signifying a shoot that makes its appearance in midsummer.

The phenomenon of intermittent annual growth has been especially noticeable during the past summer on various trees and shrubs in and about the New York Botanical Garden. Young and old trees of *Quercus palustris* have exhibited such growth most abundantly. Young trees of *Quercus rubra* have shown a strong tendency toward such growth. The writer has observed especially forty-seven trees of this species growing along one of the avenues near the Garden. These are all young trees averaging about thirty feet in height. Thirty-six of these trees exhibited intermittent seasonal growth. The number of branches per tree which resumed growth varied from one to perhaps a hundred, but in most cases there were less than ten. Most of these were from a terminal bud giving an excurrent seasonal growth for the twig concerned; in all such cases the buds were not forced into growth by any evident injury. In some cases however the newer growth was from lateral buds (on new growth) which had been, so to speak, forced into development by injury of the terminal bud above. In a few of the tree tops the new growth extended slightly in among the telephone and electric wires strung

above; here the swaying of the branches among the wires cut off many of the uppermost tips and led to the development of lateral branches during the second period of growth. No second period of growth was observed on any old trees of *Quercus rubra.*

During the past summer intermittent seasonal growth has also been frequent in the elm, the wild cherry, and in old as well as young trees of the apple. It has been occasional in various other trees and in shrubs such as the beach plum, the bayberry, and the American holly. As far as the writer's observation goes, intermittent annual growth is limited to those species which have a short period of growth during early spring. However, not all woody plants of such a habit have exhibited resumption of growth during the past season.

On some woody plants growing in the Garden there have been three periods of growth, giving three well-marked segments all bearing leaves but in other respects apparently quite as distinct as the different segments of single continuous growth of three successive years. Three cases of such growth are shown in the accompanying plate. At the right is a branch of the variety known as "golden oak" which made an excurrent elongation involving three periods of growth all of the past season. Even the last period of growth was completed by the middle of August. At the middle of the plate is a branch of *Quercus glandulifera*, and at the left is a branch of *Quercus lyrata*, and in these the third period of growth was in progress when the photograph was taken on September 2d. The photograph of *Quercus glandulifera* shows the flowers present at that time on the third segment of growth, and shows fairly well that each segment begins and ends in short internodes and is also delimited by zones of bud-scale scars. The development of lateral branches from the new growth giving a deliquescent annual growth is also well shown. In *Quercus lyrata* the leaves on the first segment of growth were dead or dying and were in autumnal colors, some had already fallen and one dropped off as the branch was about to be photographed; on the third segment of growth, however, very young leaves were just appearing. There is some indication that in this species winter-killing occurred in such branches of the previous

year's growth. The branches shown are quite representative of the growth made by the trees in question during the past summer. The resumption of growth for the third time was also observed in *Quercus palustris* and *Ulmus americana*.

It is apparent that the intermittent seasonal growth of twigs is in many respects similar to the alternation of growth occurring from year to year. During the past season the spring was late and the entire spring and summer, until the middle of August, was unusual in respect to the number of cloudy rainy days, to the high total precipitation, and to the lack of any extended periods of hot and dry weather. The entire season was favorable for excessive and continuous growth of all vegetation, and much of such growth has been noticeable. For this season, at least, the intermittent seasonal growth noted above has been, in a sense, the development of buds that had become dormant giving, in a year of rather unusually favorable conditions for continuous growth, resumption of growth for two or more periods of elongation.

It should be noted that the habit of intermittent seasonal growth is very definitely fixed in various oaks growing in certain localities. Some varieties, especially developed at the famous Späth nurseries near Berlin, Germany, are noteworthy in that the first period of growth gives pure green leaves while the second (the Johannistrieb) bears variegated leaves. These varieties, and evidently the parent species as well, produce under the climatic conditions of Germany, constantly year after year, the two crops of leaves. In these cases the habit seems to be in a large degree independent of the minor variations within the seasons.

The facts in general suggest that intermittent seasonal growth in a woody plant may be due to more favorable growing conditions than those to which the species has been subjected in its past history. Such growth is most noticeable in species in which the first period of growth is of short duration and limited to very early spring; this suggests that such species may have been adapted to a shorter growing period than now exists in such a climate as that about New York City. Still it is to be recognized that not all

species having a short period of growth exhibit intermittent seasonal growth and also that it is not alone species of more northerly range that are subject to intermittent growth; it seems, at least to a certain degree, that there are variations which are to be recognized as specific.

It would be of considerable interest to have data on the behavior, throughout their range, of species, such as *Quercus palustris*, *Q. lyrata* and *Q. rubra*, which, under the climatic conditions of New York City, exhibit intermittent annual growth. In fact the whole question of geographic or climatic variation of species with reference to the particular habit or type of annual growth is of considerable interest. The relation of the various types of growth to rapidity of growth, to susceptibility to winter injury, and to development of wood are moreover practical problems of forestry. The culture in botanical gardens, in arboreta, and in nurseries of numerous native and introduced species affords especial opportunity for the comparison of the behavior of these species under different conditions. During the past summer a start has been made in the study of the growth of the woody species in the New York Botanical Garden with special reference to the various problems involved.

A. B. Stout.

A WHITE PINE PLANTING

In the southwestern part of the tract added by the city last year to the Garden reservation, nearly opposite the Fordham Hospital, are two long grassy, otherwise nearly bare, partly rocky ridges. The eastern of these ridges was selected this spring for a white pine plantation. The ground required little preparation, only the removal of loose stones and of a few poor shrubs and small trees being necessary. Near the southwestern end of this ridge was a large old stone quarry, which has recently been filled without cost to us by a contractor engaged in excavating cellars in the neighborhood, using several thousand cubic yards of earth, for which he was glad to find a convenient dumping place; the original contour of the ridge is thus nearly restored.

Through the kind interest of Dr. Walter B. James, the State Conservation Commission permitted us to obtain from the State nurseries near Saratoga, two thousand four-year-old white pine transplants, which were received in fine condition and most of them planted in May about six feet apart over an area about five hundred feet long and one hundred and fifty feet wide, or about one and three-quarter acres; a few were kept in the nurseries, to ensure the replacement of those which might fail in the plantation. Our appreciation of the permission to obtain these young trees at a nominal price was duly communicated to Hon. George D. Pratt, State Conservation Commissioner.

The plants averaged about six inches high. They were set by removing a small piece of sod at each planting spot and securely tamped in. A strong single wire was run on posts about three feet high around the entire area occupied, and signs were placed at several points bearing the lettering "Demonstration White Pine Plantation, Conservation Commission, State of New York." The plantation has been under observation by the guard detailed for that part of the grounds and the only depredation suffered has been two instances in which children pulled up a few of the plants, but in both instances they were caught in the act and the trees replanted.

The season has been so favorable for vegetation that practically every tree has grown, some of them making shoots up to ten inches long.

Late in June, the grass around the trees was cut with sickles, and will be cut again late in the season, as a precaution against damage by winter fires. The white pine thrives at the Garden as is shown by old, presumably planted, trees near the museum building and elsewhere, and by those now about eighteen years old and less in the pinetum. We cannot be sure that white pine trees are native to the reservation. The blister-rust disease, which has caused much damage to young trees in the north, has not appeared as yet with us; this fungus has to have currant or gooseberry bushes in proximity to white pines in order to exist, inasmuch as one stage of its life-history is spent on the pine and another, alternating one, on currants or gooseberries; recent

observations seem to show that a distance of five hundred feet or more ensures safety for the pine; we propose to take care that neither currants nor gooseberries are brought within a thousand feet of the plantation, and neither currants nor gooseberries are wild anywhere within the reservation. This disease does not seriously affect old white pines.

This first year's growth after planting makes the little trees quite conspicuous when the grass is cut short, and the plantation is attracting much attention and favorable comment, being seen by many thousand interested citizens. The idea of a forest planting within the city appeals to the imagination, and the demonstration is a valuable educational feature.

N. L. BRITTON.

COLLECTING FUNGI IN THE CATSKILLS

The writer spent two weeks at Arkville, New York, in August, 1916, and obtained about 400 specimens of fleshy fungi for the Garden herbarium. A list of these species, with notes on their abundance and habitat, will appear in *Mycologia*.

Arkville is a small village in the edge of Delaware County at the southwestern corner of the Catskill region. Mt. Pakatakan, 3,000 feet above sea-level, overlooks the village on the south, while a lower range called the Hogback rises precipitously to the north. The headwaters of the Delaware River are in these and neighboring mountains, the elevation of the valleys around Arkville being about 1,400 feet. Arkville is interesting to many botanists in New York City because it is included within the local flora range of the Torrey Botanical Club.

The principal forest trees of the region are hemlock, sugar maple, beech, yellow birch, butternut, white elm, ash, hop hornbeam, linden, red maple, and aspen. A few chestnuts are found on Hogback, but these will soon be exterminated by the canker, which is spreading rapidly through the Catskills from the Ashokan Reservoir region. Several of the aspens were found to be seriously attacked by the poplar canker. A local wood alcohol plant consumes fifteen cords of wood daily. Practically all the

north side of Mt. Pakatakan has been denuded of its original forests, but on some small estates near the base of the mountain and in a few deep ravines stretches of virgin timber remain which contain old beeches, sugar maples and hemlocks of unusual size.

In comparing the forests about Arkville with those of Lake Placid and the Upper St. Regis, the most striking difference is the absence in the Arkville region of balsam and spruce and all other conifers except hemlock, and the relatively greater abundance of deciduous trees. This would indicate the absence of certain fungous elements which are common in the Adirondacks and the presence of a larger proportion of the species found about New York City. It may well be true that the fungous flora of the Catskills taken as a whole is very similar to that of the Adirondacks, but this general statement without modification would hardly apply to Arkville. Peck's Catskill collections were mostly obtained from Phoenicia, Tannersville, Haines Falls, Summit, and neighboring stations in the eastern part of these mountains.

If sphagnum bogs occur at Arkville, I did not happen to find one; but there is a remarkable development of *Polytrichum commune* on Hogback, where many species of *Hygrophorus* and other moss-loving fungi were found. *Clavaria fusiformis* occurred there in much greater abundance than I have ever before seen it.

Mrs. Margaret H. Newton, of the Pakatakan Inn, where Mrs. Murrill and I established our headquarters, very generously afforded us every facility for drying and caring for the specimens, while a large number of the guests became interested in hunting for fungi and aided us materially in building up the collection.

W. A. MURRILL,
Assistant Director.

GLADIOLUS EXHIBITION

An exhibition of gladioli was held by the Horticultural Society of New York in coöperation with the New York Botanical Garden, in the Museum building, on Saturday and Sunday, August 19th and 20th. A long center table in each of the halls on the ground floor was filled with these flowers. The display made by Mr. T. A. Havemeyer, of Glen Head, Long Island, filled the table in the eastern hall; in this large exhibit were many choice sorts, represented by superb specimens. In addition to the exhibits of gladioli there were displays of collections of annual flowers, which displays attracted considerable attention.

Mr. Havemeyer exhibited a flower of *Magnolia grandiflora* from a tree, grown in the open, on his place at Glen Head. This is probably the first instance of this plant flowering out-of-doors in this latitude. The tree grows naturally from North Carolina to central Florida, and through the Gulf States to Texas and Arkansas. As a wild plant it is found especially along ponds and streams, attaining a height sometimes of over one hundred feet. It is the finest of our native broad-leaved evergreens, bearing large creamy white fragrant flowers six inches or more across. It is unfortunate that it may not be regarded as one of our hardy trees in this latitude. There are trees of it under cultivation out-of-doors at Philadelphia, and fine examples in Washington, D. C.

The premiums, offered by the New York Botanical Garden from the income of the William R. Sands fund, were awarded by the Exhibition Committee of the Horticultural Society of New York, as follows:

In the classes open-to-all, Mr. T. A. Havemeyer secured the first prize for the largest and best collection of gladioli, the second prize going to John Lewis Childs, Inc. For the best twelve varieties, three spikes of each, Mr. Havemeyer also secured first prize, John Lewis Childs, Inc. second. For the best vase each of pink and white, twenty-five spikes, Mr. Havemeyer was awarded first prize in each case, John Lewis Childs, Inc. second. John Lewis Childs, Inc. was awarded the first prize for a vase of red, twenty-five spikes. For a centerpiece for the table, Mrs. H.

Darlington, of Mamaroneck, New York, was awarded the first prize.

In the classes for non-commercial growers, Mrs. H. Darlington was awarded the first prize for the largest and best collection. For the best collection of six varieties, three spikes of each, Mrs. F. A. Constable, of Mamaroneck, New York, won the first prize, Mrs. H. Darlington, the second. For the best vase of white, six spikes, Mr. William Shillaber of Essex Fells, New Jersey, won the first. For the best vase of pink, six spikes, Mrs. H. Darlington won the first. For the best vase of red, six spikes, Mrs. F. A. Constable won first, Mrs. H. Darlington, second.

Premiums, restricted to non-commercial growers, were offered for collections of annual flowers, twelve varieties. Mr. Ralph Pulitzer, Manhasset, New York, secured first prize in this class, William Shillaber second.

Special prizes were awarded as follows: for a collection of perennial flowers, Mrs. F. A. Constable; for herbaceous perennials, Bobbink & Atkins.

The judges were Patrick O'Mara, John Canning and Robert I. Brown.

GEORGE V. NASH.

COLLECTING POLLEN FOR HAY FEVER INVESTIGATIONS

Within the past two years requests from several medical laboratories and physicians have been received at the Garden asking for considerable quantities of pollen from various plants to which attacks of hay fever are attributed, and much of the writer's time, outside of hours of attendance, during the flowering season of 1915 and also during the present summer, has been given to gathering such plants and to obtaining pollen from their flowers. It was important that the plants should be certainly identified.

Pollen from catkin-bearing trees and from conifers may be obtained by collecting the catkins or the flowers and spreading them on waxed paper until dry, when the pollen readily falls out. All pollen, however, is not by any means so easily gathered.

The best method of obtaining rose pollen was, after removing and thoroughly drying the anthers, to sift through cheese cloth. Grasses, daisies, ragweed, and goldenrod were best treated by placing large numbers of plants with their stems in vessels of water, which requires changing every morning. As the anthers discharge their pollen a limited quantity will fall upon waxed paper spread beneath; shaking the stems will greatly facilitate this process. Six large galvanized water buckets were used; in many cases it was necessary to spend hours collecting each species of plant and; though these buckets were filled at least three times, even then the quantity of pollen obtained would often be very meager.

Of the many different pollens collected, those of lilac and privet were by far the most difficult to obtain, each flower having only two stamens. After several trials the only satisfactory way found was to visit the bushes early in the morning, on days when the wind was not too strong, and to shake the pollen through netting into a large tray held beneath, a very tedious operation.

Last winter, in order to get for one of the investigators a fresh supply of pollen for use in the early spring, we grew a crop of ragweed from seeds, under glass.

Record is here made of the species from which pollen has been obtained for these interesting, and, it is to be hoped, important investigations.

Austrian Pine	PINUS AUSTRIACA Höss.
Japanese Black Pine	PINUS THUNBERGII Parl.
Pitch Pine	PINUS RIGIDA Mill.
Broad-leaved Cat-tail	TYPHA LATIFOLIA L.
June Grass	POA PRATENSIS L.
Orchard Grass	DACTYLIS GLOMERATA L.
Velvet Grass	NOTHOHOLCUS LANATUS (L.) Nash
Timothy	PHLEUM PRATENSE L.
Red-top	AGROSTIS ALBA L.
Pig-nut Hickory	HICORIA GLABRA (Mill.) Britton
Cherry Birch	BETULA LENTA L.
Swamp Oak	QUERCUS PALUSTRIS Du Roi
Swamp White Oak	QUERCUS BICOLOR Willd.

Field Sorrel	RUMEX ACETOSELLA L.
Japanese Rose	ROSA RUGOSA Thunb.
White Ash	FRAXINUS AMERICANA L.
Fringed Privet	LIGUSTRUM ACUMINATUM Koehne (*L. ciliatum* Rehd., not Sieb.)
Hairy Lilac	SYRINGA VILLOSA Vahl
Great Ragweed	AMBROSIA TRIFIDA L.
Ragweed	AMBROSIA ELATIOR L. (*A. artemisiifolia* L.)
Daisy	CHRYSANTHEMUM LEUCANTHEMUM L.
Tall Goldenrod	SOLIDAGO ALTISSIMA L.
Early Goldenrod	SOLIDAGO JUNCEA Ait.

P. WILSON.

AUTUMN FRUITING SHRUBS

To those who admire the bright fruits of fall, a visit at this time to the fruticetum will prove of great interest. The fruticetum is just to the north of the lakes in the rear of the Museum. Here are a great many shrubs which have brightly colored fruits. Striking among these are the thorns, belonging to the genus *Crataegus*. Of these there are many kinds, in the circle in the plaza and to the east of the road beyond, some of which are in fruit from early fall to winter. Many of these are now in their prime. One of the best is *Crataegus succulenta*, a dense compact shrub of great decorative value, full of the brightest fruit. Others are *C. pentandra*, *Egglestoni*, *albicans*, *viridimontana*, and *macrantha*. And there are still others with green fruit, giving promise of color for the future.

To the east of the thorns, near the woodland border, is the collection of barberries. The common barberry, *Berberis vulgaris*, is among these, one of the finest forms of this, a dwarf form known as variety *macrocarpa*, bearing pendulous clusters of brightest red fruit. Another form is the variety *sulcata*, with clusters of ruby red.

Beyond the thorns are the roses, many with showy fruit. *Rosa villosa* has very large fruits, while the dog rose, *Rosa canina*,

glows with orange-red. The seven-sisters rose, *Rosa multiflora*, is covered with a profusion of small but bright fruit-clusters.

Across the road to the west of the roses are the hollies. Two of these are particularly attractive. One, *Ilex serrata*, a native of Japan, bears a profusion of bright red berries; these, although smaller, are borne in much greater numbers than are those of our own native *Ilex verticillata*, as you will see by a shrub of the latter nearby.

Near the hollies is a group of the staff-tree family. Here one of the finest, *Euonymus Bungeanus*, is just about to don its mantle of old-rose fruits. *Euonymus alatus*, of dwarfer and more compact habit, with curious winged branches, is another species of great decorative value; its fruits are a bright orange-red.

Passing to the west we come to the cornels, where the most attractive shrub at present is *Cornus foemina*, covered with creamy berries; this is also known as *Cornus paniculata*.

Away in the western corner of the fruticetum is the genus *Viburnum*, containing many kinds with attractive fruits. At present *Viburnum Opulus*, the cranberry tree, is brilliant in its masses of bright red. Of larger size is *Viburnum Sieboldii;* its drupes, in great numbers, red at first—its attractive time—drop as soon as they assume their mature coats of black. *Viburnum dilatatum* is a shrub of broad spreading habit, its berries, of the deepest ruby red, occurring in great abundance.

There are other shrubs in the fruticetum which owe their attractiveness to colored fruit, and a hunt for all of these will add much of zest and interest to the visit.

GEORGE V. NASH

NOTES, NEWS AND COMMENT

Mr. Wilson Poponoe of the Bureau of Plant Industry, United States Department of Agriculture, spent some days in late August at the Garden herbarium studying specimens of the Avocado. Mr. Poponoe was on his way to Guatemala for the purpose of studying the Avocado in the field and securing kinds suitable for growing in southern Florida and southern California.

Professor A. Le Roy Andrews, of Cornell University, spent a week in early September at the Garden studying mosses in connection with monographic work for *North American Flora.*

Professor W. C. Coker, of the University of North Carolina, left for his home at Chapel Hill, North Carolina, on September 2, after spending about two months at the Garden working up his general collections of North Carolina fungi and in studying our collection of Clavariaceae for publication in *North American Flora.*

Mr. L. O. Overholts, of the Pennsylvania State College, spent a few days in August at the Garden studying the fungous genus *Pholiota* for publication in *North American Flora.*

Professor George M. Reed, of the University of Missouri, recently spent a day at the Garden. During the summer, Professor Reed has been carrying on work at the Brooklyn Botanic Garden. For some time past he has been pursuing researches on the physiology of some of the parasitic fungi.

Mrs. Flora W. Patterson, of the United States Department of Agriculture, visited the Garden on August 22 to complete arrangements for publishing her contribution on the Exoascales of North America in *North American Flora.*

Mr. M. V. Reed of Lincoln, Nebraska, spent July and August at the Garden on a scholarship grant assisting in the experimental studies being conducted in genetics.

Volume 6, of the Memoirs of the New York Botanical Garden, consisting of papers presented at the Garden's Twentieth Anniversary Celebration, September 6 to 11, 1915, was issued August 31. It makes a volume of 592 pages, with 43 plates. Thirty-

seven papers are included, ranging in length from one page to one hundred and twenty-two pages and dealing with a great variety of subjects of botanical interest.

The Bulletin of Miscellaneous Information of Kew Gardens records the gift to that institution by Lady Church of the valuable collection of water-colored drawings of plants brought together by the late Sir Arthur Church. This consists of sixty-seven drawings, forty-six of which have been arranged on the wall of the room adjoining the gallery containing Miss North's famous collection.

Many of the older books in the library, belonging to Columbia University and to the Garden, are in need of rebinding. A shipment of such books, comprising 32 volumes, has recently returned from the bindery, and the books are now replaced upon the shelves.

Meteorology for August.—The total precipitation for the month was 1.21 inches. The maximum temperatures for each week were 95° on the 8th, 89° on the 17th, *98° on the 22d*, and 88° on the 31st. The minimum temperatures were 59° on the 3d, 52° on the 14th, 57° on the 25th, and *49° on the 29th.*

ACCESSIONS

MUSEUMS AND HERBARIUM

49 specimens of mosses, mostly from New Mexico. (By exchange with the United States National Museum.)

318 specimens of *Rubus* from the Southern States. (Distributed by Mr. W. S. Blanchard.)

17 specimens of crude drugs. (Given by Dr. H. H. Rusby.)

265 specimens of flowering plants from the Ozark Mountains, Missouri. (Collected by Mr. W. W. Eggleston.)

172 specimens of flowering plants from Africa. (By exchange with the United States National Museum.)

1 specimen of *Juglans insularis* from Cuba. (By exchange with the Bureau of Plant Industry, United States Department of Agriculture.)

6 specimens of hepaticae from New England. (By exchange with Miss Annie Lorenz.)

10,000 specimens from the Isle of Pines, Cuba. (Collected by Dr. and Mrs. N. L. Britton and Mr. Percy Wilson.)

3 specimens of flowering plants from Mt. Kisco, New York. (Given by Miss Carolena Wood.)

374 specimens of flowering plants and ferns from the vicinity of New York. (Collected by Dr. F. W. Pennell.)

1 specimen of *Vibrissea truncorum* from Pennsylvania. (By exchange with Mr. L. O. Overholts.)

22 specimens of fungi from Porto Rico. (By exchange with Professor B. Fink.)

24 specimens of *Chaetomium* from New England. (Given by Professor A. H. Chivers.)

1 specimen of cup fungus from New York. (By exchange with Mr. Stewart H. Burnham.)

1 specimen of cup fungus from New York. (By exchange with Professor H. M. Fitzpatrick.)

10 specimens of fungi from New York. (Collected by Dr. Fred J. Seaver.)

PLANTS AND SEEDS

1 plant of *Opuntia discata*. (U. S. National Museum, through Dr. J. N. Rose.)

36 plants for American wood garden. (Collected by Mr. Percy Wilson.)

4 plants for American wood garden. (Given by Miss E. M. Kittredge.)

5 plants, all cacti, for conservatories. (U. S. National Museum, through Dr. J. N. Rose.)

2 plants of *Sisyrinchium mucronatum*. (Collected by Dr. F. W. Pennell.)

1 plant, *Eriocereus* sp., for conservatories. (By exchange with Mr. F. Lighte.)

10 plants, all *Castalia*, for water lily tanks. (By exchange with Mr. Wm. Tricker.)

2 plants of *Paulownia Fortunei*. (By exchange with the U. S. Department of Agriculture, Bureau of Plant Industry.)

12 plants, *Opuntia* sp. (By exchange with Plant World, Tucson, Arizona.)

1 plant, *Cypella* sp. (By exchange with U. S. National Museum, through Dr. J. N. Rose.)

4 plants, *Bambusa* sp., for conservatories. (Given by Mr. John H. Snoke.)

1 plant, *Arisaema* sp., for American wood garden. (Given by Miss E. M. Kittredge.)

7 plants of *Pentstemon pallidus*. (Collected by Dr. F. W. Pennell.)

17 plants for conservatories. (By exchange with Prospect Park, Brooklyn.)

5 plants of *Seaforthia elegans*. (By exchange with U. S. Department of Agriculture, Bureau of Plant Industry.)

4 bulbs for conservatories. (Given by Parke, Davis & Co., Detroit, Michigan.)

33 bulbs, *Scilla* sp., for economic garden. (Given by Dr. H. H. Rusby.)

5 bulbs, *Curcuma* sp., for conservatories. (Given by Dr. H. H. Rusby.)

1 packet seeds of *Melanchia* sp. (Given by Treasury Dept., through Dr. J. K. Small.)

1 packet seeds for conservatories. (Given by Dr. H. H. Rusby.)

1 packet seeds of *Cupressus glabra*. (By exchange with U. S. Department of Agriculture, Bureau of Plant Industry.)

1 packet seeds of *Pinus Sabiniana*. (Given by Mr. John N. Drake.)

1,467 plants for collections. (Derived from seed from various sources.)

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Vol. 3, part 1, 1910. Nectriaceae—Fimetariaceae.

Vol. 7, part 1, 1906; part 2, 1907; part 3, 1912. Ustilaginaceae—Aecidiaceae (pars).

Vol. 9, parts 1 and 2, 1907; part 3, 1910; part 4, 1915; part 5, 1916. Polyporaceae—Agaricaceae (pars). (Parts 1 and 2 no longer sold separately.)

Vol. 10, part 1, 1914. Agaricaceae (pars).

Vol. 15, parts 1 and 2, 1913. Sphagnaceae—Leucobryaceae.

Vol. 16, part 1, 1909. Ophioglossaceae—Cyatheaceae (pars).

Vol. 17, part 1, 1909; part 2, 1912; part 3, 1915. Typhaceae—Poaceae (pars).

Vol. 22, parts 1 and 2, 1905; parts 3 and 4, 1908; part 5, 1913. Podostemonaceae—Rosaceae (pars).

Vol. 25, part 1, 1907; part 2, 1910; part 3, 1911. Geraniaceae—Burseraceae.

Vol. 29, part 1, 1914. Clethraceae—Ericaceae.

Vol. 34, part 1, 1914; part 2, 1915. Carduaceae.

Memoirs of the New York Botanical Garden. Price to members of the Garden, $1.00 per volume. To others, $2.00. [Not offered in exchange.]

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 Arthur Hollick and Edward Charles Jeffrey. viii + 138 pp., with 29 plates. 1909.

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OF

The New York Botanical Garden

EDITOR

FRANCIS WHITTIER PENNELL

Associate Curator

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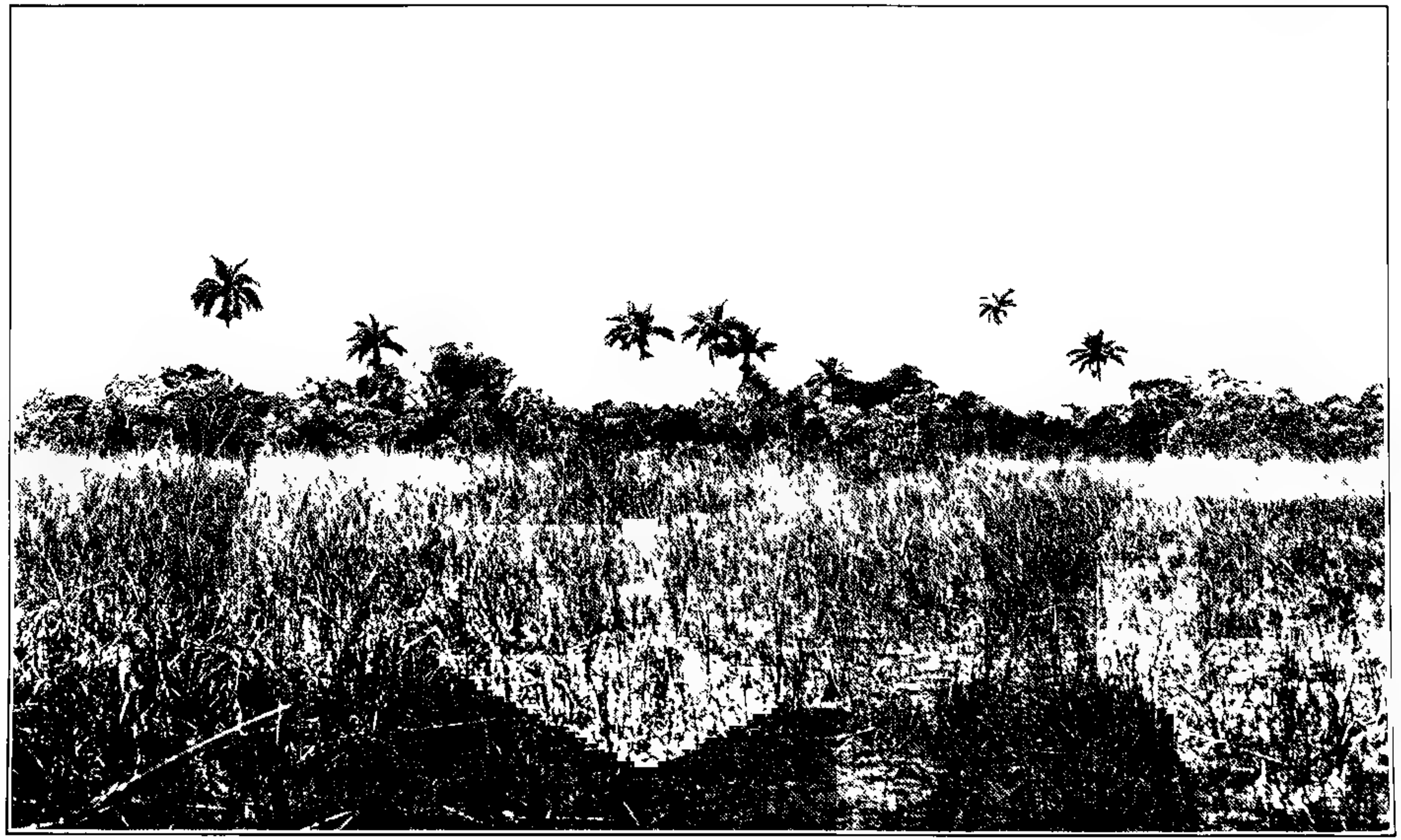

Everglades in foreground. A portion of Royal Palm Hammock, about the middle of the key, in background. Royal palms, some estimated to be one hundred and twenty-five feet tall, tower above the largest live-oak trees. Large clusters of immature fruits may be seen hanging from the sides of the palm-trunks a short distance below the crown of leaves. The royal-palm here flowers in mid winter and matures its fruits in mid-summer.

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ROYAL PALM HAMMOCK

(WITH PLATES CLXXIX CLXXXII)

The two natural divisions of the Everglade Keys in extreme southeastern peninsular Florida, the Biscayne pineland and the Long Key pineland, are separated from each other by the headwaters of the Taylor River, a stream which has not yet been mapped. Among the forks and sloughs of this river are many keys or islands clothed with hammock vegetation. Most of these islands are small; but one of them is larger than many of the others put together, and it stands out so prominently in the landscape that it may be seen across the prairie for a distance of more than ten miles. It lies a little south of the main axis of the Everglade Keys,* and is called Royal Palm Hammock.† It is also known as Paradise Key.‡ The island received the former mentioned name from the most conspicuous element of the vegetation, this consisting of scores of royal palms, many of which tower above the other trees.

* It is located within sections 15 and 22, township 58 south, range 37 east.

† A hammock,—the word probably of Indian origin,—is a dense growth of mostly broad-leaved shrubs and trees, thus giving shade, in a pine forest or on a prairie. The use of the word is confined mostly to Florida and adjacent states. For more extensive definitions, see R. M. Harper in *Science* II. 22: 400–402. 1905; Third Annual Report of the Florida Geological Survey 217. 1911; and Geological Survey of Alabama, Monograph 8: 83. 1913.

‡ The word key (cayo) primarily applied to islands near the coast in and near Spanish speaking countries, largely replaces the use of the word island in southern Florida, and by the inhabitants is applied to islands in the Everglades as well as to the islands of the coasts and reef of Florida.

[Journal for September (17: 147–164) was issued October 14, 1916]

For nearly twenty years public and popular interest in this hammock has been growing. This interest gained momentum, and under wise guidance recently culminated in the setting aside of the tract as a public reservation for the benefit and pleasure of all the people. This fortunate result did not happen, however, without opposition, and an account of the many narrow escapes of this unique work of nature from mutilation or destruction would fill many pages.*

When settlers entered southern Florida the Seminole Indians told them of an island far away in the Everglades with large palms growing on it. This locality may have been encountered by the white man during or about the time of the Seminole War, for at that time Indian hunters penetrated to many remote portions of the Everglades; but there appears to be no definite record to this effect preserved.

In response to inquiries I have received accounts of two independent discoveries of this island in the latter part of the last century, the one made by starting from the western side of the peninsula, the other from the eastern side. Mr. Kirk Munroe, author, and student of the Seminoles, says in a letter recently received:

"As regards Royal Palm Hammock—In the winter of 1881–82 I spent four months cruising in a sailing canoe on the west coast of Florida from Cedar Keys to Key West. In February, 1882, I spent some time on Shark river, making headquarters at a camp of charcoal burners. I had a medicine kit from which I had relieved the sufferings of one of the negroes who must have communicated the good news to some Seminoles who occasionally visited the camp, for one day two of them arrived in haste to see if the white medicine man would visit their camp in the Glades where a child was in danger of dying.

"Of course I went and was taken almost due east from the upper waters of Shark river some 25 or 30 miles to an Indian camp on the edge of a low hammock island, or Everglade key, on which grew a number of Royal Palms which I recognized from having seen them at Panama.

* An interesting account of the hammock itself and a history of the campaign carried on to save it, recently appeared in the *Tropic Magazine*, 4: 5–16. 1916.

A bed of wood-fern in the jungle of Royal Palm Hammock. More than a dozen kinds of ferns grow on the key. Four kinds are wholly or partly epiphytic (growing on trees); the others are terrestrial. Large beds of the leather-fern, the royal-fern, the Boston-fern, the sword fern, and the brake may be met with in the dense forest. The ferns grow so luxuriantly that walking through the beds is

"Unfortunately the child had died before my arrival. Perhaps I should say 'fortunately' for me as I probably could not have saved it.

"I remained with my Indian friends over night, but was invited to depart on my return trip to Shark river at daybreak, and so made no exploration of what, I am convinced, is the Royal Palm Hammock, in which we are now so greatly interested, as I never have seen those trees elsewhere in the Everglades, though I have made several subsequent trips into them, from Okeechobee southward. On one of these trips, made in 1900, from Miami southward to the great 'rock-barrier' [Long Key?] I sighted the hammock again and recognized it, or thought I did, for the one previously visited."

In 1893 Messrs. John and Marion Soar visited the island on foot. Indians in camp near Little River told them of a large island, with many tall palms growing on it, toward the southwest in the Everglades. The Soar brothers took their sail-boat to Black Point Creek about five miles south of Cutler and went up the creek to the edge of the pineland, that is to the line where the eastern side of the pinelands meets the everglade prairie. Leaving their boat at this point they proceeded on foot down the prairie along the pineland for a distance of eighteen or twenty miles until tall palms came into view about six miles to the west; then they waded over to the hammock. They did not return by the route they had gone, but followed up the western edge of the pineland until they thought that they had proceeded far enough, and then by chance turned into the intersecting Black Point prairie. Going down the prairie for the distance of about ten miles they found their sail-boat where it had been left.

In this connection it may be well to call attention to the existence of several hammocks with royal palms on the western side of peninsular Florida. Early visits to these should not be confused with the visits to the locality under consideration.

As the population of southern Florida increased the island was occasionally sighted and reported by hunters who penetrated the Everglades in search of the furs and skins of various native

animals, but as late as 1903 nothing definite about the plant-life of Royal Palm Hammock was known, except the fact that it was a large and very luxuriant hammock with numerous trees of the royal palm. In the fall of 1903 the systematic botanical exploration of southern Florida by the writer was begun, and the attention from a botanical standpoint subsequently devoted to Royal Palm Hammock was as follows:

In December of 1903, after the writer had left the field, and when the waters of the Everglades had subsided sufficiently, Mr. A. A. Eaton, together with Messrs. C. T. Simpson and John Soar spent a day on the island, having reached it by wading a distance of about three miles from Camp Jackson. They made some interesting discoveries. In March of 1904, Professor P. H. Rolfs and Dr. N. L. Britton, following an exceptionally dry season, visited the island for a day dry-shod, and in May of the same year Mr. Percy Wilson and the writer crossed the Everglades to Long Key, passing within less than a mile of the hammock, but were prevented from going to it by the rapidly rising waters of the Everglades. After this period, as far as botanical activity was concerned, Royal Palm Hammock had a rest of four years. In May, 1908, Dr. Ernst A. Bessey and Mr. G. L. Fawcett made the crossing and did not find water in the deepest sloughs. In January, 1909, the hammock was visited by Mr. J. J. Carter and the writer while they were encamped for two weeks just across the prairie slough on the edge of Long Key. At that time it was necessary to wade through from one to four feet of water and mud in order to reach it. At this time the waters were subsiding and in March Dr. Roland M. Harper crossed over from Camp Jackson dry-shod. For a second time four years of botanical non-activity elapsed. During this early period of exploration a visit of a day on Royal Palm Hammock was a question of nearly a week's travel from Miami and back by wagon and on foot, and only after the railroad was extended from Miami to Homestead was the time necessary to make the trip reduced to three or four days. The conditions and the experiences of the three miles, between Camp Jackson and Royal Palm Hammock, except in dry seasons and consequent

Deep slough in the Everglades east of Royal Palm Hammock. One of several sloughs that have preserved the hammock from the prairie fires of the Everglades. This channel is seldom perfectly dry. It supports a dense growth of yellow water-lily, pickerel-weed, and maiden-cane. It, like similar places in the vicinity, is a rendezvous for the native amphibians in the dry season. Its edges are fringed with saw-grass, common-reed, and small hammocks of low trees and shrubs.

low waters in the Everglades, can only be appreciated by those who have actually participated in the trips.

About the beginning of 1915 a scarified road was extended from Homestead southwestward. This was a slight improvement on the old surveyors' trail. Temporary bridges were placed over the sloughs between Camp Jackson and the hammock, so that now the return trip from Miami can be made by automobile in a few hours! Since the beginning of 1915 the writer has made ten collecting trips to the hammock.

Beginning with the period of our early visits to this island, talk of setting it aside as a public reservation was started, chiefly on account of its unique characteristics. This agitation was continued sporadically. It finally bore fruit, and the tract is now in the hands of the Florida Federation of Women's Clubs for protection and preservation. This solution of the problem is fortunate, for the vandal, the prospector, and the squatter had not been idle. I now recall that while returning from there in 1909, we met a group of six or eight men on their way to the hammock with the idea of securing it in order to clear it and plant out a citrus grove. I suppose, judging from like circumstances, the only obstacle which prevented them from accomplishing their purpose was their inability to get title to the tract, as definite ownership has only recently been determined.

On June 5, 1915, the hammock together with the remaining one and a half sections of Everglade land which surrounds it, was turned over by the state of Florida to the care of the Florida Federation of Women's Clubs, under the name "Royal Palm State Park." The Federation is now raising funds for the protection and preservation of the hammock, and aside from funds which are accumulating, Mrs. Henry M. Flagler has contributed one and a half sections of neighboring Everglade land as an endowment. This land is to yield funds either through rentals or through sales. A warden has now been stationed there.

The road to Royal Palm Hammock already referred to is a portion of the Ingraham Highway which is to connect Miami with Cape Sable. This road will be about one hundred miles long. It is completed at least as far as Homestead, and it may

be traveled as far as Royal Palm Hammock. It now traverses a portion of tropical Florida which the writer has been exploring by occasional visits since 1903 with most interesting results. The proposed route from Royal Palm Hammock to Cape Sable will open up a section of our country which is botanically unknown. Work on the latter portion of the road has already been started.

So much for the history of Royal Palm Hammock. As to its flora: In our phytogeography it is not duplicated. It is different from the high pineland hammocks, a score of which are or were hidden in pine forests of the Everglade keys before the deforestation of those islands was started, nor is it like the low pineland hammocks which are situated at many places along the edge of the pineland and the prairies or "glades." It is really a very large Everglade hammock, and thus like the hammock islands which are scattered in myriads over the southern portion of the Everglades. However, it differs from these in that it is larger and higher, and consequently more rocky and with a more extensive flora. Furthermore, it has been always surrounded by water or damp sloughs and thus protected from fires from without, and heretofore there has been little chance of fires starting within. Thus its vegetation has had nearly uninterrupted growth for ages. This condition perhaps accounts for the occurrence of the royal palms there. The decaying fallen leaves, the large spathes, the spadices, also the myriads of sepals and petals of the flowers, and the fruits, each and all, on account of the unbranched habit of growth, falling at the very base of the trunk, form mounds of humus larger and higher than do any of the hardwood trees. Upon such a gradually increasing mound a palm is, from year to year, raised higher and higher on humus formed from its own tissues. Now these mounds of humus would furnish ideal fuel and the palm, although able to resist fire above the roots, could not exist or even stand up if the humus was burned away between the base of the trunk and the rock. As it is, it seems nothing short of a miracle that the slender trunks over one hundred feet tall with the heavy crown of leaves and spadices can withstand the winds of severe storms,

Everglades with the charred bases of saw-grass plants in foreground. Small hammock west of the southern end of Royal Palm Hammock in background. This hammock is neither as high nor as rocky as its larger neighbor; but its jungle consists of many of the same kinds of trees, shrubs, and vines. It has not yet been thoroughly explored, having been visited only once by botanists It was then the home of the bear, the deer, the panther, the wild-cat, and the otter, as well as that of many smaller kinds of mammals and of reptiles

not to mention frequent hurricanes. This protection from fire would also account for the occurrence of a few royal-palms in neighboring hammocks. Although the royal palm has been protected from fire, it has evidently an enemy in the rodents which inhabit the island. Fruits are produced by the millions every year, but new palms are apparently springing up in numbers only about sufficient to replace those that die. It would be interesting to see what would happen if the animals that eat the seeds were eliminated from the hammock.

Botanical exploration up to 1916 has revealed two hundred and forty-one kinds of plants, from the mushrooms upward, growing naturally on the key. Sixty-one of these are flowerless plants, viz.: mushrooms 18, lichens 6, liverworts 13, mosses 11, and ferns 13. The remaining one hundred and eighty kinds are flowering plants. Of these one hundred and sixty-two are native species, while eighteen have been recently introduced.*

It is to be hoped that the hammock will be duly respected and that its future will be carefully considered. Its natural features have already, though unavoidably, been seriously interfered with, and suggestions for the future treatment of the reservation, ranging from the maintenance of it in its natural condition to clearing it of its growth of shrubs and trees "to make it a cornfield" have been advanced. The only rational plan suggested is to keep the key intact. Royal Palm Hammock is unique; therefore, for the sake of science and the sake of art, do not change it, except to restore parts already devastated. Too much to favor its natural destruction in the future has already been accomplished. A small clearing, or even a fallen tree that makes an opening in the hammock roof, may furnish a starting point for a hurricane to wreck acres of beautiful forest, whereas an even and normal growth of the forest would save it. This was clearly shown in the high pineland hammocks on the neighboring Everglade Keys during recent hurricanes. The more the natural growth of a hammock had been changed by man the more it suffered during the storms. Consequently the first concern on the part of the custodians should be to replace

* Journal of the New York Botanical Garden 17: 41. 1916.

the forest, even to the extent of individual trees, wherever man and nature have lately destroyed it. Nature should be assisted in eliminating debris that might be detrimental to the forest and also helped to restore the natural growth as fast as possible, and then to maintain it. Among the many suggestions for the development of Royal Palm State Park is the introduction and cultivation of exotic plants. This, however, should be vetoed as far as Royal Palm Hammock itself is concerned. If my copy of the map of the region is correct, there is a comparatively small but beautiful hammock island within the bounds of the park area. It lies about a quarter of a mile west of the southern end of Royal Palm Hammock on the line between the two sections in which the park is located. It has several royal palms in its jungle, one of which towers above the tops of the other trees so that it may be seen for many miles across the Everglades. If it is considered advisable to introduce horticulture and other foreign features into the scheme of Royal Palm State Park, let them be confined to this neighbor of Royal Palm Hammock.

JOHN K. SMALL

A "CONVENTION GARDEN"

The annual convention of the Society of American Florists and Ornamental Horticulturists for 1917, will be held in New York next summer, and a large attendance is expected from all over the United States and Canada. The conventions of this society include the reading of papers, discussions, visits to points of especial interest and one of the features is the planting and maintenance of a special garden, which has come to be known as the "Convention Garden," wherein members of the society exhibit collections of novelties and other plants of interest, the society meeting the expenses involved by a charge against the exhibitors proportionate to the space occupied.

Our local organization, the New York Florists' Club, took the lead in inviting the national society to meet in New York, and officers of the New York Botanical Garden were consulted last spring by Mr. John Young, Secretary of the New York

Florists' Club, relative to a site for the Convention Garden. The matter was brought to the attention of the Board of Managers at their meeting on June 15, 1916, and the Director-in-Chief was authorized to assign the use for this purpose of a tract of about five acres, south of the Herbaceous Garden and east of the Southern Boulevard. Mr. Young inspected this site and pronounced it satisfactory; he attended the convention of the society, held at Houston, Texas, in August, 1916, and states that his description of the site was instrumental in causing the society to accept the New York invitation.

The area is open, undulating, sloping in general toward the southeast, with a fine forest background on two sides, and two rocky hills near the Southern Boulevard. It has good soil, and a water-main traverse it, to which hose-taps may readily be attached. It is a part of the land added to the New York Botanical Garden by the City in 1915, and has not as yet been developed; a path-system, taken from the general plan of development is being constructed, which will connect the site with the Herbaceous Garden to the north and with the Iris Garden to the south, leading eastward to the valley of the Bronx River. It is expected that some of the exhibitors will plant portions of their collections during October of this year, and the rest in the spring.

These "Convention Gardens" have proved very interesting and attractive in other cities where this society has maintained them, as at Boston, Minneapolis, and San Francisco. They are open and free to the public.

N. L. Britton,
Director-in-Chief

INJURY TO VEGETATION RESULTING FROM CLIMATIC CONDITIONS

Nearly every winter furnishes conditions which are responsible for more or less injury to vegetation of both native and exotic species. During the past decade a vast amount of damage due to extreme conditions has resulted to vegetation, especially in

the northeastern states. There has probably been no period within the memory of living men, or for that matter within the period of exact meteoreological records, when damage to vegetation in America has been more extensive than during the past twelve years or since the winter of 1904. Every meteorological factor has its specific influence on vegetation, but since some of these influences are so intimately related to certain types of injury we will deal only with those concerned in the so-called winter injury. The principal meteorological factors associated with winter-killing and allied phenomena are temperature, soil and air moisture, wind, and light.

Either high or low temperatures or too much or too little soil moisture are conducive to abnormal conditions in plants; also the amount and intensity of light and the movements of the air form important factors in respect to this. Both winds and sunlight have a marked effect on transpiration, even sunlight alone greatly accelerating this process. Therefore, for a correct understanding of the cause underlying injury to vegetation from climatic conditions, it is essential to have some conception of the relative importance of meteorological agencies on plant development and the rôle which they play in regard to susceptibility to various troubles.

Some of the conditions which underlie winter-killing are as follows:

Severe and prolonged cold, causing frost to penetrate to a great depth.

Sudden and severe cold following a prolonged warm spell in the fall, in which case the wood tissue may be tender and immature.

All conditions which favor a soft growth and immaturity of wood. Various causes may be responsible for this, such as growth in a low, moist soil, too heavy manuring or fertilization, or absence of sufficient sunlight.

General low vitality, caused by insect pests and fungous diseases and by lack of moisture in the soil.

Insufficient soil covering, such as lack of organic matter, light mulching and thin snow covering in winter.

Location in unusually windy and exposed places, etc.

A summer drought followed by copious rains during the fall is often responsible for the production of immature tissue susceptible to cold.

Plants growing in the drainage of cesspools are likely to be affected by cold owing to the production of unripened wood.

Many of our introduced species are quite tender and are likely to be affected more or less every winter by severe cold. The buds of peach trees are generally affected by cold in the northern states and such plants as the privet, Japanese maples, etc., are affected by ordinary cold. On the other hand, plants that are native further north, such as the Labrador tea, frequently suffer some winter injury in our latitude when grown out of their natural environments. Swamp species transplanted to relatively dry soil suffer more from drought and low winter temperatures than those grown in their normal habitat. Many native plants are winter-killed badly when grown on the north side of buildings where light is insufficient, because in such situations the wood fails to mature properly. On the other hand, some southern species of plants, such as the magnolias, are more hardy in the north than are some of our native species. Indeed the reason why the magnolias do not grow more abundantly in the north is apparently not connected with temperature requirements.

Some injury to vegetation is generally caused by snow and ice, and this aside from that which occurs from the overloading of branches. The leaves of the lower branches of various conifers are often killed when buried in snow banks and the leaves of arbutus are commonly sun-scorched from exposure to winter snows and ice.

The injuries resulting to vegetation induced by meteorological conditions can be conveniently placed under two different categories, namely; injury to the root system, and injury to the aerial portion of the plant, to limbs, branches and leaves. Injuries which occur to a plant above the surface of the ground and which are associated with meteorological agencies are "frost-cracks," "sun-scald," "sun-scorch" and "bronzing."

"Frost-Cracks"

"Frost-cracks" are formed in winter and are due to extreme changes in temperature within the tissues and occur on those portions of the tree where the maximum amount of heat is developed, namely on the southwest side of the tree. Since the maximum amount of heat derived from sunshine is received generally between 2 and 3 P. M., that portion of a tree trunk coinciding with the direct rays of the sun at this period is the one most likely to be affected on a day of uniform clearness. Moreover the location of frost-cracks on a tree coincides with that area giving the minimum electrical resistance, and since the electrical resistance of a tree is proportional to the temperatures of the tissue comprising the same—the lower electrical resistance corresponding with the higher temperatures -that portion of the tree showing the least electrical resistance is most susceptible to frost-crack.

The opening and closing of frost-cracks are very responsive to changes in the meteorological conditions, they being influenced by variation in temperature, moisture, and in barometric conditions. They open more in winter than in summer, more under a dry than under a moist atmosphere and more during high than during low barometric pressure. Various fruit and shade trees are susceptible to frost cracks and the principal injury caused is to induce a tending to bleeding.

"Sun-Scald"

What is termed "sun-scald" is associated with severe and abrupt changes in temperature on non-ripened wood. Sun-scald may occur either in the winter or in summer. When coniferous forests are thinned and sunshine is allowed to enter, the exposed trees are likely to suffer from sun-scald. The moose-maple, a shade-loving tree, will sun-scald badly in such a thinned forest or whenever transplanted to the open.

Among shade trees the rock-maple is one of the most subject to sun-scald; also among fruit trees and shrubs various kinds are affected. Sun-scald is more likely to occur on unpruned apple trees than on pruned ones, or on shaded limbs than

on those growing under good light conditions. The shaded limbs on unpruned and neglected apple trees are more likely to be affected by sun-scald, owing to the development of unripened wood. Sun-scald may also follow as a result of too intensive sunlight, as for example when certain fruit trees are stripped of their foliage in the summer, such as sometimes results from the ravages of the gypsy moth. In such instances the new unripened wood sun-scalds badly.

"Sun-Scorch"

"Sun-scorch," a term given to designate the burning of foliage, generally occurs in summer during periods when the soil is dry, and also is common to evergreens during warm windy days in spring before the frost is out of the ground. Any defects in the root system which prevent root absorption is likely to give rise to sun-scorch. In the case of evergreens sun-scorch is not infrequently ascribed to winter injury and in fact it may follow winter killing of roots. It may be induced by any cause responsible for a defective root system, such as by winter killing of roots, by drought, or by the use of such fertilizers as have an inhibitory effect on root absorption, etc.

Sun-scorch is common to many trees, particularly the rock-maple, and is characterized by a burning of the foliage which often becomes lacerated when strong winds prevail. Since sun-scorch occurs on the side of the tree coinciding with the direction of the prevailing winds, the particular combinations of meteorological conditions which cause this can readily be determined. In one instance when the wind was blowing at the rate of seventy-two miles an hour from the northwest during May, at a time when the soil was relatively dry and the leaves exceptionally tender, practically all of the foliage of the rock-maples over a large section were sun-scorched on the northwest side of the tree. During another severe dry period in summer when the wind was blowing at eighty miles an hour, the white pines in southern New England which were suffering from a defective root-system were sun-scorched.

"Bronzing"

"Bronzing" of foliage is a form of sun-scorch characterized by the occurrence of a reddish-brown or bronze color of the leaf. It is produced by lack of soil moisture or defective root absorption during dry hot periods. In bronzing, the cells furthest removed from the water-conducting tissues of the veins and veinlets of the leaves collapse from want of water, while those nearest to the water-conducting channels may remain alive. These groups of dead cells give the leaf the peculiar color from which this type of sun-scald takes its name. The location of some trees is such that they are subjected to sun-scorch or bronzing during every dry period.

The burning which has occurred so extensively to conifers and evergreens, particularly rhododendrons during the past spring, comes under the category of sun-scorch. This has occurred frequently through many portions of New England. It has been, however, more severe around New York than further north and has there affected a large variety of evergreen plants.

We are of the opinion that this burning can be traced to the unusually warm period which occurred between January 21 and 29, 1916, at which time the maximum temperature was 60° F. on the 22nd and 70° F. on the 27th. This warm spell was responsible for greatly accelerating the vital processes in plants and the low temperatures which immediately followed it undoubtedly caused the injury. In some instances the leaves were merely scorched and the terminal buds and wood untouched, while in others the burning was more severe and the wood was injured to such an extent that it died back as the warm weather approached.

This burning appears to have been associated with excessive transpiration or exhalation of water from the leaves at a time when the ground was frozen and the water supply to the roots was insufficient, hence causing a wilting and dying of the foliage and in instances of much of the younger wood. Some of the hardier rhododendrons appear to have been burned more than those regarded as tender, and plants under trees seem in many

cases to have burned more than those exposed to the direct sun. Generally when spring burning occurs to evergreens it is associated with more or less strong winds and one side shows the burning more than the other. The injury to foliage and wood occurring to plants during the winter does not always show itself immediately, but is bound to be discernible during March or April when the sunshine is more intense and warm strong winds are likely to occur. It is rather difficult to prevent burning to outdoor plants when unusual and extremely abnormal periods occur in mid-winter. Ordinarily most burning occuring to evergreens during the spring at a time when the frost is in the ground and warm winds prevail, can be prevented if care is taken to handle the plants properly. Where beds are mulched heavily with leaves it is a good idea to remove this mulching from around the base of the plants as soon as there is a tendency for the frost to disappear. This allows sunlight and heat to enter and to thaw out the soil around the plants, which in turn gives an opportunity for the roots to absorb water. After the frost is out of the ground the mulching can be replaced.

The removal of the frost and warming of the soil around the roots of plants by any method which will meet the demands of transpiration, or loss of water from the foliage, will prevent sunscorching of the young wood and foliage.

GEORGE E. STONE,
Amherst, Mass.

INJURY TO EVERGREENS

The past winter was unusually severe upon certain evergreens, while to others, which had been considerably injured in winters of apparently greater severity, little if any harm was done. The present article is written, not so much to account for the causes of the injuries, as to record the kinds which were damaged. The trouble was confined by no means to this vicinity, but was rather general throughout the northeast.

The genera which suffered most were *Chamaecyparis* and *Thuja*. It was to be expected that *Chamaecyparis Lawsoniana*,

a native of the northwest Pacific coast with its humid climate and winter of comparative mildness, would suffer under the greater severity of our seasons, but the injury done to this species was greater the past winter than ever before. The usual result of the winter injury is a disfigurement by the burning of the branch tips thus giving the plant a dilapitated appearance until the growth of the new foliage. This year the burning was much more pronounced, in one or two instances resulting in the total destruction of a portion of the plant. Even the variety *Alumii*, usually going through the winters without a blemish, had the leaders killed in a number of specimens. Other American members of this genus in the collections are *Chamaecyparis nootkatensis*, which was but little damaged, and our common white cedar, *C. thyoides*. This group of the American members of the genus is located in a depression along the south walk but a short distance from the south gate. The situation is well protected, sheltered on the north by rising ground upon which is a dense screen of trees and shrubs, and on the south by the tree and shrub border marking the southern limit of the Garden. Thus the force of the winds is much reduced, and the sunny position insures a warmer environment. *Chamaecyparis thyoides*, even under these favorable conditions, was greatly damaged, some trees eight to ten feet high, which had been there ten or twelve years without suffering injury, were so affected that their removal was necessary. The variety *andelyensis* of this species was also badly injured. Other specimens of the white cedar, located north of the middle lake in low ground protected on all sides from the sweep of the winds, were as severely damaged, requiring the removal of several of them.

The collection of the Japanese section of the genus, commonly known as *Retinispora*, is situated on the slopes and at the foot of the terrace to the west of conservatory range I, and in the triangle adjacent thereto, a location open to the sweep of the winds from the north and west. There are two species, *Chamaecyparis pisifera* and *C. obtusa*, with numerous horticultural varieties and forms. During the past winter, as in previous years, *C.*

obtusa and its varieties proved the hardier of the two. *C. pisifera filifera* suffered most. Plants which were on the boundary of the group and thus exposed, were entirely killed in some instances, while others, which enjoyed the protection of surrounding vegetation, escaped with only the destruction of the exposed portions. The branches of this variety are long and rather slender, a condition which may make it more susceptible to injury. Specimens of this same variety in the decorative beds on the north side of conservatory range 1 and protected by surrounding vegetation were also severely damaged, the upper portions receiving such injury that the removal of the plants was necessary. It is interesting to note that the golden form of this variety, known as *aurea*, proved hardier than the green form, a circumstance which has attracted attention in other severe winters. Even in exposed situations this golden form was but comparatively little damaged. Plants five and six feet tall of *Chamaecypars pisifera* and its variety *plumosa*, in the triangle and at the east end of the collection, were killed. One very large specimen of *C. pisifera*, which had been in the collection for a dozen years, had the exposed top destroyed. A large plant of *C. pisifera plumosa aurea*, near the above, also lost its top.

Chamaecyparis pisifera plumosa sulphurea, a form of dense compact habit, suffered little. A striking example of the wind as a destructive factor was exhibited by two specimens of this, standing side by side at the foot of the terrace on the north side, west end, of conservatory range 1, a situation with the ground sloping down to the north and west, thus exposing the plants to the sweep of the winds. One of these plants was protected on the windward side by specimens of *Picea pungens glauca*, thus escaping injury, the other unprotected had the exposed top killed. *C. pisifera squarrosa* furnished a victim, located at the foot of the terrace, in a large specimen about ten feet tall, a member of the collection for a dozen years or more. Its destruction was not outright, but it has never recovered from the injury. Smaller plants of the form of this known as *sulphurea*, in an equally exposed situation, received no injury. The form known as *Veitchii* also suffered little damage.

The collection of the genus *Thuja*, arbor vitae, is in the western part of a strip separating two driveways to the south of conservatory range 1. This area is much swept by the winds. Many specimens of our native arbor vitae, *Thuja occidentalis*, were damaged or killed; this has happened also in previous winters. In the tall forms of this it was the upper portion which was killed, the broad base suffering no injury. In a group of six plants of the variety *globosa*, a dense compact plant of dwarf habit, every plant was more or less burned. In a group of these at the foot of the terrace on the north side of conservatory range 1 five out of nine were burned. At the same time a number of specimens of *T. occidentalis lutea* nearby were entirely uninjured. In the same section plants of the variety *Ellwangeriana* had the tops destroyed. A number of specimens of the variety *plicata* were killed. The odd variety of this species, known as *Spaethii*, went through with no more than customary damage. *Thuja orientalis* and its varieties burned as usual, some of the plants presenting a most unsightly appearance; but later the brown burned tips dropped away, the new growth appeared, and at the end of the summer the plants had recovered.

The collection of hemlocks, *Tsuga*, is just south of power house 1, not far from the terminus of the Third Avenue Elevated. This situation is well protected by a screen of trees and shrubs on three sides, the side to the east being open. There was more mortality among the hemlocks the past winter than ever before. In this collection some specimens of our own native hemlock, *Tsuga canadensis*, had the tips of the leaves burned. A large plant, ten years old, of the variety *gracilis* was entirely killed. The Japanese hemlock, *Tsuga Tsuga*, also known as *T. Sieboldi*, suffered to some extent, branches in several specimens being killed. The hairy-twigged Japanese hemlock, *T. diversifolia*, proved much hardier, going through the winter without a blemish; it has rich dark-green leaves, and proved especially desirable the past winter.

Other conifers, located in various parts of the grounds, suffered. A fine plant about five feet tall of *Abies Pinsapo*, in one of the beds to the north of conservatory range 1,

among the shrubbery and well protected, had gone through seven or eight winters without injury, but the past winter its destruction was complete. *Abies nobilis*, a species of the Pacific coast of northwestern America, had the tips of its leaves badly injured, a circumstance of rare occurrence. Its appearance during the spring was anything but pleasing, but summer brought recovery. *Abies Nordmanniana* often has the tips of the leaves browned, but the past winter saw less of this injury. A plant of the California big tree, *Sequoia Washingtonia*, which had survived, but with considerable winter injury, for five years in a well-sheltered situation, was so badly damaged that it finally died.

Certain rhododendrons were severely injured. The worst example was a group of large plants on the wooded bank to the south of the upper lake. This is an ideal site for these plants, a northern exposure with an overhead protection of tall trees. Here one rhododendron, of which some of the leaves each year show pronounced signs of burning, was much damaged, the leaves of the upper parts of the plants not only being killed, but much of the wood also. These plants, which had been there for nearly twenty years with but minor injury hitherto, presented a hopeless appearance, but in the early summer some of the buds along the branches began to swell and soon young leaves appeared, considerably changing their general appearance. Unless another severe winter follows, these plants will probably recover in course of time. In the new planting of rhododendrons at conservatory range I there were only two kinds severely injured. One was *Rhododendron catawbiense grandiflorum*, the other *R. giganteum*. The rhododendrons generally, with the exceptions noted above, were little damaged.

One circumstance stands out strikingly in the injury to the conifers. In nearly all instances it was the parts exposed to the sweep of the winds which were injured or killed. If the entire plant were exposed, it was usually the upper portion, the part through which the wind could sweep, which succumbed, the lower broad and dense portion offering more resistance and thus a protection. In plants protected by surrounding vegetation it was the portions standing above the protection, and upon

which the winds could have full sweep, which were damaged. The injury was not apparent until the winds of late March and early April came; then the damage suddenly revealed itself. It would seem that the winds at least were the culminating factor of destruction. What circumstances adverse to the plants may have been at work previously would be problematic. The previous fall was one of unusually long-continued mild weather, bringing into bloom prematurely more than the usual quantity of blossoms which normally appear in the early spring. Such a condition of course would tend to keep the wood and the leaves in an active and soft condition, ill prepared to stand the cold winter to follow. The remarkably soft weather in January, tending to start things moving, may have been a contributing cause.

After the long list of casualties above, it is a relief to turn to some plants which proved equal to the past winter. One of these is *Ilex crenata*, which passed through without a blemish. This is the more remarkable, for the spring of 1914 revealed a serious injury to the young branches, requiring the summer to effect a recovery. The pines were uninjured, showing their adaptability to this climate. Even *Pinus Sabiniana*, the digger pine, a native of California, was not affected. *Picea orientalis*, which in nearly all previous winters has shown evidence of considerable injury, was not damaged in the least. Some of the conifers of sturdy constitution, as evidenced by their resistance the past winter, are:

Pines. Nearly all of these are reliable, that is those members of temperate climes. Especially desirable are: *Pinus austriaca*, *sylvestris*, *montana Mughus*, and *Thunbergii;* and among the white pines: *Pinus Strobus*, *Cembra*, *Peuce*, and *nepalensis*.

Firs. *Abies homolepis*, *Veitchii*, *brachyphylla*, *Nordmanniana*, and *concolor*.

Spruces. *Picea pungens* and its varieties, *polita*, and *Engelmannii*.

Hemlocks. *Tsuga canadensis*, and *diversifolia*.

Retinisporas. *Chamaecyparis obtusa* and its varieties in preference to *C. pisifera* and its varieties.

Yews. *Taxus cuspidata* and its varieties.

Cedars. *Juniperus virginiana glauca, chinensis, chinensis Pfitzeriana, chinensis aurea, depressa*, and *depressa aurea.*

Arbor vitae. *Thuja japonica.*

Douglas spruce. *Pseudotsuga mucronata.*

GEORGE V. NASH

NOTES, NEWS AND COMMENT

Mr. Paul C. Graff, a former student at the Garden, has been appointed instructor in botany at the University of Montana, Missoula, Montana. He entered upon his new duties September 15.

Mr. M. A. Carleton, of the United States Department of Agriculture, recently made a short visit to the Garden. Mr. Carleton's specialty for years has been the introduction of profitable cereals into this country. He has done more than any one else to introduce varieties of drought-resisting durum wheats, varieties which have changed thousands of square miles of the semi-arid western plains from poor grazing lands into profitable wheat fields. His visit to New York City was in connection with his work.

Another short call also has been made by Professor F. E. Lloyd, of McGill University, Montreal, Canada. Professor Lloyd while holding the chair of botany at Teachers' College, Columbia University, years ago was indirectly connected with the Garden and did much of his research here. After leaving New York he was for some years connected with the desert laboratory of the Carnegie Institution, which place he left to take up investigations on the Mexican rubber plant. For the last three years he has held the professorship of botany at McGill University.

Professor C. R. Orton, of Pennsylvania State College, is on leave of absence for one year and has registered for graduate work at Columbia University. He will also spend some time at the Garden in connection with his researches on parasitic fungi.

Professor Orton is especially interested in fungi causing plant diseases.

The following persons were among those who have registered in the library during August and September. Earl E. Sherff, of Chicago; Dr. Julia W. Snow, of Smith College; Dr. J. N. Rose, of Washington, D. C.; Dr. J. A. Samuels, of Paramaribo; Dr. Winifred J. Robinson, of the Women's College of Delaware; Dr. A. Le Roy Andrews, of Cornell University; Dr. Charles B. Fitzpatrick, of the Board of Health, New York City; Dr. George M. Reed, of Columbia, Missouri; S. Hotta and K. S. Hiraide, of Tokyo; Professor H. T. Darlington, of the Michigan Agricultural College; Dr. J. Elias Fries, of Birmingham, Alabama and Upsala, Sweden; and Fred R. Jones, of the University of Wisconsin.

A Teachers' Institute meeting on Nature Study, held at the Garden on the afternoon of September 12, was attended by a number of the Bronx Public School teachers. Dr. Peabody, of the Morris High School, delivered the main address, followed by a brief talk by Dr. Murrill and an excursion led by Mr. Percy Wilson.

Two hundred teachers from the public schools of The Bronx met at the Garden Thursday morning, September 14, to hear an illustrated lecture by Mr. George V. Nash on "How the Public Schools can use the Collections of Living Plants at the New York Botanical Garden." After the lecture there was an excursion to various parts of the grounds under the direction of Mr. Percy Wilson.

A valuable collection of ferns from the Hawaiian Islands has recently been added to the Garden herbarium through an exchange with the Bernice Pauahi Bishop Museum, Honolulu.

A collection of over five hundred specimens of ferns and flowering plants from various parts of Mexico has been received for the herbarium through exchanges with Prince Roland Bonaparte, Paris.

Of much interest at the present time is a group of plants of the common European Crocus (*Crocus vernus*) now in full flower. This may be found on the south side of conservatory bed 3 at conservatory range 1. The occurrence now of these blossoms, normally among the earliest to be seen in the spring, is very unusual, and this is the first time that a group of these plants has flowered at the Garden in the fall.

The dedication of the new Museum Building of the California Academy of Sciences in Golden Gate Park, San Francisco, took place on the afternoon of September 22, when a private view of the exhibits thus far installed was given to guests especially invited to the dedication exercises.

According to a recent number of *American Forestry*, the governor of Montana has ordered a quarantine against the importation of any five-leaved pines, currants or gooseberry bushes from the states of New Hampshire, Vermont, Massachusetts, Connecticut, New York, Pennsylvania, and other localities which are suspected of harboring the white pine blister rust. The white pine blister rust is a fungus, one stage of which causes great damage to the various five-leaved pines and the other stage appears as a parasite on various species of *Ribes* (currants and gooseberries). The above action is taken with the hope of preventing the introduction of this destructive fungus into Montana, and similar action may be looked for in other states. It is predicted that unless this disease can be checked it will rival the chestnut blight in the destruction of the white pines, which trees supply some of our most valuable timber.

Meteorology for September.—The total precipitation for the month was 2.27 inches. The maximum temperatures for each week were 87° on the 1st, *95° on the 8th*, 88° on the 14th, and 74° on the 20th and on the 30th. The mininum tempetatures were 48° on the 3d, 48° on the 10th, 44° on the 17th, and *43° on the 20th and on the 27th.*

ACCESSIONS

MUSEUMS AND HERBARIUM

10 specimens of lichens from Alaska. (By exchange with the United States National Museum.)

303 specimens of flowering plants from the Himalayan Mountains. (By exchange with Mr. R. R. Stewart.)

160 specimens of ferns from the Hawaiian Islands. (Given by Dr. Winifred J. Robinson.)

121 specimens, "Kryptogamae Exsiccatae," Century XVII+addenda, for the Columbia University Herbarium. (Distributed by the Natural History Museum, Vienna.)

4 specimens of mosses from Cuba. (By exchange with the Field Museum of Natural History, Chicago.)

4 specimens (types) of mosses from the West Indies and South America. (By exchange with Professor V. F. Brotherus.)

2 specimens of mosses from Chenghsien, Kansu, China. (By exchange with Mr. Frank N. Meyer.)

59 specimens of mosses from eastern Canada, Ohio, and Pennsylvania. (By exchange with the Carnegie Museum, Pittsburgh.)

2 specimens of hepaticae from New Hampshire. (By exchange with Miss Annie Lorenz.)

24 specimens "Musci Acrocarpi Boreali-Americani," nos. 326–350. (Distributed by Professor J. M. Holzinger.)

2 specimens of hepaticae from Fisher's Island, New York. (Given by Dr. A. W. Evans.)

6 specimens of fungi from California. (By exchange with Mr. W. W. Thomas.)

15 specimens of fungi from California. (By exchange with Professor W. A. Setchell.)

2 specimens of fungi from New York. (By exchange with Professor H. M. Fitzpatrick.)

3 specimens of fungi from New York. (By exchange with Professor George F. Atkinson.)

10 specimens of local fungi from New York. (Collected by Dr. Fred J. Seaver.)

3 specimens of local fungi from New Jersey. (Collected by Dr. F. J. Seaver.)

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EDITOR

FRANCIS WHITTIER PENNELL

Associate Curator

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The "Barbee" at anchor in Card Sound, between Pumpkin Key (left) and Key Largo (right). Pumpkin Key is nearly circular in outline and differs from other keys inside the main line north of the Bay of Florida in being of well-elevated coral rock clothed with fine hammock. The other keys are mud-flats or sand-bars clothed with mangrove. Key Largo is the largest Florida Key.

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A CRUISE TO THE CAPE SABLE REGION OF FLORIDA

(WITH PLATES CLXXXIII–CLXXXVIII)

The early morning of March 28 found the writer on board the "Barbee" as she lay off Buena Vista in Bay Biscayne. All supplies were aboard and everything was ready for a cruise of exploration through the Cape Sable region of Florida.

The objects of the expedition were four, namely, studies in the distribution of tree-snails, studies in the distribution of plants, the securing of a cargo of living palms and orchids, and photography. The party comprised Messrs. C. T. Simpson, John Soar, Victor Soar, Captain Paul Matthaus, and the writer.

The "Barbee" is a motor boat of light draught, about thirty-two feet long, and twelve feet abeam. She is especially suited to navigating, for scientific investigations, in the waters that surround peninsular Florida and the Florida Keys. The "Barbee" was generously furnished for the cruise by Mr. Charles Deering, whose deep interest in the expedition was the foundation of its success.

Simultaneous with our departure was the advent of a "norther." The strong north wind stirred up a rough sea, and consequently a large part of the first day at sea was spent in keeping our food supply and collecting-outfit out of reach of the water which came in over the decks as we proceeded southward. The end of the first day found us in the shelter of Jewfish Creek, which is about midway between the northern and southern ends

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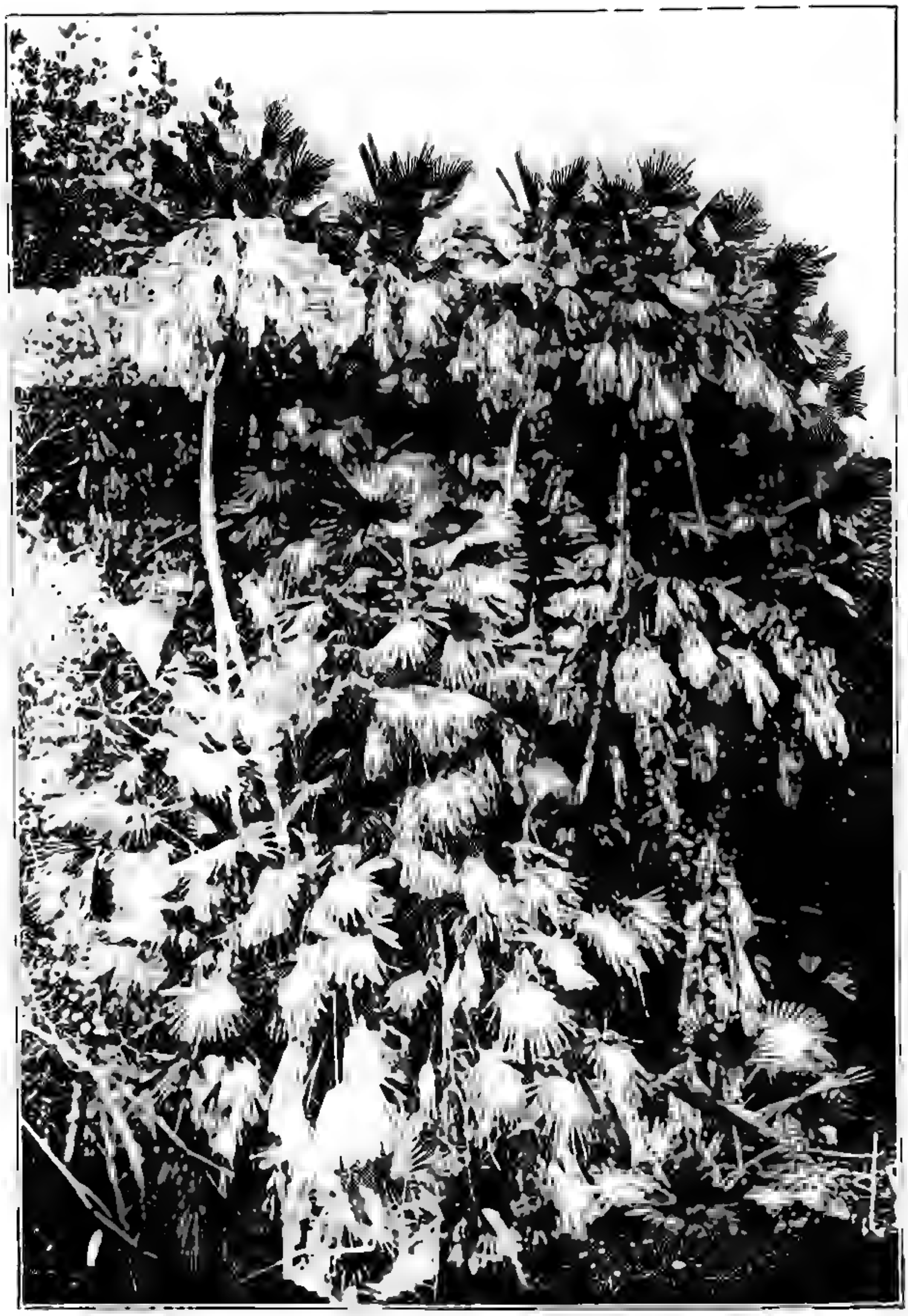
of Key Largo. The strength of the "norther" continued, but during the second day we made our way southward through Blackwater Sound and Tarpon Basin and then entered the Bay of Florida. There we anchored between Lignum Vitae Key and Lower Matecumbe Key and in this shelter awaited the falling or the shifting of the wind.

During this delay we made collections on Lignum Vitae Key, where we discovered a prickly-pear new, apparently, to science, on Lower Matecumbe Key where we found a large cactus very closely related to the endemic *Cephalocereus* of Key West, and on Upper Matecumbe Key which yielded a shrubby marsh-fleabane heretofore known in the United States only from Key West.

When the wind abated slightly we decided to try to reach Long Key and Vaca Key, instead of going directly to Cape Sable. However, as soon as we had gotten behind the banks that extend northward from near Lower Matecumbe Key we found smoother water, and headed the "Barbee" in the direction of Cape Sable. Soon after land had disappeared to the southward, Sandy Key came above the horizon to the northward. When opposite Sandy Key the wind shifted to the northwest and we soon found ourselves in very rough water. This condition continued until we turned eastward just south of Cape Sable and headed in the direction of the settlement of Flamingo situated on the southern shore of the Florida peninsula about eight miles east of the cape. Flamingo is the southernmost settlement on the mainland of the United States.

Having anchored off the settlement we devoted the late afternoon to collecting in the hammocks and on the prairies in the vicinity, and in the evening arranged for the coöperation of Mr. John Douthitt with his small motor boat to help us penetrate into the interior of the southern end of the Florida peninsula. At daybreak next morning we weighed anchor and proceeded eastward to the limit of deep water where we cast anchor behind Joe Kemp's Key. There we transferred a supply of food and water to our fleet of three small boats, two of them with gasoline engines, and started for a point of uncertain geographical position known as Cuthbert Lake.



Small colony of saw-cabbage palm in hammock along Cuthbert Lake. Colonies of this palm are often composed of scores or hundreds of stems so closely set as to be impenetrable. The new stems are short and leafy throughout; the older stems are tall and very slender, and bear erect or ascending flower-stalks which project above the crown of leaves at the top, as may be seen in the above print

After sailing eastward a short distance the water became very shallow, and as the tide went out our boats merely slid over soft mud covered with only a few inches of water. Having passed Shark Point* we entered a narrow bay and near its head one after another of our boats disappeared in the mangroves through a very narrow almost entirely concealed creek. There we were introduced into a strange world. Not only were there epiphytic orchids and bromeliads, but large cactus plants as well grew everywhere on the trunks of both dead and living trees. Although there was little showy terrestrial vegetation, many of the air-plants were conspicuously beautiful. The butterfly-orchid (*Cyrtopodium punctatum*) was in full bloom. Most interesting was the large cactus (*Harrisia eriophora*), with its erect, reclining, or climbing, hawser-like stems and branches, and large white flowers.

Once within the mangroves our course, for a distance of about six miles, lay through seven creeks and seven lakes. These are completely hidden one from another, and each is concealed from the traveler until he is actually upon them. The creeks are natural channels of deep water; their courses are tortuous and progress along them is much impeded by snags, beneath, on either side, and overhead.

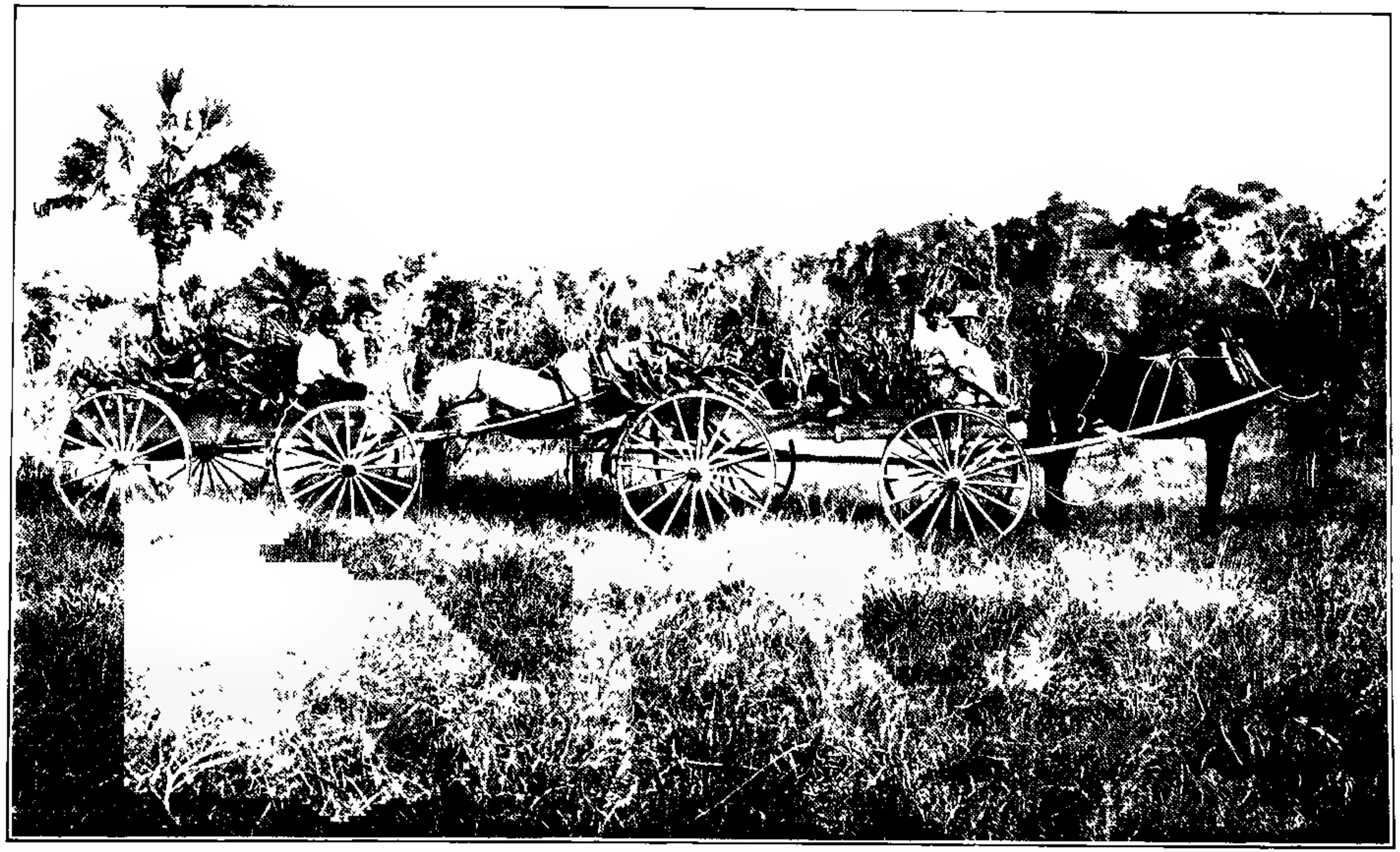
For a great part of the distance we had either to lie down in the boats in order to save our heads or to get out and pull the boats over snags. The lakes are beautiful, shallow, irregular bodies of crystal-clear salt-water. Their soft mud bottoms are almost completely covered with the most matted masses of seaweeds I have ever seen. This "Brussels-carpet"-like growth of seaweeds comes to within about six inches of the surface of the water, and is so dense as to support a man walking.

Finally Cuthbert Lake was reached. This is a fine body of water completely surrounded by banks of beautiful green mangroves. There is some comparatively high land about the lake and there in the dense hammock we came upon the object of our incursion, namely the saw-cabbage palm (*Paurotis Wrightii*), the least known and most distinctive of the palms of the eastern

* Not to be confused with Shark Point of the western coast.

United States. This palm grows in small and large clumps or colonies. Sometimes between one hundred and two hundred stems stand closely together. The older stems, resembling stout fishing-poles, reach a height of over thirty feet, and around each clump of these, starting as suckers from their bases, arise new and shorter stems. After securing as many palms and orchids as we could carry in our small boats through the creeks and lakes we started on the way back to the "Barbee." Darkness fell just as we emerged from the mangroves into the Bay of Florida and before we were half way to our destination. After proceeding a short distance both of our engines began to show signs of breaking down. Consequently we tied the three boats together so that we would not lose each other in the darkness and so that we could at least be sociable in case we should have to spend the night on the open sea in our leaky boats. The salt-spray on the exposed iron-work short-circuited the spark of the engines. Sometimes neither engine would work, sometimes one or the other would work for a while. We made haste slowly, however, and after considerable speculation and search we located a boat at anchor before midnight. Urged to quick action by the chillness occasioned by the hours of the cold ride in wet clothes, every one boarded the craft, only to find that we had taken possession of the wrong boat! On discovering our mistake we disembarked with unanimous spontaneity. The occupants of the boat were perhaps as much surprised as we were, for no resistance was offered and no attempt at arrest for our apparent act of piracy was made. We could not escape as fast as we desired, for both of our engines now positively refused to work. However, we continued our search by rowing and poling, and in less than an hour we located another boat lying at anchor, and after making sure she was the "Barbee" we boarded her without further delay. Thus ended one of our most strenuous and exciting days.

Next morning at sunrise we went ashore, and with a horse and wagon in which to carry orchids, we set out for Coot Bay which lies in the wilderness about four miles northeast of Flamingo. This region is as different from that of Cuthbert Lake as any one could imagine; and the day turned out to be the greatest orchid-



Returning to Flamingo after a day's orchid hunt in the hammocks about Coot Bay, Cape Sable region. Prairie in foreground. Hammock in background. The two wagons are filled with living plants of epiphytic orchids. A small plant of the saw-cabbage palm may be seen in the rear wagon. It was found near Coot Bay.

hunt in which any of us have ever participated. After passing through stretches of beautiful prairie and strips of hammocks we entered Snake Hammock which lies just south of Coot Bay. Unless some richer orchid locality is to be discovered in Florida, and this is possible, this hammock is the most marvelous natural orchid garden in the United States. All but one or two species of our epiphytic orchids grow there. They were not only there but grew in greater profusion and to greater size than I have ever seen them elsewhere. The most conspicuous orchid on account of size and flowers was *Oncidium undulatum*, which grew singly or in great masses; its leaves were 2-3 feet long and often over 8 inches wide. One plant of the butterfly-orchid (*Cyrtopodium punctatum*) was found with thirty-one flower stalks, each about four feet long and bearing scores of blossoms. Among other peculiarities in this hammock the poison-wood, *Metopium toxiferum*, is replaced by another poisonous tree of another family, namely the manchineel, *Hippomane Mancinella*. Numerous other species of botanical interest could be mentioned, but lack of space forbids. Before we reached Coot Bay we had gathered two wagon loads of living orchids. As we were about to send our wagon back to Flamingo and then have it return for a second load, a party of hunters appeared in the trail with a wagon-load of supplies for their boat brought into Coot Bay from the west coast. They kindly turned the horse and wagon over to us, and we proceeded back with two wagons filled with orchids. On the way back we temporarily deviated from the trail and penetrated the hammock to the westward towards Mud Lake. The further we went the more wonderful the hammock became and many interesting plants were gathered. It was late in the afternoon when we started westward and lack of time prevented us from pressing on further. Thus forced to return we reached Flamingo after sundown and stowed our orchids in a shed.

Early the following morning we made a start for our course up the western coast. The day was devoted to exploration on Cape Sable. The cape consists of three blunt projections: namely East Cape, Middle Cape, and Northwest Cape. These

points are about five miles distant from each other and are distinctive. East Cape, which projects southward, is the most southern spot on the mainland of the United States, reaching almost to latitude 25° north. Here the sand-dunes are narrow, and back of these are considerable areas of hammock. The hammocks have grown up on old sand-dunes and the low hills have never been leveled. On the higher portions of the hills large trees occur, while in the depressions are numerous shrubs, and thickets of vicious cactus plants far more difficult to penetrate than barbed-wire fences and entanglements. The sand-dunes proper at East Cape are narrow and have a line of cocoanut trees along their edge near the beach. It may be interesting to note here that there is a five-foot, or six-foot tide about Cape Sable and northward on the western coast, while there is only about half as much on the opposite side of the peninsula. The tide, too, runs around the cape like a mill-race. When we cast anchor at East Cape, the "Barbee," under the influence of the tide, stood with the stern against a gale so strong that we were puzzled before learning the reason. The rushing of the tide past the cape doubtless accounts for the deep water close to the shore.

At Middle Cape, which projects southwestward, there are wide sand-dunes behind a fringe of cocoanut trees and the hammock is quite remote from the beach. There we were successful in finding Garber's-spurge (*Chamaesyce Garberi*) which was discovered there nearly half a century ago and apparently never collected there since. Another interesting find was the tuber-bearing prickly-pear (*Opuntia austrina*) discovered at Miami some years ago.

The Northwest Cape projects westward. It has a rather steeply sloping beach and wide prairie-like sand-dunes behind the treeless beach line, and then a narrow strip of hammock before the swamps are reached. On the sand-dunes occur grasses and sedges and considerable saw-palmetto, and cabbage-palmetto, while in the hammock thatch-palms are exceedingly abundant. There is good evidence that the silver-palm (*Coccothrinax argentea*) once grew at this cape; but recent hurricanes have washed away large areas where it probably occurred. How-

On Chokoloskee Island. White surface of island is composed of weathered oyster-shells, clam-shells, and conch-shells. Gumbo limbo tree, devoid of leaves on account of drought, in foreground. Hills, each twenty-eight feet in altitude, in background. Groves

ever, further exploration may yet bring it to light. One of the numerous interesting features of the Cape Sable region is the mingling of the flora of the Everglade Keys and that of the Lower Florida Keys. The cape is on a direct line between Miami and Key West. There is good evidence that there was once a land connection from the Miami River region, which represents the northern end of the Everglade Keys, southwestward to Key West. Towards the upper part of this cape we found a beautiful black-mangrove swamp back of the hammock. This swamp resembles the one we found later back of Saw-fish hole, and it may be that the two points are extremities of a continuous line of swamps. Just above Cape Sable the red-mangrove swamp comes to the water's edge and at the mouth of Shark River about ten miles northward the Ten Thousand Islands begin and extend as far as Cape Romano, a distance of about fifty miles. It seems to be the unanimous opinion of all who have been among these islands that instead of bearing the name they have, it should be the "Ten Million Islands."

As the sun was setting we started up the western coast, and as darkness fell we anchored back of Shark Point for the night. During the night the wind shifted to the northwest and the temperature fell. The forenoon of the next day was cloudy and misty as well. After a rough passage of over twenty miles northward, we located Chokoloskee Pass and found our way into Chokoloskee Bay about noon. We were fortunate in reaching this point at high-tide. In fact, we were fortunate in finding the pass at all without the help of a pilot. The entrance to the pass is very obscure, and the winding narrow channel leading from the ocean to Chokoloskee Bay is quite shallow and obstructed with oyster bars. However, we sailed directly into the bay and surprised the natives, some of whom came aboard and kindly directed us to a safe anchorage. We at once went ashore to investigate Chokoloskee Island. The island is a kitchen-midden. It is nearly circular, comprises a hundred and five acres, and has several elevations reaching twenty-seven feet and one altitude of thirty-one feet. It consists, from about the

water-level to its maximum altitude, of shells, mainly oyster-shells, clam-shells, and conch-shells. Most of the hammock that once clothed and adorned the island has been partially or wholly cut off. What hammock there is, is rather stunted, partly on account of the lack of finely disintegrated soil and partly due to its exposed and wind-swept situation. The island, both in the condition of the natural vegetation and in the settlement consisting of about one hundred people, is unique. We were surprised to find a number of tropical plants there. The island and Cape Romano, a few miles further north, represent the limit of most of the tropical vegetation on the western side of the Florida peninsula. One West Indian plant, a relative of our poke-weed, is known to occur in our flora only on Chokoloskee Island.

On the following day the region about the headwaters of the Chokoloskee River was our objective. After crossing the bay our first stop was Turner Island, which is another kitchen-midden situated at the mouth of the Chokoloskee River. Here among other interesting plants we found one of our rarer lip-ferns, *Cheilanthes microphylla*, growing in the heaps of oyster-shells. As we ascended the river, stops were made at several small kitchen-middens on the banks. The most conspicuous plant in bloom at that season was a kind of ragwort, or *Senecio*, with very bright-yellow flower-heads. It occurred in great masses at many points on both sides of the river. The smallest kitchen-midden, and that nearest the head of the river, is known to the inhabitants of Chokoloskee and to hunters as Mt. Pleasant. It is a few inches above high-water and about large enough for pitching a small tent. The river flows through prairie, hammock, and mangrove-swamps. Near its source the channel narrows down to a stream only a few feet wide and is almost hidden by the tall cat-tails. The source is a basin-like pond, at low water only about two rods wide. Here we left our boats and made our way by an Indian trail across the prairie to the Tommy "Cypress," an area so called from an Indian named Tommy who once lived in the region. The "cypress" consists of areas of pine, palmetto, cypress, and of hammock. We passed through

Rounding Cape Sable. View from the stern of the "Barbee," while under way, looking southward. East Cape, the most southern point of the mainland of the United States, in the distance.

Source of the Chokoloskee River, with Seminole Indian canoe in foreground. Prairie, covered with saw-grass and cat-tail, in background.

one after another interesting phytogeographic area until we entered a very large and dense hammock, where we were surprised to encounter many of the shrubs and trees common in the more northern portion of the Florida peninsula. We were then in a floral region wholly different from that we had left in the morning. At this point our party separated into two; the one followed the length of the hammock in one direction and the other went through prairie, pineland, and deep cypress-swamps in the other direction and finally encountered an Indian camp in the pine-forest. After several hours of interesting and profitable exploration and collecting, both parties met near the source of the Chokoloskee River where we had left our boats.

Upon returning to the "Barbee" we weighed anchor and went several miles northward in order to investigate the kitchen-middens at Sand-fly Pass. The place is evidently well-named, for the sand-flies soon found us. At sunset we returned to Chokoloskee Island and prepared for our homeward journey.

The following morning, on a low tide, we decided to go to sea. After proceeding for a mile through the channel we ran on an oyster-bar. After several attempts to find a way through and around this bar we decided to defer our departure until high tide. When the tide came in we made our way to the Gulf of Mexico where we were greeted with a strong westerly gale and a sea so rough that we were compelled to eat our dinner off the floor of the boat instead of off the table.

Our next harbor was Lossman's Key, which is about half way between Cape Sable and Chokoloskee Pass. We made a landing on the island and searched for a reported hammock with royal-palms, but were unsuccessful in our quest. Returning to the "Barbee" we tried to locate the channel leading into Rodgers River. This river rises in the Everglades and flows through the Ten Thousand Islands into the gulf at the southern end of Lossman's Key. Darkness overtook us before we found the channel, so we anchored off shore for the night. The following morning before sunrise we started in one of our small boats for Rodgers River. This river is one of the outlets for the waters that flow from the Everglades and surround the Ten Thousand

Islands. Once above the mouth of this, as of similar rivers, one finds a confusing maze of channels winding among myriads of mangrove-clad islands, altogether a labyrinth of the first order. We ascended the river to a point where, instead of mangrove, the higher land supports hammock. There stately royal-palms rise to heights of over one hundred feet, conspicuously overtopping all other vegetation. The channels there are filled with myriads of oyster-bars which furnish an inexhaustable supply of oysters.

About noon we returned to the "Barbee" and started for Flamingo. After rounding the cape we were soon at our destination. There we delayed just long enough to readjust our cargo and load the large collection of orchids we had stored at Flamingo the previous week. When the cargo was made secure from damage by sun or salt-spray, we headed for Cape Sable again and before sunset cast anchor for the night in Saw-fish Hole about three miles east of the cape. An hour was devoted to collecting on shore in the black-mangrove hammock, where more orchids and other interesting plants were found. The following forenoon we started across the Bay of Florida, heading in the direction of Vaca Key. A short stop was made at Sandy Key for collecting. This key, an isolated sand-bar about seven miles south of Cape Sable, supports considerable hammock. Among the interesting plants we found quantities of our rarest dew-flower, the tropical *Commelina elegans*. Vaca Key we reached in due time. The next island on our course was Bamboo Key,* and, when darkness found us, we were in a small bay behind Lower Matecumbe Key, from a point near which ten days previously we had left the keys for Cape Sable. The following morning we landed on Lower Matecumbe Key and secured quantities of the rare cactus we had located there during the earlier part of our cruise. This plant, a species of *Cephalocereus*, with garlic-scented flowers, is nearly or quite similar to the one heretofore definitely known only from Key West. It was observed but not collected in a hammock on Lower Mate-

* This island was visited by the writer on a cruise earlier in the year, and its vegetation will be described in a subsequent report.

Carrying out plants of the saw-cabbage palm from Madeira Hammock. Many colonies of this palm inhabit the northern shore of Madeira Bay. Colony of palm with close-set stems in foreground on right. Dense jungle of hammock with various vines in background on left. Personae, left to right. Charles T Simpson, conchologist; John Soar, horticulturist; Paul Matthaus, Captain of the "Barbee."

cumbe Key several years ago by a member of our party, Mr. John Soar. Having devoted as much time as could be spared to this locality we moved on to Umbrella Key (Windlys Island) and Long Island. The former island is higher than the other keys, and most of it in the form of rock has gone to build the larger part of the Key West Extension of the Florida East Coast Railway. The main object of our visit to this island was to search for one of our rarest trees, the white-ironwood, *Hypelate trifoliata*. We were successful in finding a few trees in the small remnants of the once beautiful hammock. Some of these trees had a maximum trunk-diameter of fully two feet. Proceeding northward we reached Jewfish Creek about sundown and spent the night there. The next morning we started for Miami and Buena Vista, reaching our destinations without incident except for the breaking away of one of our small boats in a high sea in Barnes Sound and the consequent excitement of capturing it. For a long time this small boat defeated, with almost human intelligence, our attempts to lay hands on it.

After a period of five days, during which our living and dried specimens were cared for, a cruise to Madeira Bay was proposed and undertaken. This, as had been the cruise just completed, was partly for the purpose of finding the saw-cabbage palm (*Paurotis Wrightii*). An early start on Saturday, April 15, and a continuous run, without a stop of the engine, brought us to the mouth of Madeira Bay at the southern end of the Florida Peninsula about an hour before sunset. This hour was devoted to exploring a hammock island near the mouth of the bay. There, as in all the neighboring hammocks, the mahogany or Madeira-redwood (*Swietenia Mahagoni*) is exceedingly common. At sunrise the following morning we started in two row boats for the western end of the bay about two miles distant. It was not long before we located the palm we sought, and found it growing in great clumps, its fishpole-like stems commonly over thirty feet in height. The day we spent digging palms and exploring the Madeira hammock. Much of interest was encountered. It is a pleasure to report the rediscovery of our rarest, and a showy, passion-flower (*Passiflora pallens*). It grew

in great quantities. This plant was once found in the now extinct Caldwell Hammock on the Everglade Keys. While in the Madeira hammock, as nearly as we can calculate, we were not over three or four miles distant from one point near Cuthbert Lake we had reached several weeks previously. Having secured and gotten aboard as many palms as could be carried across the bay in our small boats, we returned to the "Barbee" with some difficulty against a strong east wind which had freshened during our absence.

When, during the afternoon of the previous day, we were approaching Madeira Bay we had noticed that the hammock was on fire; indeed the following morning we had actually crossed smoldering areas. The rising eastwind was now fanning into flame the smoldering embers, and, as we departed homeward across the Bay of Florida, we saw miles of hammock rolling clouds of black smoke skyward. This calamity was not confined to the neighborhood of Madeira Bay, but in the Cape Sable region three or four vast forest fires were to be observed, and we could see clouds of smoke drifting for many miles over the Gulf of Mexico and the Bay of Florida. Forest fires, perhaps, were more frequent in southern Florida this year than usual, as, beginning with the end of last year, there had been a prolonged drought. Little or no rain had fallen and the hammock both on the keys and on the mainland presented an unusual appearance. Shrubs and trees, that during normal seasons are never devoid of leaves were completely bare; others had dropped a large proportion of their leaves, and of those still clinging nearly all instead of standing in their normal positions, were wilted and drooping. The floor of a hammock in tropical Florida is usually quite clean, as normally the trees drop their leaves gradually, and only after new leaves have developed. Last April was the first time I ever saw those tropical hammocks so much resemble our northern woods in early winter, when fallen leaves lie a half foot deep on the ground.

The following itinerary will show our movements during the cruise:*

*Localities printed in small capitals indicate points where collections of plants were made.

March 28. Miami to Jewfish Creek.

March 29. Jewfish Creek to LIGNUM VITAE KEY, to UPPER MATECUMBE KEY, to LOWER MATECUMBE KEY.

March 30. LOWER MATECUMBE KEY to FLAMINGO.

March 31. FLAMINGO to CUTHBERT LAKE, and return.

April 1. FLAMINGO to COOT BAY, and return.

April 2. Flamingo to Cape Sable, EAST CAPE, to MIDDLE CAPE, to NORTHWEST CAPE, to Shark Point.

April 3. Shark Point to CHOKOLOSKEE ISLAND.

April 4. Chokoloskee Island to TURNER ISLAND, up to head of CHOKOLOSKEE RIVER, to Tommy Cypress, PINELAND, PRAIRIE, HAMMOCK, to SANDFLY PASS, to Chokoloskee Island.

April 5. Chokoloskee Island to LOSSMAN'S KEY.

April 6. Lossman's Key to RODGERS RIVER, to Flamingo.

April 7. Flamingo to CAPE SABLE to SANDY KEY, to VACA KEY, to BAMBOO KEY, to LOWER MATECUMBE KEY.

April 8. LOWER MATECUMBE KEY to UMBRELLA KEY, to LONG ISLAND, to JEWFISH CREEK.

April 9. Jewfish Creek to PUMPKIN KEY, to SANDS KEY, to Miami.

SUPPLEMENTARY CRUISE

April 15–17. MADEIRA BAY and MADEIRA HAMMOCK, southern end of peninsular Florida.

The purposes of the expedition were satisfactorily accomplished. Notwithstanding the prolonged drought which seriously affected vegetation, we secured large collections of living plants and of herbarium specimens. A number of West Indian plants were found for the first time in Florida, and the geographical ranges of some of our rarer native plants were more thoroughly worked out.

Our hurried examination of Cape Sable showed it to be a region where the flora of the Everglade Keys and the flora of the Lower Florida Keys, to some extent, mingle, and also to be a locality for some West Indian plants not yet known to grow on either of those areas.

The geographical position of Cape Sable in itself clearly indicates

the necessity of thorough exploration in connection with our studies on the flora of southern Florida and its relation to the flora of the West Indies.

JOHN K. SMALL.

SOME PROBLEMS IN NEW YORK STREET TREE PLANTING

The problems associated with planting and caring for shade trees in a city so large and congested as New York are, as might be expected, complicated, and if tree planting is to be attempted on a large scale it should receive most careful consideration from every point of view. To plant trees on more or less busy thoroughfares is not impossible, but such an undertaking may require much study, even by those familiar with street planting.

Any systematic planting undertaken in the congested portions of New York must necessarily be quite expensive, as compared with that in smaller cities and towns. If such is attempted it should be thoroughly done even if the area covered should have to be greatly restricted each year on account of the expense. The type of tree for each locality should be selected with the greatest care, not only as regards its conformity to some particular landscape feature, but more particularly as regards its adaptibility to atmospheric and other conditions. The presence of conduits, sewers, gas and water pipes, subways, impenetrable pavements and side-walks in the streets of New York complicate materially the problem of street planting. Also the lack of tree belts and park strips between the sidewalk and curbing and the general poor soil conditions contribute obstacles that will prove expensive to overcome. These, however, can be remedied to a large extent by the copious use of loam and by extensive trenching of the parking strip. Such strips should also be supplied with a system of sub-irrigation in order that water can be supplied below the surface during drought periods. There are innumerable detrimental agencies which affect street trees in large cities and which are not met with so extensively in towns and smaller cities. Where illuminating gas is used as extensively as in New

York, and the pipe lines carrying it are so often disturbed, not only by frequent street change and repair work, but even by the ordinary heavy traffic, the soil often becomes more or less saturated with illuminating gas, which constitutes one of the most toxic substances to plants.

New York conditions are probably the most complex for street planting of those of any city, since here there exist many obstacles not found elsewhere to the successful establishment and permanent maintenance of street trees. The atmospheric conditions are scarcely favorable, due to the presence of sulphur dioxide, a product of coal combustion, and of other gases arising from the great variety of manufacturing establishments surrounding Manhattan. The detrimental effects of atmospheric gases on street trees are generally overlooked and the ill health of many individuals is often ascribed to other causes. The pathological effects following exposure to gas indicate troubles of a chronic rather than acute nature, the trees gradually losing vigor through a series of years until they finally die. In most cases trees subject to adverse conditions linger on in a state of *malaise* or weakened vitality, thereby easily falling a prey to saprophytic and parasitic enemies. There are many instances, particularly in the large industrial centers, where the expectation of life of trees is reduced to one-half to one-third the normal, owing to the presence of noxious atmospheric gases and no amount of soil renovation or tree surgery can correct such conditions. When such is the case, only the removal of the cause will prove effectual, but much can be gained by carefully selecting gas-resistant species for planting in locations where the atmospheric conditions are such that they cause injury to vegetation. Beside the various conifers, the elms about New York show the greatest amount of injury and deterioration from atmospheric gases. Such effects are noticeable on the trees located on Riverside Drive, in Central Park, and on most of the trees of the smaller parks located in the congested sections. With the exception of the Austrian pine, practically all the conifers in Central Park are dying from the effects of atmospheric gases, and it is rarely that one observes a Norway spruce anywhere within the vicinity

of New York that is not either dead or in a state of deterioration. The latter species, however, is dying everywhere in the north and its present condition is due in part, at any rate, to other causes than atmospheric gases. Beside some actual burning of the foliage which can occasionally be observed on some species of trees in the region where atmospheric gases are abundant, a stunted growth occurs as a result of gas poisoning. Many of the elms in New York are characterized by small leaves, and the base of the tree, the portion near the ground, is relatively much thicker than the portion of the shaft higher up. This condition, of course, prevails in trees suffering from other causes, such as poor soil conditions, but it is also characteristic of trees in a more or less chronic state of ill-health following exposure to atmospheric gases. There are innumerable trees to be found in Manhattan which have been affected by illuminating gas, caused by leakage in the soil, beside the many that are suffering from the deteriorating effects of severe drought so prevalent during the past few years.

Many of the elms formerly set out on streets and in parks are extremely deplorable specimens. It is a question whether many of them should not be removed and replanted by better types. Some of them are so inferior that it is difficult to conceive where they may have originated, although it is possible and not unfair to assume that some trees have been ruined by early injudicious pruning, and others are in part the product of poor environment and general lack of care. Excellent types of elms, maples, etc., can be found growing in The Bronx, and the unusually large number of fine specimens of trees of all descriptions growing in the New York Botanical Garden indicate that the atmospheric condition in The Bronx section are well suited for the growth of trees. From the appearance of the conifers in such localities as Central Park, it is only too apparent that it is quite impractical to continue the planting of these trees in general in congested regions on account of the unfavorable environment caused by the presence of atmospheric gases. It is, moreover, doubtful whether the American elm should be utilized in planting in extremely congested regions, owing to its susceptibility to

drought, poor soil conditions, and atmospheric gases. The Norway maple seems to tolerate congested regions as well as any of the types of trees recently planted in New York; and the black locust and ailanthus endure the presence of atmospheric gases as well as any. The sycamore is also fairly immune from troubles common to thickly settled communities. The linden has the reputation of tolerating more or less severe conditions, the species known as *Tilia platyphyllos* being regarded as most superior as a shade tree. All the lindens, however, show better development in the vicinity of New York than in New England, where they are generally affected with frost cracks and are usually short-lived.

GEORGE E. STONE

AMHERST, MASS.

"NORTH AMERICAN FLORA"

The completion of Volume 9 of *North American Flora*, accomplished in October by the publication of its seventh part, is a noteworthy event in the progress of this undertaking. The volume consists of 542 pages and is entirely given to descriptions of the larger fungi of North America, in the three families Polyporaceae, Boletaceae and Agaricaceae. Most of it is written by Dr. W. A. Murrill, Assistant Director, with shorter contributions by Dr. Gertrude S. Burlingham and Mr. Leigh H. Pennington. The volume is supplemented by a bibliography by Dr. John H. Barnhart, Bibliographer, and is copiously indexed.

A memorandum of the history of this work is not out of place at the present time. Publication was commenced in 1905, by the issue of the first part of Volume 22, and parts of various volumes have since appeared, at average intervals of a little more than four months, 11 of the 34 volumes planned being now represented by one or more published parts, 29 parts of the work in all having been issued. In addition to the monographic work of members of the Garden staff, the cooperation of a large number of experts stationed at other institutions has been obtained and work at the present time is progressing on about

20 more parts, scattered through various volumes. North America, for the purpose of this work, is taken in its broadest sense, from the arctic regions south to the northern boundary of Colombia, and including all the West Indies except Trinidad, Tobago, and other islands off the northern coast of Venezuela, whose flora is essentially South American.

An edition of 500 copies of this work is published, and the regular subscription at the present time, which is largely from libraries, is 204. The work is supplied to regular subscribers at $1.50 a part, and a limited number of separate parts are sold at $2.00 each.

NOTES, NEWS AND COMMENT

Professor Francis E. Lloyd, of McGill University, Toronto, visited the Garden for several days while returning from a season's work at the Coastal Laboratory of the Carnegie Institution at Carmel, California.

Mr. E. H. Costick, of Hicks Nurseries, Westbury, N. Y., spent several days at the Garden last month consulting the herbarium for localities of many native shrubs and trees of this vicinity with a view of introducing them into cultivation.

Mr. C. G. Lloyd, of Cincinnati, recently visited the Garden, making a study of some of the woody fungi.

About sixty pupils from the senior class of Morris High School spent the afternoon of October 4 at the Garden studying methods of propagation in plants and some of the principles of plant breeding under the direction of Dr. A. B. Stout, Director of the Laboratories. They were accompanied by Dr. Peabody and guided through the grounds by Mr. Percy Wilson.

The third (September) number of Addisonia, the Garden periodical begun in March of this year, contains colored illustrations, with descriptive text, of the following flowering plants: *Adoxa Moschatellina*, *Sisyrinchium Bermudiana*, *Columnea hirta*, *Pedilanthus Smallii*, *Cremnophila nutans*, *Pithecolobium guadalupense*,

Anthurium grandifolium, Epidendrum paleaceum, Begonia Williamsii, and *Oncidium urophyllum.*

It is with sorrow and regret that the announcement must be made of the death, on October 19, of Mr. Fred T. Hyam, for many years connected with the gardening force of this institution. Mr. Hyam served in the Spanish-American War, being detailed for duty in the Philippine Islands. He came to the Garden as an apprentice early in 1903, and was transferred to the rank of gardener in November of the following year, remaining in that position until March, 1905, when he resigned. He again entered the service of the Garden in May, 1908, and remained here continuously until the time of his death. His knowledge of gardening and horticulture was acquired during his service here. In June, 1913, he was placed in charge of the range of propagating houses, a service which he satisfactorily fulfilled until the time of his death. He was especially successful in the care and cultivation of the large collections of cacti. He was of genial disposition, took a keen and active interest in horticultural matters, and performed his duties faithfully and intelligently. His services will be much missed.

Meteorology for October.—The total precipitation for the month was 0.87 inches. The maximum temperatures recorded for each week were 77° on the 8th, *84° on the 10th*, 74° on the 17th, and 67° on the 28th. The minimum temperatures were 40° on the 3d, 33° on the 15th, *32.5° on the 18th and on the 27th*. Local and slight killing frosts occurred on the mornings of the 18th and 27th.

ACCESSIONS

MUSEUMS AND HERBARIUM

250 specimens of flowering plants from California. (Collected by Dr. A. A. Heller.)

5 specimens of hepaticae from New York and New England. (By exchange with Miss Annie Lorenz.)

455 specimens of flowering plants from Mexico. (By exchange with the Herbarium of Prince Roland Bonaparte.)

1 specimen of lichen from Cuba. (By exchange with the Field Museum of Natural History.)

16 specimens of mosses from the Bahamas. (By exchange with Mr. L. J. K. Brace.)

28 specimens of mosses from Tolland, Colorado. (By exchange with Dr. A. J. Grout.)

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

2 specimens of mosses from Milton, Massachusetts. (By exchange with Mrs. H. C. Dunham)

3 specimens of mosses from the Himalaya Mountains, Asia. (By exchange with Mr. R. R. Stewart.)

3 specimens of mosses from New Mexico and Florida. (By exchange with Professor J. M. Holzinger.)

147 specimens of flowering plants from Illinois. (By exchange with Mr. I. W. Clokey.)

14 specimens of flowering plants from California. (By exchange with the University of California.)

21 specimens of crude drugs. (Given by Dr. H. H. Rusby.)

3000 specimens of flowering plants from the central Rocky Mountain region. (Collected by Dr. F. W. Pennell.)

400 specimens of fleshy fungi from Arkville, New York. (Collected by Dr. W. A. Murrill.)

1 specimen of *Lactaria controversa* from Wyoming. (By exchange with Dr. Gertrude S. Burlingham.)

1 specimen of *Polyporus amygdalinus* from Alabama. (By exchange with Dr. R. P. Burke.)

79 specimens of fungi from Alabama. (By exchange with Dr. R. P. Burke.)

30 specimens of fungi from New York. (By exchange with Mr. Stewart H. Burnham.)

1 specimen of *Elfvingia megaloma* from Vermont. (By exchange with Mr. George M. Thomas.)

15 specimens of fungi from Jamaica. (By exchange with Dr. C. H. Farr.)

3 specimens of fungi from Pennsylvania. (By exchange with Mr. A. S. Rhoads.)

15 specimens of fleshy fungi from the New York Botanical Garden. (Collected by Dr. W. A. Murrill and Dr. H. D. House.)

1 specimen of *Urophlyctis pluriannulis* from Illinois. (Given by Mr. Percy Wilson.)

1 specimen of fungus from New York. (By exchange with Professor H. M. Fitzpatrick.)

6 specimens of woody fungi from New York and Pennsylvania. (By exchange with Dr. David R. Sumstine.)

6 specimens of fungi from Long Island. (By exchange with Dr. Gertrude S. Burlingham.)

13 specimens of fungi from Indiana. (By exchange with Professor George N. Hoffer.)

18 specimens of mosses from New Mexico. (By exchange with the United States National Museum.)

48 specimens of mosses from Cuba. (By exchange with Brother Leon.)

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JOURNAL

OF

The New York Botanical Garden

EDITOR

FRANCIS WHITTIER PENNELL

Associate Curator

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JOURNAL

OF

The New York Botanical Garden

VOL. XVII December, 1916 No. 204

THE DEVELOPMENT OF THE HORTICULTURAL VARIETIES OF COLEUS

The early history of the cultivated varieties of *Coleus* shows that the original species utilized in cultivation and hybridization were few in number and relatively simple in respect to diversity of color patterns and leaf-shape. The variations which appeared within a few years after introduction gave a wide range of variability, with greater extent than the extremes of the characters in the original species.

It appears that the first variegated species of *Coleus* introduced into European cultivation was *Coleus Blumei* Bentham. The original description, published in 1826 under the name *Plectranthus scutellarioides*, states that the leaves were spotted above with dark purple (folio supra maculis atropurpureis picta). This plant was introduced into Holland in 1851 and the next year a brief description of it was published, accompanied by a colored plate. It was soon introduced into England, and in 1853 a description with a colored plate also appeared in Curtis's *Botanical Magazine*. These two illustrations agree quite closely, although the latter shows the plant in somewhat a brighter green, with leaves with a somewhat more solid mass of central red. The central areas of the upper surfaces of the leaves were dark purple or sanguineous, breaking into spots near the margin. In the description it is stated that the leaves were entire at the base, "which is gradually attenuated into a more or less elongated petiole," a character well shown in the accompanying outline drawing of a leaf.

[Journal for November (17: 189–208) was issued November 20, 1916.]

There are no specimens of this species in the Bentham collections at the Kew Herbarium. There is, however, a specimen in Herb. Hookerianum with a label in Sir William Hooker's handwriting, stating that the plant was grown at Kew Gardens and citing the description and plate in the *Botanical Magazine*. This was evidently regarded by Hooker as a typical specimen. The leaf-shape is identical with that of the illustration referred to.

Morren in 1856 describes the variety *C. Blumei pectinatus* as somewhat more richly colored, but differing chiefly in having the leaves deeply and doubly lobed. The colored plate shows that the base of the leaf-blade was cuneate, as in the parent species.

Coleus Verschaffeltii was first named in 1861 by Lemoine, who decided that it was distinct from *C. Blumei*. It appears that this plant was introduced into Rotterdam in 1860 from Java. Colored plates (Ill. Hort. **8**: *pl. 293*, and Flor. Mag. **2**: *pl. 96*) show that the leaves of this species were richly and deeply colored with crimson on both surfaces and that the bases of the leaf-blades were not cuneate but heart-shaped. Being richer in color than *C. Blumei*, this plant attracted considerable attention as a foliage plant. In 1864 (Gard. Chron. p. 506), a sport of this species called *marmoratus*, with bright green patches in its leaves, was described.

Concerning *C. Verschaffeltii* Herincq remarks, in 1865, that the expression of red coloration fluctuates with conditions of light and suggests that one might eliminate the red by keeping the plants in the shade. Later, in 1866, he notes fluctuations that are less due to environment, for he observes variations in the leaves of a single plant and states that no doubt selection of cuttings would give pure-green plants. He mentions that he had seen a young plant having no trace of red coloration.

Two types of *Coleus* destined to play an important part in the development of horticultural varieties were introduced into England from New Caledonia by John G. Veitch. Although briefly mentioned in 1866, they were first described and illustrated in 1867. One of these, which was named *C. Gibsonii*, was of a dwarf bushy habit. The leaves were large and "of a

light-green color, distinctly veined and blotched with dark crimson-purple." The plate clearly shows that the margins of the leaves were only slightly crenate and that the bases were broadly cordate. The other, *C. Veitchii*, possessed leaves quite similar in shape to that seen in *C. Gibsonii*, but with the entire central portion of the leaf of a deep chocolate color with the edges green.

These four species, *C. Blumei*, *C. Verschaffeltii*, *C. Gibsonii*, and *C. Veitchii*, were used as parents in the production of hybrids by F. Bause, in the employ of the Royal Horticultural Society of London. Twelve hybrids, of which *C. Verschaffeltii* was the seed parent, resulted from the first year of hybridization work. Rather extended descriptions of these are given by Thomas Moore in 1868. Plants of the F_1 progeny, even from the same parentage, were widely different, some resembling the seed parent, while others resembled the pollen parent. In regard to leaf-shape, there were two groups; one with flat crenate leaves, as in *C. Veitchii*, and one with frilled-dentate leaves, as in *C. Verschaffeltii*. In colors there were various shades of purple in solid colors, blotched areas, and in reticulations. At the time, this variation among the F_1 progeny aroused considerable interest. One anonymous writer (Gard. Chron. 33: 407) raises the question how several kinds of *Coleus* could originate from the same cross. Only one hybrid with *C. Blumei* as the parent is reported. This had frilled leaves, but the coloration was much like that of *C. Blumei*. It was less deeply colored than the hybrids resulting from the other pollen parents.

There is no mention of the presence of yellow colors in any of these hybrids. All were bi-colored, but with striking combinations of green and various shades and amounts of purplish or red colorations. They were sold at auction (Gard. Chron. 33: 432) for the aggregate sum of £390. One hybrid brought 59 guineas.

The production of these valuable variegated *Coleus* varieties stimulated further hybridization work. William Bull soon produced eighteen different types (reported by Herincq, 1868), and in November of that year he advertised pedigreed seed from twenty crosses involving fourteen varieties grown that year (advertisement, Gard. Chron. 33: 1232. 1868).

Meanwhile, at the gardens of the Royal Horticultural Society, a new series of hybrids were produced much finer than those of the previous year. The parentage of these interesting hybrids is not fully given, but it is stated that certain of the hybrids of the previous year were crossed with *C. Blumei* itself. In this second lot of hybrids, yellow coloration appeared as a new or spontaneous development. Eight (Gard. Chron. 33: 1210. 1868) possessed distinct yellow which in some cases formed a golden margin. Two (Prince Arthur and Princess Beatrice) are described as having a yellowish ground-color. Most of them had a yellow and green ground-color overlaid with shades of purple or crimson red. The most brilliant of the series was named Queen Victoria, a colored plate of which appeared as a frontispiece in the *Florist and Pomologist* (volume for 1869). This plate shows that the ground-color was mostly yellow, overlaid by an epidermal red, appearing crimson over the yellow and entirely covering the upper surface of the leaves except at the margin. None of the series possessed frilled leaves. The leaves of all were flat, with crenate teeth somewhat deeply cut. Although of much more remarkable variegation than the hybrids of the previous year, nine of these new coleuses brought but 65 guineas.

While the yellow element in the variegation appeared strongly in this second lot of hybrids, it should be noted that in the year 1867 (Gard. Chron. 33: 460) a golden *Coleus* arose as a bud-sport from *C. Blumei*. It is described as like *C. Blumei*, but with the green exchanged for a decided yellow tint. The sport appeared in one half of a single leaf. The bud at its base was propagated and gave the new variety. It does not appear that this sport was used in the hybridization work that produced the golden coleuses.

During 1868 and 1869, the various horticultural publications mentioned by name no less than fifty-four new varieties of *Coleus*. For several years thereafter few varieties were mentioned, but in 1878 (Gartenflora, p. 50) thirteen forms not previously mentioned are listed. The next year this journal (pp. 341–346) states that breeding of *Coleus* had been carried on in Germany, speaks of new forms that arose, and prints an uncolored plate

illustrating four types. New types were also credited to Bull (Rev. Hort. Belg. 5: 49; Gard. Chron. 45: 748. 1879).

At the exposition in Paris in 1879, Morlet exhibited varieties described as far surpassing all previous varieties. These had enormous foliage, with remarkable combinations of shades of carmine, yellow, and green. Twenty forms are mentioned by name and twelve of these are described.

Pynaert in 1881 states that about 250 varieties of *Coleus* had been put upon the market. He notes that it is difficult to establish a nomenclature for the various *Coleus* varieties. He describes and illustrates in color a variety called Reine des Belges which arose from seed of the variety Duchess of Edinburgh, a variety illustrated in the *Floral Magazine* in 1874. The leaves of the Duchess of Edinburgh possessed a yellow border; the Reine des Belges had the yellow in the center of the leaves. The relative position of the green and the yellow was therefore reversed.

From the evidence at hand, it is clear that a large number of types of *Coleus* have been produced. Probably the same type or nearly identical types have been given different trade names. With the exception of the first hybrids produced by Bause, there is almost no record of the parentage of most types. The plants attracted attention solely on account of their variegated foliage, and for a time were more extensively used as bedding and foliage plants than they are at the present time.

From the standpoint of horticultural practice as well as of the scientific study of heredity and variation, it is suggestive that such wide variation appeared in the cultivation and hybridization of the four species already discussed. It should be recognized, however, that there is the possibility that other species were concerned in the parentage of some of the varieties now in cultivation. The leaves of all the parent species possessed a green background, or at least were without pronounced yellow. The epidermis especially was more or less colored with purple or red in *Blumei*, *Verschaffeltii*, and *Veitchii*, while in *Gibsonii* the purplish coloring was largely confined to the veins.

In the varieties derived from these, yellow appeared as a pronounced part of the coloration. Some types were largely

yellow, others were pale yellow, and others were entirely green. In many the yellow was localized at the border of the leaves, but in others it was at the center and in others the yellow blotches were well distributed. These variations in yellow and green were combined with variations in amount and quality of epidermal and internal (chiefly in veins) development of purplish and red tints.

Coleus Blumei, as stated above, was already in cultivation in Java when described by Blume. Blume (1826) suggests that the plant named by him *Plectranthus laciniatus* may have been simply a variety, as it seems to have differed largely in having laciniate leaves. Blume's original description speaks of the leaves of *C. Blumei* as spotted above, but the colored plates appearing in 1852 and 1853 show the greater part of the upper surface of a solid purplish color. *Coleus Blumei* was introduced into the German gardens under the name *Plectranthus concolor* var. *picta*. Only in one of Bause's first lot of hybrids was *C. Blumei* concerned, but this species was, it is stated, the seed parent of the second lot of hybrids. If this hybrid was used in further hybridization work there is no record. It was the least brilliantly colored, possessed no yellow, and sold for the sum of 5 guineas, which was the lowest sum paid for any one of the twelve hybrids (Gard. Chron. 33: 432. 1868). I have been unable to find further mention of this hybrid, which was named *Reevesii*.

C. Blumei produced in 1868 a bud sport with the green changed to a decided yellow tint. Through propagation this gave rise to the variety *Telfordi* (Gard. Chron. 33: 460. 1868).

In 1880, André illustrated and described four new varieties, which he attributed to *C. Blumei*. Apparently all have, however, leaves with cordate bases and not at all cuneate, as is the case in *C. Blumei*, which makes his determination of doubtful validity. The same is true of the type Gloire de Dijon, described and figured by Rodigas in 1888. Rodigas later (1892) noted the wide variability obtained from the seed progeny of what was considered as *C. Blumei* from Chile. The four derived types, which he illustrated, possessed, however, strongly cordate leaves, which make the identity with *C. Blumei* doubtful.

At the present time it does not appear that any pure strains

of *C. Blumei*, *C. Gibsonii*, or *C. Veitchii* are in cultivation. The writer inquired about and observed all types of *Coleus* available at numerous botanical gardens and nurseries during a six week's trip to Germany, Holland, and England during the summer of 1914. Only one plant—a plant observed at the Royal Botanic Gardens at Regent's Park, London—was seen which had the *Blumei* type of leaf. *Coleus Verschaffeltii* is, however, quite generally in cultivation at the present time and agrees quite closely with the type first described. It is somewhat doubtful if any of these parent species (or perhaps so-called species?) are in existence in the wild state at the present time. Regarding *Coleus Blumei*, Dr. J. C. Konigsberger, director of the 's Lands Plantentuin at Buitenzorg, Java, states in a recent letter to the writer that "*Coleus Blumei*, as figured in Curtis's *Botanical Magazine* is at present not represented here." This may raise some questions regarding the origin of the plants Blume described and even raise some doubt as to the validity of the species.

The writer has studied bud variations in a strain of plants which very closely agrees in the peculiar character of the leaf-shape as well as in the flower characters with the descriptions of *C. Blumei*. This strain is one that has been in cultivation in the New York Botanical Garden for some ten or fifteen years, and previous to that it was cultivated for many years at the homestead of the Britton family on Staten Island. The method of propagation has been almost exclusively vegetative by means of cuttings.

In the efforts to trace the history of the hybrids referred to above, the writer has been aided by Mr. F. J. Chittenden, the present secretary of the Royal Horticultural Society. Mr. Chittenden obtained a statement (a letter to Mr. Chittenden) from Mr. B. Wynne, in which he states that he spent three months of his time (as a student) at Chiswick in 1866, under Bause, in the propagating department. He was quite familiar with the methods used in the development of the hybrid coleuses and states that "it fell to my lot to convey the first half dozen coleuses sold to Steven's rooms." Mr. Wynne refers to the description (see reference above) of the hybrids as adequate. In regard to

the present existence of these hybrid types, Mr. Wynne gives the following statement:

"I am unable to say whether there is more than one of the Chiswick-raised set of *Coleus* in existence now, but I very much doubt it. It is very interesting, however, that at least one of them has survived and is still grown for Covent Garden and possibly for other markets. This is the variety originally named Queen Victoria, which received a first-class certificate (R. H. S.) in the autumn of 1868, and was bought at the second sale by the now extinct firm of John and Charles Lee, of Hammersmith. I do not think it is now known in the market by its original name, but it is the well-known variety with chocolate leaves and golden segments and I have no doubt about its identity with our old Chiswick plant."

It should be noted that Wynne's description of this form as "chocolate leaves with golden segments" does not agree with the colored plate in the *Florist and Pomologist* for 1869. The latter represents the pattern as solid crimson in the center, with a well-defined yellow border. Efforts to obtain living plants of this strain for observation at the New York Botanical Garden have not thus far been successful.

While *Coleus* is now regarded with less favor than it formerly received, there are many types in cultivation exhibiting great range of color patterns and leaf character. At Erfurt, Germany, during the summer of 1914, the writer saw large collections of *Coleus* grown for seed for the trade. In the Ernst Benary collections they were chiefly of large-leaved, small-leaved, and fringed-leaved types. In the large-leaved plants the yellow, if present, was usually in the center, a condition which was true without exception for the plants with small leaves. The fringed-leaved types possessed most curious doubly-cut proliferations about the margin. Of the entire collection hardly any two plants were alike as to color distribution. There were, however, fewer classes in regard to leaf-shape. One of the newer types was a dwarf with fringed leaves derived by selection.

At the greenhouses of Haage and Schmidt there were two rather definite types with laciniate leaves. One known as

"*salicifolia*" has narrow, slender, quite irregularly-lobed leaves. Another is "*quercifolia*," with broad leaves coarsely cut with round-tipped segments. Their large-leaved types, entire and fringed, showed great diversity of color patterns. The plants are grown for seed, and in producing stock for seed parents selections are made with special reference to leaf-shape and general habit of growth. In general no selection is made with reference to color patterns and each type usually exhibits wide variation in this respect.

From the history of *Coleus* it seems quite clear that the numerous and diverse varieties have arisen from few species. These varieties exhibit many characteristics of coloration and leaf-shape that were not possessed by any of the parents; for example, there is no evidence that a yellow element of variegation was present in any of the parent species. In leaf-shape also, many new types have arisen. Hybridization and rather intense and artificial cultivation have been associated with the development of such diversity from plants comparatively simple.

The ease with which these various types may be established by the selection and propagation of bud variations is well shown by the studies made by the writer. A single strain was propagated vegetatively in two main lines of descent for three years. The plants exhibited both gradual fluctuations and sudden mutations, giving a total of sixteen distinct and characteristically different color patterns. These involved increase and decrease of green and yellow, increase and decrease of red pigmentation, reversals of the relative positions of green and yellow by which a type with leaves with yellow center and green border was derived from one having green center and yellow border, and changes in the distribution of the red pigmentation. Progeny of eleven types were grown through from two to six generations, and these exhibited sufficient constancy to be considered good horticultural races. Considering the various types of color patterns in varieties of *Coleus* as a whole, the wide range of variability which they exhibit was in large measure realized in the bud variations which appeared in the writer's cultures.

There were also variations, mostly fluctuating, in leaf-form.

The striking feature of these was the marked tendency for the production on the same plant of deeply laciniate leaves during winter, while in summer the leaves were of the usual form. In this case the leaves on a single plant fluctuated from entire to extremely laciniate, giving various leaf-shapes quite similar to those of the "*quercifolia*" and "*salicifolia*" varieties.

In seed progeny and in bud variations the single strain of *Coleus* investigated has in the three years of observation shown the same types of variation that have developed in the entire series of cultivated varieties.

The foregoing account of the history of the cultivated varieties of *Coleus* has already been published along with a detailed account* of observations which the writer has made on *Coleus*. The colored plates there included illustrate most excellently the different types of variations referred to above.

A. B. STOUT

EXPLORATION OF APPLE ORCHARD MOUNTAIN, VIRGINIA

This mountain is located eighteen miles north of Bedford, Virginia, and is the highest mountain in the conspicuous range containing the Peaks of Otter, which are about 4,000 feet high, while Apple Orchard is 4,200. I left Bedford on Tuesday morning, October 24, and drove in a buggy to the foot of the mountain and walked the remaining four miles up the mountain side, covering about 3,000 feet elevation in less than three hours. The road is very rough and steep and it is more pleasant to walk than to ride.

A very pretty trout stream was followed to its source near the summit of the mountain, where there is a camp owned by Mr. Patterson. The camp consists of three small cabins of logs with a stable and a few other buildings, and a considerable area adjacent is cultivated in corn, apple and peach trees, etc. The

* Stout, A. B. The establishment of varieties in *Coleus* by the selection of somatic variations. Publication no. 218, Carnegie Institution of Washington.

name of the mountain was suggested by a grove of large chestnut trees resembling an apple orchard. Mr. Patterson has also trimmed up a number of shoots in burned-over ground and is developing an extension of this orchard. The chestnut canker is in the valleys to the south and to the north of the mountain but has not yet extended above the valleys. I was very comfortably located in one of the log cabins and Mr. Patterson set an excellent table. The nights were cool, about freezing temperature, and the days perfectly delightful.

The woods were found to be mostly oak-chestnut intermixed with a number of other trees, such as hickory, sassafras, maple, and witch hazel, the last then in full flower. Near the camp a large swamp, which formed the source of the trout stream, was filled with *Rhododendron* and mountain laurel, and many old hemlock trees were also found there. A number of interesting plants which grew in this swamp did not occur in the woods adjoining, among them a *Botrychium* and several species of violets. The conditions on the north side of the mountain along a brook leading to the waterfall were similar to those found in this swamp and many of the plants were the same. There is more moisture, however, on the north side of the mountain and this makes considerable difference in the flora. The northern species of turtlehead, *Chelone glabra*, grew luxuriantly along this brook, the large, evergreen rosettes being very conspicuous. Rosettes of the evening primrose, *Oenothera*, were found in open woods on the trail to Black Rock. *Rhododendron catawbiense* was very common near the summit of the mountain, forming dense thickets either alone or mixed with mountain laurel. In some of these thickets that were not shaded by forest trees, interesting heath plants were found, such as blueberry, huckleberry, and azalea. *Pyrola americana* was found in one of these thickets. In the open field adjoining the older chestnut orchard, a species of violet was common. The crop of chestnuts was very light this year but I never saw so many acorns, especially on the red oak. This tree was unusually abundant and extended to the very summit. The cucumber-tree, *Magnolia acuminata*, was found on the north side of the mountain at about 2,700 feet elevation.

The summit of the mountain, running east and west, consists of masses of granite rock, with some grass, a few stunted red oaks, thickets of hawthorn, willow, dogwood, hazelnut, etc. The common polypody fern was abundant on the rocks, and a few clusters of the marginal shield fern grew in shaded places. Just over the top of the mountain to the north, where it was cool and moist, the Alleghany birch was abundant and of quite large size. I saw at a distance what appeared to be a tree of mountain holly with an abundant crop of red fruit. The mountain ash was scarce and without fruit this year. The single species of hawthorn, *Crataegus neofluvialis*, grew in a dense thicket on the very summit. The plants were about five feet high and loaded with fruit, a considerable quantity of which was collected for planting. The dogwood grew in a dense thicket, the plants being about three feet high and having the habit and appearance of the maple-leaved viburnum, only the fruits were white. A large thicket of hazelnut was found nearby and Mr. Patterson told me that both species of this shrub grew there and that he had often gathered the fruits, though none were obtained this year. The willow was less abundant than the other shrubs.

The summit of the ridge at Black Rock, about 1½ miles west of the camp, is similar in most respects to the one described, although it is about 600 feet lower. Many of the floral elements here are the same as are found on Bald Knob, 4,444 feet elevation, 18 miles north of Blacksburg, Virginia, in the Alleghany Mountains, where the rocks are very different geologically but contain no limestone. The general region about Blacksburg is much colder than at Bedford and the plants on Bald Knob are much more dwarfed in consequence.

All the species of fungi seen were collected, but it was too late in the season to find more than a small percentage of the fleshy kinds. The weather was no colder than in New York, but the season was earlier and the fungi had nearly all disappeared. In the open fields I found *Bovista pila* and a small white species of *Clitocybe*. On the summit, 4,200 feet elevation, *Inonotus radiatus* occurred on dead birch and *Hydnum caput-ursi* on decaying trunks of oak. The sulfur-colored polypore was common in the

woods on oak and chestnut logs but it was too much decayed to be edible. *Pyropolyporus igniarius* was found once on birch, while *Fulvifomes Robiniae* was rather common on black locust. *Trametes robiniophila* was found on locust at Bedford but not in the mountains. The only species eaten was the brick-top, which was rather common on deciduous logs and stumps. At Bedford, I found *Rostkovites granulatus* and *Russula rubrotincta?* in an open pine grove in sufficient quantities to be used as food. This species of *Russula* was particularly good, and, on account of the cool weather, was free from insects.

Sixty species of fungi were obtained, a list of which will appear in the January *Mycologia*. A list of the chief flowering plants will be submitted to *Torreya* for publication. A number of living plants were shipped to the Garden by express and these have been planted in the woods east of the shrub collection. The summit of the mountain was carefully studied so that it might be reproduced here if desired.

W. A. MURRILL,
Assistant Director

DAHLIA EXHIBITION

A Dahlia Exhibition was held in the Museum Building on Saturday and Sunday, September 23d and 24th, 1916. The premiums offered were from the income of the William R. Sands Fund. There were both classes open to all, and classes restricted to non-commercial growers.

In the open-to-all classes, the first prize for the largest and best collection was won by Mr. C. Louis Alling, the second by Messrs. Mills & Co.; the latter also secured the second prize for a vase of twelve cactus blooms, and likewise for a vase of twelve peony-flowered blooms. In the class for twelve blooms decorative, the first prize went to Mr. W. A. Manda, the second to Mr. Alling, and the third to Mills & Co. In the class for twelve blooms show or fancy, Mills & Co. obtained first. Mr. William

Shillaber, J. P. Sorenson, gardener, won first for a vase of twelve blooms of pompons, Mr. Alling second, and Mills & Co. third; the last also won first for a vase of twelve blooms, single or collarette, Mr. Alling taking second in the same class. A fine vase, arranged for effect, brought the first prize to Mr. Linane, the second to Mills & Co.

In the classes for non-commercial growers, the first for the best collection went to Mrs. W. G. Nichols, Geo. N. Sullivan, gardener, the second to Dr. M. A. Howe, and the third to Mr. E. D. Adams, W. H. Waite, gardener. In the class for eight blooms, cactus, Dr. Howe won first, Mrs. Nichols second, Mr. Linane third. In the peony-flowered classes, a vase of eight blooms gave the first to Mrs. Nichols, the second to Mrs. F. A. Constable, Jas. Stuart, gardener, and the third to Mr. Linane. A fine vase of eight blooms, decorative, won for Mr. Adams the first prize in that class, the second prize going to Dr. Howe, and the third to Mrs. Nichols. Mr. Adams won the first prize for a vase of eight blooms, show or fancy, Dr. Howe second. In the class for eight blooms, pompon, Mr. Linane received first, Mr. Shillaber second. A vase of eight blooms, single or collarette, obtained for Mrs. Nichols first prize in that class, the second going to Mr. Linane, the third to Mr. Adams.

The following special prizes were awarded: Mr. Alling, for a yellow peony-flowered seedling, "George E. Alling," certificate of merit; Mr. Adams, for vase of new seedling dahlia, "Rohallion," certificate of merit; Mrs. Constable, for specimen of *Cattleya labiata*, silver medal; for vases of perennials and a plant of *Pancratium*, cash; Mr. Robert Petrie, for vase of a new dahlia seedling, certificate of merit; Messrs. John Scheepers & Co., Inc., for seedling dahlia, "Sunshine," certificate of merit; Messrs. Lager & Hurrell, for a plant of *Cattleya Hardyana rosea*, certificate.

The judges were: Messrs. Robert Petrie, J. A. Manda, John E. Lager, and John Scheepers.

GEORGE V. NASH.

CONFERENCE NOTES FOR NOVEMBER

The November conference of the scientific staff and registered students of the Garden was held in the main laboratory of the museum building on the afternoon of November 1. The hour was occupied with the presentation of the following program: "The distribution of the subalpine plants of the Rocky Mountains in comparison with that of the alpine and montane plants," by Dr. P. A. Rydberg; "*Elvela infula* and *Gyromitra esculenta*," by Dr. F. J. Seaver.

Dr. Rydberg discussed at length the distribution of the subalpine plants and compared their distribution with that of the alpine plants growing at higher, as well as with that of the montane species growing at lower altitudes.

The number of species found above the timber-line is about 350. Of these about 250 are truly alpine and the rest are such subalpine species as have immigrated into the Alpine Zone. In the Subalpine Zone are found about 800 species, but of these perhaps not more than 250 are characteristic subalpine species. The number of species in the Montane Zone or Pine Belt is nearly 2,000, but only about one half of these are characteristic of that Zone.

The plants of the Rockies may be divided into three categories: (1) Transcontinental species, (2) Species common to the Rockies and one of the other two provinces, Appalachian and Pacific, of North America, and (3) Endemic species. In the Alpine Zone the transcontinental plants constitute about 30 per cent. of the species, in the Subalpine Zone about 20 per cent., in the Montane Zone perhaps 15 per cent., in the Submontane still smaller, and in the Sonoran Zone practically none.

The plants common to the Rockies and the eastern highlands, if the transcontinental ones are excepted, are very few; in the Alpine and Subalpine Zones none, in the Montane Zone few, but increasing in number in the Submontane Zone.

The plants common to the Rockies and the Pacific mountains are more numerous. They constitute in the Alpine Zone less than 10 per cent., in the Subalpine Zone about 20 per cent., and

in the Montane Zone perhaps about the same, but if the Cascade species which have invaded the western slope of the northern Rockies are excluded, scarcely half as large a per cent. They may be divided into the following categories: (1) Plants about equally common in both; (2) Rocky Mountain plants that have invaded the Pacific highlands, especially the northern portion, the Cascades; (3) Pacific plants which have immigrated into the Rocky Mountains, especially the Northern Rockies. Of these the first category is best represented in the Alpine Zone, less so in the Subalpine, and least in the Montane. Of the Rocky Mountain plants, which have invaded the Pacific mountains, especially the Cascades, the largest percentage is found in the Subalpine Zone; and of the Pacific immigrants into the Rockies in the Montane Zone, but this immigration is mostly restricted to the western slope of the Northern Rockies. This difference is due to the fact that the Subalpine Zone is comparatively humid in the whole Rocky Mountain chain and in the Cascades, but less so in the Sierra Nevada, and the Montane Zone is humid in the Cascades but rather arid in the Rockies except on the western slope of the Northern Rockies.

The purely endemic element constitutes only about 50 per cent. in the Alpine Zone, about 60 per cent. in the Subalpine Zone, and between 60 per cent. and 70 per cent. in the Montane Zone. That the endemic element in the last should be so large is surprising, as this zone is made up of a nearly continuous forest from British Columbia and Alberta to New Mexico, and is contiguous in the north with the same zones of the Appalachian and Pacific provinces.

Dr. F. J. Seaver called attention to the similarity and apparent identity of the two fungi known as *Helvella infula* and *Gyromitra esculenta*. If these two species are identical as would seem to be the case from a study of the literature and available specimens, then the genus *Gyromitra* is not a valid genus since it was founded on a supposed difference between the two above mentioned species. The genus has been almost universally accepted by mycologists and has become thoroughly established in literature

although apparently founded on characters which are most variable and unreliable. Specimens of this and related species were shown.

A more detailed account of the matter will appear at a later date in *Mycologia* where it will be published as preliminary to the work on the Discomycetes for *North American Flora*.

A. B. STOUT,
Secretary

NOTES, NEWS AND COMMENT

Mr. Stewart H. Burnham of Hudson Falls, New York, recently spent a day at the Garden looking over mycological literature.

Professor Mel T. Cook, of the New Jersey Experiment Station, spent the afternoon of November 13 at the Garden, and in the evening gave a lecture at Public School 46.

The following persons are among those who signed the register in the library during October: Mr. Herbert W. Faulkner, of Washington, Connecticut; Mr. J. B. Norton and Mr. E. C. Arzberger, of Washington, D. C.; and Dr. R. Ruggles Gates, of New York.

We learn from *Science* that the meeting of the American Association for the Advancement of Science to be held in New York City from December 26 to December 30 "will surely be the largest and most important gathering of scientific men hitherto [!] held in this country or elsewhere." Most of the meetings of Section G, Botany, and of the Botanical Society of America will be held at Barnard College. At 2 P.M., on Wednesday, December 27, Professor W. A. Setchell, retiring vice-president of the Association and chairman of Section G, will deliver an address on "The Geographic Distribution of the Marine Algae," and this will be followed by a symposium on the relations of chemistry to botany. At 7:30 P.M. on Thursday, December 28, the dinner

for all botanists will be held at the Hotel McAlpin, at which the retiring president of the Botanical Society of America, Professor John M. Coulter, will give an address on "Botany as a National Asset."

By invitation of the officers of the New York Botanical Garden, members of the corporation and of the Women's Auxiliary, and their friends, visited the Garden on the afternoon of Thursday, October 26, 1916.

Motor-cars assembled at the Botanical Garden Railway Station Plaza at three o'clock, and proceeded to the site of the "Convention Garden," under construction for planting by the Society of American Florists and Ornamental Horticulturists, near the Southern Boulevard. The young white pine plantation was also examined, as also the Iris Garden, constructed and planted this spring, and the new plantation of thorn trees on the hillside nearby.

The party then proceeded, by way of Pelham Avenue, past the new lilac plantation, to the new rose garden, for an inspection of the progress of work there, and thence to the Mansion, where tea was poured at four o'clock. The weather was perfect.

On September 30, Mr. L. Robba referred to the Garden a collection of truffles which had been collected in New Jersey. The truffles, which are the most valuable of the edible fungi, occur underground and are collected with the aid of trained dogs. Although frequently collected in America they have never been found here in sufficient quantity to become a commercial article as in Europe. The collector continues to hope that with the aid of his imported dog he may locate these plants in sufficient quantity to make their collecting a profitable enterprise.

Bulletin No. 34, consisting of a descriptive guide to the grounds, buildings, and collections of the New York Botanical Garden, was issued September 21, 1916. It contains 24 plates and 1 map, with 114 pages of text. A number of additions were nec-

essary in this third edition of the Guide Book, owing to recent large developments in the plantations and construction work. Separates of this number have been repaged and bound and are now on sale for the use of visitors.

Owing to the crowded condition of many of the drawers in the general catalogue, the cards have been redistributed, nine previously unused drawers being now filled. At the same time a large number of subject cards were removed and a beginning made upon the much needed work of their revision.

Dr. Rydberg has prepared a map and some charts to show the extent of the life zones, both in horizontal extent and in altitudinal elevations, in the Rocky Mountain region. The life zones were drawn in black linework so as to be easily reproduced into lantern-slides, which were used in connection with the reading of his paper on "The Life Zones of the Rocky Mountain Region" at the Garden's twentieth anniversary last year. Miss Wharton, of the United States Forest Service, who visited the Garden in the spring, saw this map and these charts and asked for the loan of the same, thinking that they might be useful in the departmental work with which she is connected. Since then the United States Forest Service has had made enlarged photographic reproductions and recently surprised us by sending not only these, but also an elaborate handcolored copy of the map. This last makes a very fine wall map three by three and a half feet, the map proper being in the middle and on each side charts showing the elevations and life zones on the eastern and western side of the mountains.

Meteorology for November.—The total precipitation for the month was 1.70 inches. The maximum temperatures recorded for each week were 68° on the 2d, *70° on the 9th*, 57° on the 14th, and 58° on the 24th. The minimum temperatures were 35° on the 4th, 28° on the 12th, 26° on the 17th and *21° on the 22d*.

ACCESSIONS

MUSEUMS AND HERBARIUM

30 specimens of mosses from Kerguelen. (By exchange with Mr. Cardot.)

5 specimens of Hepaticae from Cuba. (By exchange with Brother Leon.)

3 specimens of *Rolliniopsis* from Brazil. (By exchange with the United States National Museum.)

155 specimens of flowering plants from the eastern United States. (By exchange with Rev. L. H. Lighthipe.)

5 specimens of flowering plants from New York. (By exchange with Miss E. M. Kittredge.)

26 specimens of flowering plants from Oakland, Maryland. (Collected by Dr. F. W. Pennell.)

7 specimens of flowering plants for the local herbarium. (Given by Mr. Percy Wilson.)

16 specimens of figworts. (By exchange with Dr. H. D. House.)

5 specimens of Hepaticae from Maine. (By exchange with Miss Annie Lorenz.)

3 specimens of marine algae from Tortugas, Florida. (Given by H. H. M. Bowman.)

18 specimens of flowering plants for the local herbarium. (Given by Dr. R. R. Stewart.)

128 specimens of flowering plants from the central states. (Collected by Dr. F. W. Pennell.)

5 specimens of Hepaticae from New England. (By exchange with Miss Annie Lorenz.)

17 specimens of fungi from Long Island and New York. (By exchange with Mr. Frank H. Ames.)

1 specimen of *Sclerotium* from Ohio. (By exchange with Mr. B. Leeper.)

1 specimen of *Cyathia lentifera* from New York. (Collected by Dr. M. A. Howe.)

1 specimen of *Thelephora vialis* from Washington, D. C. (By exchange with General Timothy E. Wilcox.)

125 specimens of fungi from Rio Piedras, Porto Rico. (By exchange with Mr. John A. Stevenson.)

2 specimens of fungi from Haines Falls, New York. (Collected by Miss Florence Willey.)

60 specimens of fungi from Montgomery County, Alabama. (By exchange with Dr. R. P. Burke.)

15 specimens of fungi from Java. (By exchange with the United States National Museum.)

22 specimens of fungi from various localities, mainly from Oregon. (By exchange with the United States National Museum.)

649 specimens of fungi (*Meliola*) from Porto Rico. (Collected by Professor F. L. Stevens.)

5 specimens of fungi (discomycetes) from the New York Botanical Garden. (Collected by Dr. F. J. Seaver.)

1 specimen of *Boletus auriflammeus* from Washington, D. C. (By exchange with General Timothy E. Wilcox.)

PLANTS AND SEEDS

1 plant for herbaceous collection. (Given by Mr. E. T. Seton.)

2 cactus plants for conservatories. (By exchange with U. S. National Museum, through Dr. J. N. Rose.)

1 plant, *Opuntia* sp., for conservatories. (Collected by Mr. W. H. Long.)

2 plants, *Hylocereus* sp., for conservatories. (By exchange with Bureau of Plant Industry.)

4 plants for herbaceous collection. (Given by Miss F. M. Devan.)

3 plants of *Lacinaria graminifolia*. (Collected by Dr. F. W. Pennell.)

5 plants of *Elymus glaucus*. (By exchange with Dep't of Parks, Bronx.)

36 plants, all orchids, for conservatories. (Given by Mr. W. V. Levy.)

2 plants, *Fragaria* sp., for herbaceous collection. (Given by Miss E. M. Kittredge.)

4 plants of *Hymenocallis rotata*, for conservatories. (Given by Miss Mary C. Dickerson.)

1 plant of *Persea persea*, for conservatories. (Given by Dr. Hadley.)

3 plants for conservatories. (Given by Mrs. E. F. Post.)

4 plants, *Cycas* and *Livistona*, for conservatories. (Given by Miss Jean C. Gordon.)

4 plants for conservatories. (By exchange with Mr. Wm. Harris.)

6 plants for conservatories. (By exchange with Prospect Park, Brooklyn.)

1 plant, *Opuntia* sp., for conservatories. (By exchange with Mr. W. H. Long.)

1 plant, *Ficus elastica*, for conservatories. (Given by Miss F. Dyer.)

263 plants from Virginia, for American Wood Garden. (Collected by Dr. W. A. Murrill.)

3 plants, *Prunus* sp., for nursery. (By exchange with Brooklyn Botanic Garden.)

1 plant, *Juncus effusus*, for herbaceous collection. (Collected in vicinity.)

3 plants, *Scopolia carniolica* and *Lilium*. (Given by Dr. H. H. Rusby.)

2 bulbs of *Arisaema Stewardsonii*. (Given by Miss E. M. Kittredge.)

1 packet of seeds of crucifer. (Given by Mr. J. M. Bates.)

6 packets of seeds. (By exchange with U. S. National Museum, through Mr. Paul C. Standley.)

4 packets of seeds of *Quercus* sp. (By exchange with Dr. Wm. Trelease.)

4 packets of seeds, *Quercus* sp. (By exchange with Dr. Wm. Trelease.)

1 packet of seeds. (Given by Dr. H. H. Rusby.)

2 packets of seeds, *Quercus* sp. (Collected by Dr. W. A. Murrill.)

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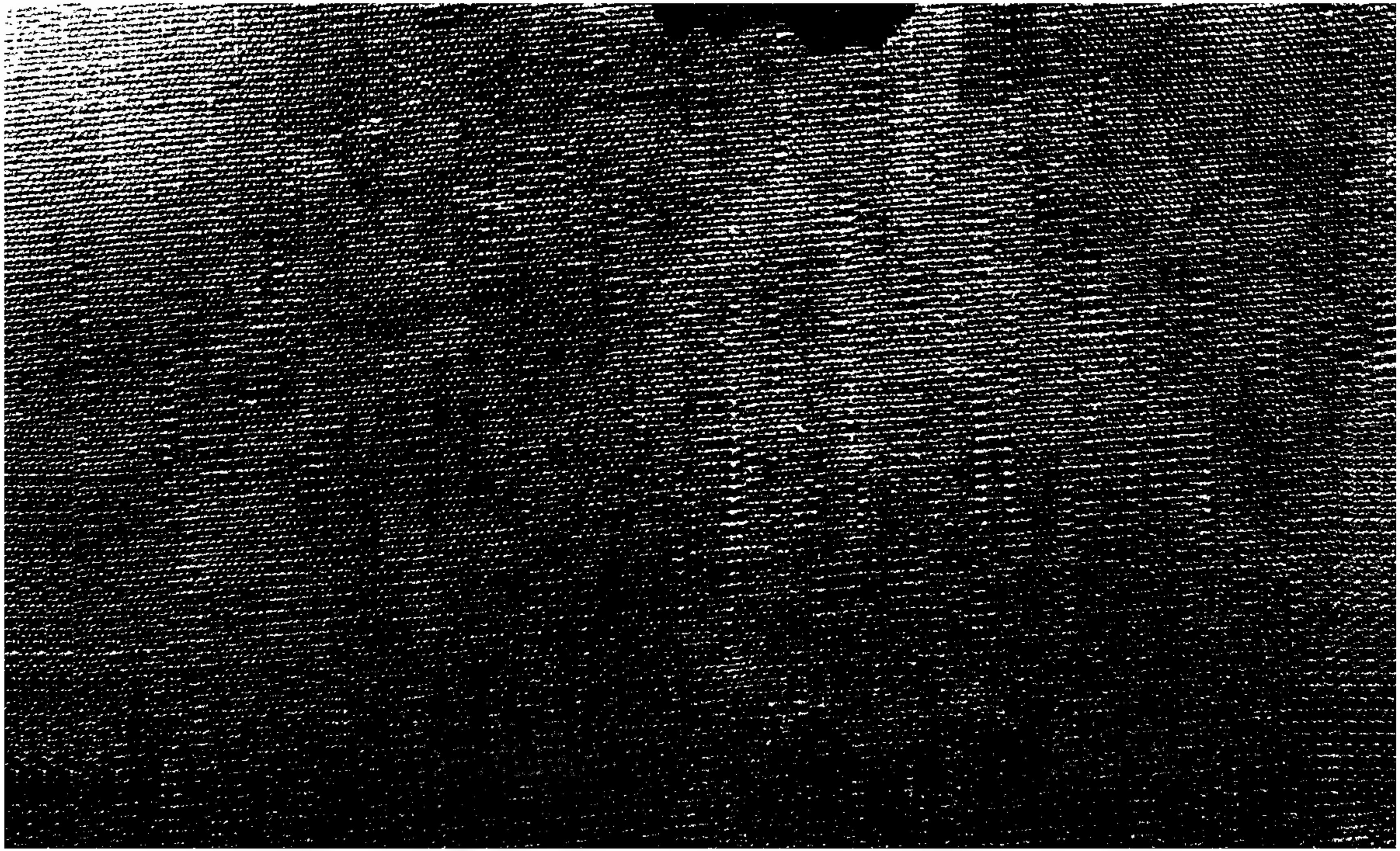

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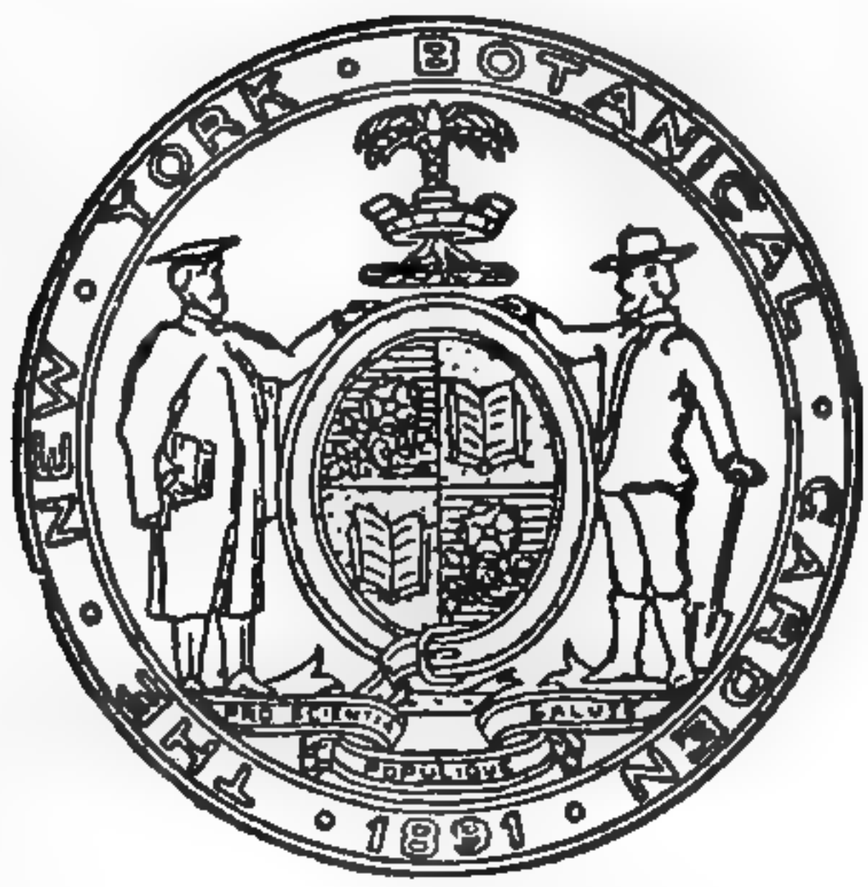

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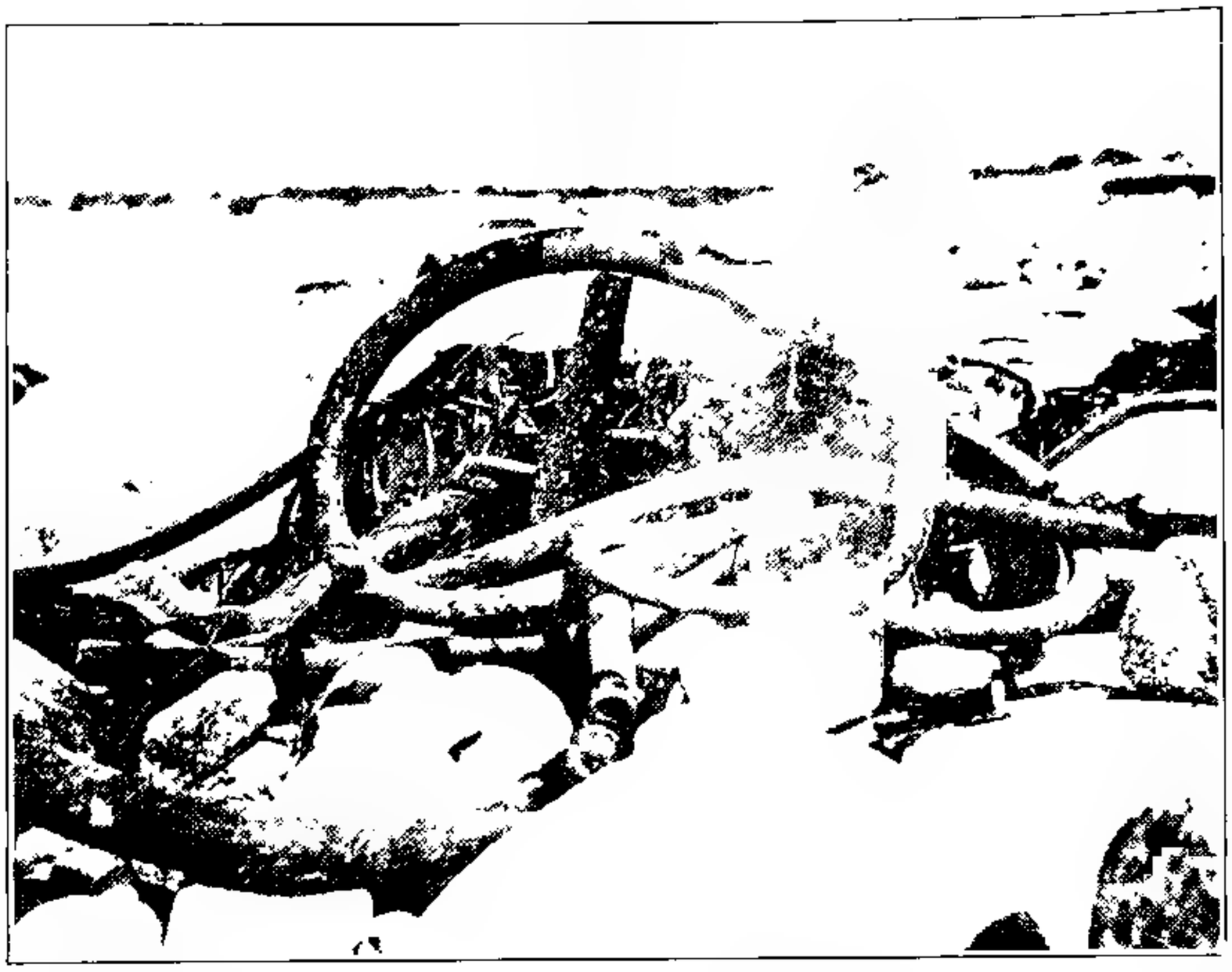

FIG. 1. *Nereocystis* washed up on the shore near Pacific Grove, California. (Photograph from A. A. Heller.)

FIG. 2. "Seatron," a candied product made from the stalks and vesicles of *Nereocystis* (a little more than one half natural size). The basket is made from *Pelagophycus*.

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SOME ECONOMIC USES AND POSSIBILITIES OF THE SEAWEEDS*

(WITH PLATES 189–190)

The seaweeds, or marine algae, as most of them are known to botanists, are more or less abundant in many parts of the world, but it is chiefly along rocky coasts of the temperate regions of both the northern and the southern hemispheres that they are sufficiently large and numerous to attract general attention. And it is only in such regions that they have been and are likely to be of some economic importance. In the vicinity of New York City the seaweeds are, as a rule, not particularly large or abundant, yet there are places, as at Pelham Bay and Hunter's Island, where the rocks and stones along the shore are left by the ebbing tide more or less densely covered with a coating of conspicuous algae belonging to the group commonly known as the rockweeds. Most of the sea plants grow either between the tide-lines or in water that is comparatively shallow, few of them being found attached to the bottom in water that is more than two hundred feet deep. As one goes northward along our Atlantic coast from New York, the seaweeds become more conspicuous and abundant, this abundance being especially pronounced in northern Massachusetts, the coast of Maine, the southern coasts of New Brunswick and Nova Scotia, and certain parts of Newfoundland. It is not everywhere along the seashore even in

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* Abstracted and adapted from an illustrated lecture given at The New York Botanical Garden on September 25, 1915.

those regions that the algae occur in any obvious quantity. They are usually wanting on a loose sandy or muddy bottom, principally because they find little anchorage or foothold in such places. And there are localities where a wide-ranging and rapidly flowing tide seems to operate unfavorably on the marine vegetation. At Kingsport, Nova Scotia, for example, where the tide has a vertical range of nearly sixty feet, the marine flora is very poor, although wharves and rocks for its attachment are not altogether wanting.

In the writings of Horace, the old Latin poet, the phrase "vilior algâ" occurs, indicating that a seaweed was, even in his day, considered to be the climax of futility and worthlessness and that when one had said that anything or anybody was more worthless, useless, and cheap than a seaweed, one had gone about as far as the Latin language would carry one! And this idea has apparently persisted, more or less, in the popular mind at least, down to the present day, even though in some parts of the world it is well and generally understood that certain seaweeds serve very useful purposes. Although the seaweeds of the United States have not thus far been of much importance from the financial and economic point of view, it was quite otherwise a hundred years or more ago in Scotland, Ireland, and northern France, and is still quite otherwise today in Japan. In northern Scotland especially, and more particularly in the Orkney Islands and the Hebrides, the so-called kelp industry from about 1720 to 1830 was lucrative and important. The word "kelp" to a modern English-speaking botanist suggests in particular one of the larger seaweeds of the family Laminariaceae. But the word has had and still has a wider signification, meaning primarily some of the larger brownish or olive-green seaweeds and secondarily the ash derived from burning these seaweeds. This ash contains large quantities of "potash" and "soda", or potassium and sodium salts, and was for many years extensively used in manufacturing soap and glass and to a less extent is still so used in the British Isles. And until recent years this kelp ash has been the chief source of the iodine of commerce. The inhabitants of the Orkneys and the Hebrides, off the north coast of Scotland,

used to get a large part of their living from burning seaweeds and selling the ash. It is said that in the Hebrides a century ago the first toast to be drunk on festive occasions was "A high price to kelp and cattle." The general popular sentiment in favor of selling high and buying low was apparently as pronounced in the Hebrides a hundred years ago as it is in the United States today! In the height of the prosperity of the kelp industry, Scotland is said to have derived from it an annual income of about two million dollars. A certain Lord MacDonald alone is reputed to have made $50,000 a year from the seaweeds that grew along the rocky shores of his land. The kelp industry was for many years an important one also in parts of England, Ireland, northern France, Norway, and Denmark. During the more prosperous period of this industry, the value of the seaweed crop on the coast of Brittany is said to have reached a million dollars a year. But after a time the soapmakers and glassmakers, or their collaborating chemists, found it cheaper to convert common salt into sodium carbonate, the potash salts began to come into the market from the natural deposits in the Stassfurt region of Germany, iodine was derived more cheaply from the saltpeter beds of Chile, and the kelp industries of northern and western Europe began to decline. However, the brown seaweeds are still gathered for their iodine on the coasts of Japan, Scotland, and Ireland, and kelp-burning remains an industry of some little importance in these countries. The species of *Laminaria* and *Ecklonia* (Japan) are particularly rich in iodine, though other members of the Laminariaceae and various rockweeds (species of *Fucus* and *Ascophyllum*) are sometimes included in the burning. In Ireland, according to Cotton,* "the 'rods' (stipes) of the various Laminariae employed are collected as they are cast ashore in autumn, winter, and spring, and placed on stone walls till burning time. In February and March the weed is also cut by hand during the lowest tides. . . . During the last weeks of June and in the beginning of July dense clouds of heavy oily smoke may be seen along the coast-line, and the preparation for this general burning provides employment for many months."

* Proc. Roy. Irish Acad. 31^{16}: 152. 1912.

The use of seaweeds as a fertilizer for the soil has been in vogue for centuries among farmers living in the vicinity of the sea. In parts of the British Isles, France, Norway, and Denmark, in particular, the beneficial effects of the marine plants as a soil fertilizer have long been recognized. In northern France there used to be conflicts between those who wished to gather the seaweeds for fertilizer and those who wished to burn them for the ash—a matter that had to be regulated by laws. On the coast of Brittany in France and on the west coast of Ireland it is not unusual to see farmers and gardeners carting away seaweed from the shore to be used as a fertilizer for the land. It is used chiefly by the farmers living near the sea, though it is sometimes carted as much as seven or eight miles inland.* In Ireland, the weed is applied to potato beds previous to planting, and a dressing of seaweed is often applied in spring or autumn to grass lands and grain fields. In many places the loose seaweed that drifts in at certain seasons, especially during and after storms, is sufficient for the farmers' requirements; in other places, it is cut by hand from the rocks; and in a few localities in Ireland it is actually cultivated for use as a fertilizer. The *Fucus* farms of Achill Sound and Clew Bay have recently been described and illustrated by Cotton.† It seems that for this purpose places that are more or less level, sandy, and destitute of weeds are selected and that stones are planted out between the tide-lines for the seaweeds to grow on. The stones are set out in rows with paths between for convenience in harvesting and carting. The rockweed, here mostly of one species, appears of itself on these stones from the fertilized eggs or sporelings that are floating about in the water and finally attach themselves. The seaweed is cut in February and March when it is two years old and the stones are then turned over for another crop.

In the United States the practice of using seaweeds as a fertilizer for the soil is especially well established in Rhode Island, in which state the Agricultural Experiment Station has issued a

* Cotton, loc. cit. 153.

† Loc. cit. 53, 153. *pl. 5. f. 2.*

bulletin* on the subject. It would appear from this that in 1885 the value of the seaweeds used for agricultural fertilizers in Rhode Island was $65,044, as compared with $164,133 paid for commercial fertilizers. At Rye Beach, New Hampshire, the farmers attribute their unusual success with red clover to the fact that they cover the land with seaweed and plough it under, a practice that has obtained since the founding of the colony.†

The possibilities of an extensive and general use of certain seaweeds or their products as fertilizers for the soil in the United States have recently been emphasized by the appearance of two government publications bearing upon this matter. The first of these appeared in 1912 as Senate Document No. 190, with a prefatory message from the President of the United States and a letter of transmittal from the Secretary of Agriculture. This document is entitled "Fertilizer resources of the United States," and to the uninitiated it is not wholly obvious from the cover or title-page that the document has anything to do with plants that live in the sea, or, in fact, with any plants other than those ordinarily cultivated by the farmer. But, as a matter of fact, this report, or series of reports, embracing nearly 300 pages and numerous plates and maps, is devoted chiefly to seaweeds and more particularly to the larger seaweeds or kelps of our Pacific coast. The writers of this Senate Document, No. 190, seem convinced that the seaweeds, which have been so long neglected, in this country at least, are about to come into their own, in a rôle of much agricultural and economic importance.

The second of these government documents entitled "Potash from kelp" was issued in 1915 by the U. S. Department of Agriculture as Report No. 100. This sets forth the results of further surveys of the kelp beds of the United States, including Alaska, and reports progress in the mechanical problems connected with harvesting and drying the kelp.

The beneficial effects of seaweeds when applied to the soil were

* Wheeler, H. J., & Hartwell, B. L. Seaweeds. Their agricultural value, and the chemical composition of certain species. R. I. Agr. Exp. Sta. Bull. 21: 1–37. *f. 1–11.* 1893.

† Turrentine, J. W. The technology of the seaweed industry. In: Fertilizer resources of the United States. Senate Document, No. 190. 1912.

demonstrated by practical experience centuries before it was really understood just in what way the good effects were brought about. But it is now well established that their fertilizing qualities are due chiefly to the "potash" or potassium salts that they contain. Potassium, nitrogen, and phosphorus are elements that plants must find in the soil if they are to grow and thrive, and of these three essential elements the seaweeds supply potassium in special abundance. In addition to supplying potassium, the application of seaweeds in bulk appears to have a desirable physical effect upon the land. Most of the algae on being dried and then soaked out with fresh water swell enormously and when they are turned under by ploughing this quality is of advantage, especially on a light dry soil, as this sponge-like action of the seaweeds holds small reservoirs of water in close contact with the roots of the cultivated plants. The potash that has gone into the commercial fertilizers used by the farmers and gardeners of the United States has come almost wholly from the mines in the Stassfurt region of Germany, a region that represents a former sea-bottom where various soluble potassium salts have accumulated in a solid form by the concentration and final drying out of the sea-water. The Stassfurt mines up to the beginning of the present deplorable war have been the one important source of the potash supply of the world. Under the German conservation laws the amount of potash salts that may be mined each year has been limited and the proportion of the annual product that may be sold outside of Germany has also been limited and prescribed. The United States has supplies of phosphate rock sufficient for its own use and for export for centuries to come, but for potash the farmers of the United States have been almost wholly dependent upon Germany ever since they began to use artificial fertilizers. Previous to the great war, the United States was importing from Germany potash to the value of twelve millions of dollars or more annually. Three or four years before the war broke out there was some trouble between the American importers and the German "Kali Syndikat" over the raising of the price of potash and the threatened curtailment of the amount that was allowed to be shipped to the United States. This

incident, among other considerations, led the United States Congress to instruct the Bureau of Soils of the Department of Agriculture to investigate the possibilities of developing within the boundaries of the United States a supply of potash that would meet the domestic needs and thus make the United States independent of any foreign nation in this important matter. To many, it might not seem that all this had anything to do with seaweeds, but it turned out that it did. The first and most natural steps to discover sources of potash with commercial possibilities led in two directions, first to the alkaline basins of our arid West, especially where the surface alkali included potash salts, but this search has not thus far resulted in discovering any deposits of commercial importance, though borings at several points are still, I believe, being made by the Geological Survey. The second obvious trail led to the feldspar and granite rocks of the United States, which contain potassium in immense quantities, but in the form of insoluble compounds. It is quite possible to separate out this potassium and convert it into soluble compounds, but thus far the cost of doing it puts these rocks outside of the commercial possibilities as a source of potash for the gardener and farmer.

The Washington scientists, in looking about for an independent American source of potash, finally took into consideration the long-established use of seaweeds as fertilizers for the soil, and they began to investigate the extensive groves of kelps on our Pacific coast and to determine with some degree of accuracy the amount of potassium salts contained by them. One of the most important of these great kelps of the Pacific is *Nereocystis*, known also as the "bladder kelp," the "sea-otter's cabbage," the "bull kelp," and the "ribbon kelp." This kelp forms in places extensive groves or beds from Point Concepcion, near Santa Barbara, California, northward to the region of the Aleutian Islands of Alaska. The plant grows attached to the bottom in water that is from 10 to 100 feet deep and it thrives especially where there are strong currents of water or active wave movements. The plant has a long slender stalk, terminated above by a more or less globose hollow enlargement that is filled with air or gas, the chemical

composition of this gas varying according to the time of day, as has recently been shown. Several long blades or leaves spring from the top of this floating vesicle. Some rather large stories have been told about the length attained by this *Nereocystis*. Kjellman in "Die Natürlichen Pflanzenfamilien" of Engler & Prantl, apparently using figures given by an earlier writer, states that the plant gets to be 100 meters long, but several observers who have had unusually good opportunities for studying the plant have expressed the opinion that these figures have been exaggerated. Professor William A. Setchell has stated that the longest individual of this species seen by him spanned 41 of his paces, which, he says,* "fully equals that number of meters." This remarkable length was probably the result of a single season's growth, as, in most cases at least, *Nereocystis* appears to be an annual plant. This rapidly growing bladder kelp is, so far as abundance and massiveness are concerned, the most important seaweed from Puget Sound to the Aleutian Islands. The analyses made by the chemists of the Bureau of Soils in Washington show that from 27 to 35 per cent. of the dry weight of this particular kind of kelp consists of potassium chloride, which before the outbreak of the great war was worth $40 a ton in the United States and since that time has greatly advanced in price.

Another large kelp of the Pacific coast that is rich in potash is *Pelagophycus*, the "elk kelp," the "sea pumpkin," or "sea orange," which is a close relative of the *Nereocystis*, but is more southern in its range, occurring from Point Concepcion, near Santa Barbara, southward to Lower California. There is apparently, however, not enough of this to make it of much potential importance as a source of potash. Small ornamental baskets made from its stalks and vesicles are sold as curios to tourists in San Diego and other southern Californian towns.

But the kelp of our western coast that from its general abundance and massiveness seems likely to be of the most importance as a source of potash is *Macrocystis*—known also as the "great kelp"—a name that it seems to deserve even when compared

* Bot. Gaz. 45: 126. 1908.

with other kelps of giant dimensions. This grows attached to the bottom in water that is mostly from 20 to 70 feet in average depth. It occurs in such large compact beds that it sometimes forms natural breakwaters for harbors, as at Santa Barbara. It impedes navigation with rowboats and, by becoming entangled with the propeller, sometimes even with steamboats. Stories of this plant's attaining a length of 700 feet or more have found a place in scientific literature, but the greatest length of a single plant so far as yet determined by actual measurement is, I believe, about 200 feet. The species persists through the winter and appears to be perennial in habit. It is abundant, locally at least, from Lower California to southern Alaska.

During the past four or five summers the Bureau of Soils has surveyed the kelp beds of California, Oregon, Washington, and Alaska, has published an extensive series of maps of these kelp beds in the two reports that have been mentioned, and has estimated the bulk of the gross material represented by these beds. Analyses of the principal kinds of western kelps from various localities have also been published, with special reference to their potash and iodine content. As a result of these surveys and analyses, the officials of the Bureau of Soils and of the Department of Agriculture are enthusiastic as to the future economic importance of our Pacific coast seaweeds. Dr. Frank K. Cameron of the Bureau of Soils states:*

"Assuming also that at least two crops a year of *Macrocystis* can be harvested on the California coast, we obtain as the totals about 390 square miles of kelp beds, producing annually 59,300,000 tons of fresh kelp, equivalent to 2,266,000 tons of potassium chloride. At the present time the total imports of potash salts of all kinds is about 1,000,000 tons, equivalent to about 400,000 tons of pure potassium chloride. That is to say, the giant kelps of the Pacific coast, harvested to a depth of 6 feet, could perennially yield an annual output of potassium chloride about six times the equivalent of the potassium salts now imported into the United States. It is hardly to be assumed that any such harvest of kelp is soon, if ultimately, to be realized; but it is practicable,

* Potash from kelp. U. S. Dept. Agr. Rep. 100: 30, 31. 1915.

and at least removes definitely any necessary dependence of the United States upon foreign sources of supply for potassium salts.

"It is also impracticable to give any close estimate of the value of the possible kelp harvest. Assuming that all the potassium chloride were extracted and marketed as such, the value at present prices would be approximately $90,000,000, whereas if the crop were all reduced to dried kelp and sold at current figures for both potash and nitrogen content, the value would be in excess of $150,000,000."

This possible valuation of $90,000,000 for the potassium chloride is evidently based upon its market price before the beginning of the war, *i. e.*, $40 a ton. At the present time, what little potassium chloride is obtainable commands a price several times as great as this.

Mr. Milton Whitney, chief of the Bureau of Soils, in an earlier paper, adds: "Moreover, it should be perfectly feasible to cover most, if not the entire, cost of production of this vast 'crop' by the iodine and other by-products produced simultaneously."

The mechanical difficulties connected with harvesting and drying the large kelps of our Pacific coast for subsequent use as a fertilizer seem on the point of being solved. The report on "Potash from kelp" includes description and photographs of a harvesting machine that has been in actual and successful operation near San Pedro, California. The machine has a toothed scythe-blade of the ordinary mowing-machine pattern that runs horizontally four feet below the surface of the water and there are also two shorter blades that run vertically at either side. The cut kelp falls on an endless belt, is brought over the side of the machine, and falls into a sort of hopper where it is cut into short lengths by another set of knives. There is then a conveying apparatus that brings the cut kelp to an open barge lying alongside and this barge is finally towed to the dock, where its load is discharged. A launch pushes the mowing machine through the kelp beds at the rate of about four miles an hour, and the machine is said to be able to cut twenty-five tons of fresh kelp an hour.

* Fertilizer resources of the United States. Senate Document 190: 7, 8. 1912.

Several companies have already been organized in California for harvesting kelp and making agricultural fertilizers from it. Some of the companies are using chemical processes for extracting the potassium chloride and iodine, while others are simply drying the kelp and using all of it for applying to the soil. In the latter case, the nitrogen as well as the potassium content is saved and used. It is said that the present unhappy demand for explosives has led an important company engaged in their manufacture to resort to the Californian kelps as a source of a part at least of its supply of potassium.

Various kinds of seaweeds are used as articles of food in different parts of the world, but it is only in Japan, China, and Hawaii that they form an important item in the diet of the people. In the United States, among the native-born population at least, the kind that is chiefly, though not very widely, used is the "Irish moss" or "carrageen" (*Chondrus crispus*), one of the "red seaweeds." On the coasts of Massachusetts (especially at Scituate) and New Hampshire, this "moss" is collected, dried, and shipped away in barrels, for making "sea-moss farina," puddings, blanc mange, or jellies. The final product is very palatable, especially when suitably flavored, and served with sugar and cream. It enjoys a certain amount of vogue with invalids as well as with others. This Irish moss was formerly used by the brewers in this country for clarifying beers, but I understand that they have now found substitutes for it and that consequently the Irish moss industry on the coast of New England is now less prosperous than formerly. The usual price has been 4–5½ cents a pound for the dried weed. For the year 1902, according to figures quoted by Smith,* the Irish moss gathered in New England amounted to 740,000 pounds, with a market value of $33,300.

The dulse or dilsk (*Rhodymenia palmata*), another of the red seaweeds, may often be found in a rough-dried state in the waterfront markets of New York, Boston, and other seaboard cities of the United States. Those who like it commonly eat it raw

* Smith, Hugh M. The utilization of seaweeds in the United States. Bureau of Fisheries, Bull. 24: 169–181. 1904.

and dry as a sort of salad or relish. It is said that some of the Irish and Scotch were more addicted to chewing it in the older days before tobacco and chewing-gum became so common and popular. In Ireland and Scotland it is sometimes cooked. Certain Scotch gentlemen have been quoted* as saying that "a dish of dulse boiled in milk is the best of all vegetables."

Dr. T. C. Frye, professor of botany in the University of Washington, and C. E. Magnuson, of Seattle, hold a patent for the manufacture of an edible product, somewhat resembling candied fruit, from the stalks and vesicles of *Nereocystis*. This looks and tastes a little like preserved citron and the trade name for it is "seatron." The potassium chloride and other soluble salts are removed by treatment with fresh water, sugar is introduced in their stead, and flavoring extracts such as lemon, orange, etc., are added. The final result is really very toothsome and the first samples of it received for exhibition in a museum show-case of the New York Botanical Garden never reached any show-case! But it has not yet come before the public in any such conspicuous way as have certain other more recently invented and perhaps less meritorious foods. Although the so-called Irish moss is fairly well known as a food, the modern breakfast-food man and fancy dietetician have not thus far taken full advantage of the opportunities offered them by the plants of the sea. A writer in the New York Evening Post a few years ago remarked: "it is within the bounds of reasonable expectation that we shall soon see 'Shredded Seaweed,' 'Flaked Fucus,' 'Desiccated Dulse,' 'Predigested Sargassum,' 'Puffed Nereocystis,' 'Malto-kelp,' 'Cream of Sea-Moss' and a score more substitutes for hot cakes and maple syrup, done up in one-pound packages, 'guaranteed under the Pure Food laws,' and crammed down the throats of a long-suffering and surfeited people."

The Japanese make use of certain kinds of sea plants (*Gloiopeltis* sp.) as the source of a sort of glue that they call "funori." This is produced in Japan to the extent of two or three million pounds a year and is there rather extensively used in the manufacture of sizing for cloth. For this purpose it appears to have

* Smith, H. M. Loc. cit. 172.

FIG. 1. Cleaning and drying *Porphyra* in Japan. From an old print said to have been used on a commercial wrapping paper by a Tokyo firm for 200 years. (After Yendo.)

FIG. 2. Bales of *Laminaria* ("kombu") for export from Japan to China. (After Yendo.)

certain advantages over starch. It is said to fill the cloth better, to be tougher, more elastic, transparent when dry, and not much affected by acids. It "imparts to the goods a thick clothy elastic feeling" without the stiffness that comes from the use of starch.

At the present day it is chiefly in Japan that the collecting and growing of seaweeds for food and for other purposes has attained the proportions of an important industry. One of the more important edible products of the Japanese algae is "kanten" or "Kant-Ten," which is derived from species of *Gelidium*, a genus of red algae that has representatives on the coast of the United States also. Dr. Hugh M. Smith* has estimated that the kanten prepared in Japan in 1902 probably reached 3,000,000 pounds, with a value of $740,000. More than half of it is exported, going to China, British India, and, in small quantity, to the United States. In its manufactured form it is a white semi-transparent, tasteless, and odorless substance, and is sometimes known as "seaweed isinglass." It is used in Japan, China, and India as an ingredient of soups and sauces and is also served as a dessert and fashioned into a sort of candy. A part of the agar-agar of commence, the glue-like or jelly-like substance that is so well known in American laboratories as a culture medium for bacteria and fungi, consists of this Japanese "kanten." The word "agar-agar," however, appears to be of Ceylonese origin, and the agar-agar of our laboratories originally came and still comes in part from the "Ceylon moss" of southern India, which seems to be chiefly *Gracilaria lichenoides*, belonging also to the red algae but representing a different family from the species of *Gelidium*. It is probable that still other sorts of seaweeds contribute to the making of agar-agar as sold in the markets of Europe and America, a circumstance that doubtless goes far to explain the somewhat varied and inconstant behavior of this substance as a culture medium.

Even exceeding "kanten" (*Gelidium* sp.) in importance as a food product in Japan is "kombu," which consists of various kinds of kelps, *i. e.*, larger brown seaweeds, chiefly of the family Laminariaceae. The kelps of Japan are not so large as some of

* The seaweed industries of Japan. Bureau of Fisheries, Bull. 24: 133–165. *pl. 1–4 + ff.* 1904.

those of our Pacific coast, even though some of them are said to approach 100 feet in length. The gathering is done mostly in the late summer and in autumn and is done by men working from boats with hands, hooks, and dredges. The dried product is placed upon the market in various forms, raw or cooked, some of them being palatable and agreeable to foreigners, others not so much so. Smith* remarks that "Kombu enters into the dietary of every Japanese family, and is one of the standard foods of the country, the various preparations having different flavors and being used for different purposes." Most of these preparations are cooked with soup or are boiled and served with fish; some of them are used in the manufacture of confectionery. Large quantities of kombu are exported to China. The exports of kombu in 1901 are said to have amounted to 81,000,000 pounds, valued at $774,000.†

Another type of seaweed that is of much importance as a food in Japan is found in one or more species of the genus *Porphyra*, which belongs with the red algae. This is known as "amanori," "Asakusa-nori," or simply as "nori," which appears to be a general Japanese term for seaweed. "Laver" or "red laver" are English names for the same or closely related species. *Porphyra* is not only gathered from its natural haunts in Japan, but it has actually been cultivated for many years, especially in the region of Tokyo, and the cultivated crop is the present chief source of supply. Brush or twigs are set out in shallow water (preferably brackish) in protected places and in the winter the young *Porphyra* plants appear on these twigs, from which the mature plants are harvested from January to March. There are said to be more than 2,000 acres along the coast of Japan that are devoted to the cultivation of *Porphyra*. Girls and women do most of the work of collecting and drying the plant. *Porphyra*, served in various ways, is a prized article of food throughout Japan. Little is exported. In combination with soy beans, meat, or fish, it is made up into a sort of sandwich that is offered for sale at railway stations, street stands, etc. About one third of the dry weight of

* Loc. cit. 153.

† Smith, H. M. Loc. cit. 154. See also Yendo, K. Uses of marine algae in Japan. Postelsia 1· 3 16. 1901.

Porphyra is protein, so that it is a rich food, which apparently is more than can be said of most of the seaweeds. The *Porphyra* crop in Japan is worth about $300,000 annually.

Several kinds of marine algae, other than those here mentioned, are used in Japan as articles of food. Statistics as to the less important kinds and also as to the kanten, kombu, and amanori consumed directly by the families of the fishermen and seaweed-gatherers are not obtainable. It is, however, surely no exaggeration to place the annual value of the seaweed crop as harvested in Japan at $3,000,000. Nothing at all approaching this, in an economic way, has as yet been done with the sea plants of the United States, but with the urgent demand for potash now arising from our farmers and gardeners, and with our usual sources of supply cut off by the war, it seems within the bounds of reasonable probability that the great kelps of our Pacific coast will soon yield even richer harvests than do the seaweeds of Japan.

MARSHALL A. HOWE

BIRDS IN THE NEW YORK BOTANICAL GARDEN

I

It was a mocking-bird that first attracted a number of bird observers to the New York Botanical Garden, and some of us have been regular in our visits there since. Where a "mocker" can live through half a dozen winters, there must be for birds plentiful food and reasonably good shelter.

Located at the northern boundary of the Carolinian zone, the Garden should share also in those other uncommon visitors from the Southland, the cardinal, Carolina wren, blue-gray gnatcatcher, and tufted titmouse. Except the last, all these have been seen. A pair of cardinals were seen frequently this summer near No. 2 greenhouse, and at least three of this species persisted for a while in the fringe of trees just north of the Museum.

To these trees during the past summer came also the orchard oriole. My Lord Baltimore, not uncommon here as in other

sections of the Garden, was more often to be seen in the willows of the north meadows. Cuckoos, mostly of the yellow-bill species, kept well to the high ground on the east side of the river among the low trees. Rose-breasted grosbeaks flamed forth in the river swamp above the Long Bridge, where also an occasional chewink would enliven the thicket.

Thrushes were most common in the enclosed portions at the north end of the Hemlock Forest, and surely its cool floor of dry needles afford the young birds a charming nursery. Veery and wood-thrush shared for nesting places the thickets around the lakes and seemed to get along very well together. Even if the former is occasionally aggressive in a determination to be sole lord of the manor, to the observer there was no evidence of jealousy. Later, when these birds were joined by their olive-clad and gray-cheeked brothers, together all took to the fruticetum where with cat-birds and robins they shared the abundant berries.

This brings us to the matter of food supply. Of this there is an abundance. Beginning with the oleasters in the northern end of the Garden down through the fruticetum walks lined with various dogwoods, viburnums, bush honeysuckles and scores of other shrubs and vines, there was never a day this summer and fall when birds feeding upon the fruits were not plentiful. An attempt will be made in a later article to give some idea of the various foods provided.

But in the matter of nesting places something is wanting, and should be supplied artificially. The Botanical Garden is spacious, sunny, shaded, protected from noise and traffic, and the public is rapidly discovering it. Of course Dr. Britton is pleased at this evidence of the people's appreciation, and is doing what he can to preserve and enhance this beautiful spot. While he need not interfere with the liberty of those who love to lie on the fresh grass and listen to the songs of birds, he should insist that at nesting time no one shall push his way through the thickets. Tube railings outlining the walks add to a well-kept appearance, furnish a seat for a moment's rest, and at least indicate preserves to those who are dull to understand the niceties of forest and field preservation. As a safety-valve, would it not be possible to

include some of the numerous inviting rocky hillsides in the part that is free to him who would "loaf and invite his soul"?

Perhaps the safest nesting place in the Garden is in the thorn trees. One year the nests here seemed to be mostly those of thrushes, and another year the catbirds held possession. You may easily reach these nests by thrusting your arm in among the branches; but as for withdrawing without scratches or a torn sleeve, that is a different matter, and the nest itself will be a sorry affair when you get it out.

Young cowbirds seemed to be common. Song sparrows fed them along the shore of the upper lake and up among the viburnums. A warbler built a second tier to her nest to cover up a cowbird's egg. There is some doubt as to the identity of this warbler. Young Kenneth Bull, the discoverer, thinks it was a pine warbler, but it is more likely to have been a chestnut-sided warbler. A relative, the yellow warbler, has been known to build four additions to its nest to get rid of a cowbird's eggs. The Maryland yellow throats were likewise imposed upon, and played the baby-farmer act. With a river and several small lakes, naturally there are plenty of nests of yellow warblers and redwing blackbirds.

A redstart's nest attracted attention because it was so close to the walk at the end of the rubble-stone bridge, yet on Sundays hundreds of people have passed here without seeing it. It was less than the usual minimum five feet from the ground, but in all other respects was typical of the species. It was made of grass, vegetable fiber, plant-down, even bits of bark, and was lined with hair and grass. Some little girls, one a cripple, came every day for two weeks to watch over it, and brought bits of cotton; they stood or sat within a few feet of the nest, while the birds were building and feeding their young, and mounted guard over them on Saturdays and Sundays till the nestlings had flown away.

Phoebes nested on a beam of the shelter-house near the lake and under the rubble-stone bridge. A dozen oven-birds were seen nearby, and one nested near the Museum. A flock of 20–24 cedar-birds spent a good part of the winter in the Garden, and at least one pair remained till spring and probably nested on some of the apple-trees.

All our species of vireo were observed feeding in one tree, a hornbeam in the Herbaceous Garden, the seeds of which were equally favorites with myrtle warblers and sparrows. A red-eyed vireo nested close to the Long Bridge in the thicket of snow-balls at the eastern end.

The record for bird-nesting encouraged by man, comes from near Washington, fifty-nine pairs to an acre, but that included twenty-six pairs of martins, a bird not common nowadays in the city. It also included fourteen pairs of house-wrens. These are frequently seen in the big brush field of the north meadows and occasionally nest near the stable and propagating house. More of them could be induced to stay if boxes were provided with entrances too small for English sparrows. Bluebirds, flycatchers, and perhaps martins, would respond readily if encouraged with artificial nesting places. It is worth a trial.

F. F. H.

CONFERENCE NOTES FOR DECEMBER

The December conference of the Scientific Staff and Registered Students of the Garden was held in the laboratory of the museum building on Wednesday afternoon, December 6.

Dr. W. A. Murrill spoke of his explorations in the Catskills and Blue Ridge mountains during the past season, exhibiting specimens and illustrations of the more interesting fungi secured. A special feature of his work was a quantitative survey of both localities with reference to the larger fungi appearing during the time he visited them. This was made possible by the active coöperation of a large number of friends, who accompanied him daily on his botanical excursions. Accounts of these explorations have been published in the *Journal*, while lists of the fungi collected have appeared in *Mycologia*.

Dr. F. W. Pennell reported briefly on investigations of the Foxglove family in the Rocky Mountain states. This study is the outcome of a collecting trip in 1915 to Colorado, Wyoming, Utah and southeastern Idaho, since his return from which material in our own and most of the other leading American

herbaria has been examined. So far this review has considered the species of *Linaria*, *Collinsia*, *Scrophularia*, *Chionophila* and *Pentstemon*. In this region all but the last have but one species each, the last has over eighty. While the single species of *Scrophularia* and *Collinsia* are wide-ranging, nearly all the many species of *Pentstemon* are local, sometimes surprisingly so. Fortunately for the taxonomist, however, they are sharply defined, and show little hybridism. Such a genus as *Pentstemon*, breaking into clearly defined local species, should offer evidence of exceptional value for demarcating phytogeographic areas. The speaker has brought together records of localities with altitude and habitat, and by correlating these hopes to present statements of distribution much more natural than those current now.

Dr. N. L. Britton exhibited specimens from the beds of plant fossils recently found in Porto Rico, and made some comments on the significance of the discovery, these being the first Tertiary plant remains discovered in the West Indies; collections have been made by Dr. Chester A. Reeds and by Mr. Bela Hubbard.

A. B. STOUT,
Secretary of the Conference

NOTES, NEWS AND COMMENT

Dr. W. A. Murrill, Assistant Director, delivered an address on "Edible and Poisonous Mushrooms" before the New Brunswick [N. J.] Scientific Society on the evening of November 27.

Mr. Carl A. Schwarze of the New Jersey Experiment Station recently spent a day at the Garden in connection with his studies of the plant diseases of New Jersey.

Dr. J. N. Rose, Research Associate in the Carnegie Institution of Washington, who is coöperating with Dr. Britton in the preparation of an illustrated monograph of the cactus family, recently made a successful trip to the cactus regions of northern Venezuela, bringing back with him an illustrative collection of

living cacti, several of which were hitherto unrepresented in the Garden's collections, as well as many herbarium specimens. He also obtained a large collection of Venezuelan orchids, some of which have been retained at the Garden.

The following persons are among those who have registered in the library during November and early December: Dr. Mel T. Cook, New Brunswick, N. J.; Mrs. Nellie F. Flynn, Burlington, Vt.; Arthur Stanley Pease, Urbana, Ill.; E. V. Louth, Ashtabula, Ohio; Miss M. L. Merriman, Hunter College, New York; Dr. J. Arthur Harris, Cold Spring Harbor, L. I., N. Y.; Dr. C. F. Millspaugh, Chicago, Ill.; Dr. Henri Hus, Ann Arbor, Mich.; Dr. Chester A. Darling, Meadville, Pa.; Professor William L. Bray, Syracuse, N. Y.

The Botanical Society of America held its annual meeting at Columbia University, December 26–30, 1916, in connection with the meetings of the American Association for the Advancement of Science and affiliated societies. The Garden staff was represented on the program by Dr. William A. Murrill, who gave an illustrated address on "The taxonomy of the Agaricaceae" at a joint session of the Botanical Society of America and the American Phytopathological Society; by Dr. Marshall A. Howe, who read a paper before the Botanical Society under the title of "A note on the structural dimorphism of sexual and tetrasporic plants of *Galaxaura obtusata*" and one before the Sullivant Moss Society under the title of "Notes on the North American species of Ricciaceae"; and by Dr. A. B. Stout, who presented a paper on "Fertility in *Cichorium Intybus:* Self-fertility and self-sterility in self-fertile and self-sterile lines of descent." The meetings of the Botanical Society of America were under the presidency of Professor R. A. Harper, one of the Scientific Directors of the Garden. The officers for the ensuing year include Professor F. C. Newcombe, University of Michigan, president; Dr. E. W. Olive, Brooklyn Botanic Garden, vice-president; Dr. E. W. Sinnott, Connecticut Agricultural College, treasurer. We learn from *Science* that there were presented in all 292 botanical papers.

During the convocation week of the American Association for the Advancement of Science many botanists visited the Garden. Among these were the following:

Professor Alexander W. Evans of Yale University was here on December 30 in connection with his studies of the genus *Herberta* of the Hepaticae.

Mr. F. S. Collins of North Eastham, Massachusetts, on December 30 consulted the library and examined the collections of algae.

Professor Ellsworth Bethel of Denver, Colorado, was at the Garden on the 27th. Professor Bethel is to be connected with the State Museum in Denver and spent considerable time looking over museum cases in order to get ideas to be incorporated into the Colorado museum.

Dr. George P. Clinton of the Connecticut Agricultural Experiment Station spent several days in the herbarium studying parasitic fungi on the leaves of gooseberries and currants.

Dr. J. J. Davis of the University of Wisconsin called and looked over the collections of parasitic fungi.

Professor J. H. Faull of the University of Toronto spent several days identifying his collections of fungi made in Canada.

Dr. F. D. Fromme of Virginia State College recently visited the mycological herbarium and looked over specimens of *Xylaria* in order to determine the identity of certain species causing root rot of apple trees in the South.

Professor J. B. S. Norton of the Maryland Agricultural Experiment Station spent some time looking over the genus *Mycosphaerella*, preparatory to a monograph of the genus.

Dr. L. O. Overholts of Pennsylvania State College spent several days studying some of the collections of higher fungi.

Professor H. H. Whetzel of Cornell University recently spent some time in the mycological herbarium looking over specimens of *Botrytris*.

Mr. F. Tracy Hubbard of Boston, Massachusetts, visited the herbarium to study our specimens of *Schizachyrium littorale*.

Dr. Karl M. Wiegand of Cornell University, Ithaca, New York spent a few hours here consulting types in the genus *Xanthium*, and also studying a little-known apparently introduced species of *Eragrostis*.

Mr. Donald White of the Massachusetts Agricultural College, Amherst, spent several days in the herbarium recording localities of grasses of the northeastern United States east of the Hudson River preliminary to field work planned to cover several seasons.

Others registered in the library were: Dr. J. H. Ehlers and Dr. C. H. Kauffman, Ann Arbor, Mich.; Dr. L. H. Pennington and H. P. Brown, Syracuse, N. Y.; Professor and Mrs. Aven Nelson, Laramie, Wyo.; R. J. Blair, Montreal, Can.; Dr. F. C. Gates, Carthage, Ill.; Dr. C. D. Howe, Toronto, Can.; Professor W. C. Coker, Chapel Hill, N. C.; C. E. Temple, College Park, Md.; H. E. Thomas and K. E. Quantz, Blacksburg, Va.; Professor Duncan S. Johnson, Baltimore, Md.; John N. Martin and L. W. Durrel, Ames, Iowa; Professor A. S. Hitchcock, J. B. Norton, W. F. Wight, W. D. Sterrett and William Palmer, Washington, D. C.; Ellsworth P. Killip and I. C. Jagger, Rochester, N. Y.; Dr. R. C. Benedict, Brooklyn, N. Y.; Professor W. W. Rowlee, E. E. Honey and Harvey E. Stork, Ithaca, N. Y.; Dr. W. D. Hoyt, Lexington, Va.

Dr. J. C. Arthur and Professor H. S. Jackson, of Lafayette, Indiana, have been granted research scholarships for the month of January. They will continue work on the plant rusts for *North American Flora.*

Volume 21, part 1, of *North American Flora*, by Paul C. Standley, containing descriptions of Chenopodiaceae, appeared November 27, 1910.

Volume 34, part 3, of *North American Flora*, by P. A. Rydberg, containing descriptions of Carduaceae: Tageteae and Anthemideae, appeared December 29, 1916.

A collection of the crude fibers of the Philippine Islands, presented to the Garden by Mr. Theodor Muller, has lately been installed in a case on the south wall of the west hall of the Economic Museum.

The Garden has recently received six large plants of *Livistona chinensis*, a gift from Mrs. F. S. Holbrook, The Uplands, Strawberry Hill, Stamford, Connecticut. These palms are about fifteen feet high and broad, and were sent by Mrs. Holbrook to the Garden on a large motor truck. This species is often known as *Latania borbonica*.

On the afternoon of December 7, ninety children of the 5B grade from Public School 10 of the Bronx came to the Garden for instruction in the classification of plants. They were divided into two groups, one in charge of Dr. M. A. Howe and the other in charge of Mr. Percy Wilson, and the special exhibits on the second floor of the museum building were used for demonstration.

Professor LeRoy Abrams, of Stanford University, has commenced the preparation of manuscript and drawings for an illustrated flora of the Pacific Coast, modeled after the "Illustrated Flora of the Northern States and Canada," published some years ago by Dr. Britton and the late Judge Addison Brown. This new flora will require four volumes instead of three, as in the case of its model, owing to the larger number of species to be included; the area of the new work will include all of California, Oregon and Washington, the coastal regions of British Columbia, and southern Alaska to about 60° north latitude; probably not fewer than 6,000 species of wild plants inhabit this large area. Dr. Britton will coöperate with Professor Abrams, and other members of the Garden staff will also give aid; it is anticipated that the herbarium of the Garden will be considerably increased in its representation of western species in the course of this investigation.

At the meeting of the Torrey Botanical Club held at the Garden, November 29th, Dr. Britton exhibited and remarked upon a very interesting collection of plants obtained by Mr. H. E. Winlock, of the Metropolitan Museum of Art, from a tomb at Luxor, Egypt. Mr. Winlock states that this tomb dates

from 1350 B. C. and that these plant specimens are of approximately that antiquity, thus about 3,266 years old. The specimens are in a remarkably perfect state of preservation, including leaves, stems, flowers, and fruits. Curiously woven garlands of olive leaves (*Olea europea*) are a feature of the collection; flowering heads of a species of *Centaurea* and berries of a species of *Solanum* are definitely identifiable. Portions of stems of a large grass are included, and there are fragments of other plants too incomplete for reference.

Meteorology for December.—The total precipitation for the month was 4.31 inches of which 1.57 inches (15.7 inches snow measurement) fell as snow. The maximum temperatures for each week were *62° on the 5th*, 40° on the 13th, 42° on the 21st, and 40° on the 25th. The minimum temperatures were 31° on the 2d, 24° on the 11th, *14° on the 17th and 20th*, and 17° on the 31st.

Meteorology for the year 1916.—The total precipitation at the New York Botanical Garden for the year 1916 was 31.05 inches. The distribution by months was as follows: January, 1.18; February, 3.74 (including 15.75 inches snow); March, 2.77 (including 22.5 inches snow); April, 2.62; May, 3.24; June, 4.05; July, 3.09; August, 1.21; September, 2.27; October, 0.87; November, 1.70; and December, 4.31 (including 15.7 inches snow).

The maximum temperature recorded for the year was 98° on the 22d of August. The minimum was 1° on the 14th and the 15th of February. The first killing frost of the autumn was on the morning of October 18.

ACCESSIONS

MUSEUMS AND HERBARIUM

325 specimens of flowering plants from Florida. (Purchased from Miss Janette P. Standley.)

3 specimens of flowering plants from New York. (Given by Mr. Percy Wilson.)

75 specimens of flowering plants from Delaware. (Collected by Dr. F. W. Pennell.)

82 specimens of ferns from various countries. (By exchange with the herbarium of Prince Roland Bonaparte.)

7 specimens of flowering plants from the District of Columbia. (Collected by Dr. F. W. Pennell.)

155 specimens of flowering plants from New York and New Jersey. (Given by Dr. L. H. Lighthipe.)

2 specimens of *Quamasia esculenta* from Michigan. (Given by Mr. O. A. Farwell.)

1425 specimens of flowering plants from Pennsylvania. (Collected by Dr. F. W. Pennell.)

279 specimens of flowering plants from Ulster, Green, and Dutchess counties, New York. (Collected by Mr. Percy Wilson.)

6 specimens of flowering plants from Pennsylvania. (Collected by Mr. W. H. Benner.)

33 specimens of grasses from New York. (Collected by Dr. Ralph R. Stewart.)

9700 specimens of flowering and flowerless plants from southern Florida. (Collected by Dr. J. K. Small.)

5 specimens of hepaticae from Maine. (By exchange with Miss Annie Lorenz.)

6 specimens of flowering plants from Long Island, New York. (Given by Dr. Roland M. Harper.)

70 specimens of flowering plants from Connecticut. (Collected by Dr. F. W. Pennell.)

50 specimens of fungi from Surinam. (Purchased from Mr. Jacob A. Samuels.)

3 specimens of fungi from Florida. (By exchange with Mr. Paul C. Standley.)

1 specimen of *Spongipellis galactinus* from New York. (Collected by Dr. W. A. Murrill.)

1 specimen of *Hypholoma aggregata* from New York. (By exchange with Mr. Hermann Kahle.)

1 specimen of *Lentinus strigosus* from Illinois. (By exchange with Dr. S. M. Stocker.)

1 specimen of fungus from Washington, D. C. (Given by Miss Harriet Daly.)

1 specimen of fungus from Arizona. (By exchange with Mr. W. H. Long.)

2 specimens of fungi from New Jersey. (By exchange with Mr. Edward F. Paddock.)

1 specimen of *Hypholoma Candolleanum* from New York. (Collected by Professor R. A. Harper.)

26 specimens of "Fungi Dakotenses," fascicle 16. (Distributed by Dr. J. F. Brenckle.)

2,306 specimens of flowering plants from New York. (Collected by Dr. F. W. Pennell.)

1 specimen of *Pentstemon* from District of Columbia. (Given by Dr. J. N. Rose.)

1 photograph of type of *Androsace asprella*. (Given by Mr. Harold St. John.)

15 specimens of flowering plants from Long Island, New York. (Given by Miss Mary E. Eaton.)

1 specimen of *Triosteum* from Connecticut. (Given by Miss Fannie M. Devan.)

2 specimens of fungi from Salt Lake County, Utah. (By exchange with Professor A. O. Garrett.)

2 specimens of fungi from Washington, D. C. (By exchange with General Timothy E. Wilcox.)

75 specimens of fungi from Virginia. (Collected by Dr. W. A. Murrill.)

2 specimens of fungi from Texas. (By exchange with Dr. J. J. Taubenhaus.)

2 specimens of fungi from Chile. (By exchange with Dr. Carlos E. Porter.)

6 specimens of fungi from Cuba. (By exchange with Brother Leon.)

6 specimens of fungi from Rio Piedras, Porto Rico. (By exchange with Mr. J. A. Stevenson.)

73 specimens of fungi from western United States. (By exchange with Dr. J. R. Weir.)

10 specimens of fungi from Porto Rico. (By exchange with Mr. J. A. Stevenson.)

26 specimens of "Fungi Dakotenses," fascicle 17. (Distributed by Dr. J. F. Brenckle)

2 specimens of *Mycosphaerella aurea* from Ontario. (Given by Mr. R. E. Stone.)

11 specimens of crude drugs. (Given by Dr. H. H. Rusby.)

1 specimen of *Norta* from Pennsylvania. (Given by Mr. Ambrose J. Heller.)

2 specimens of *Coleus* from Java. (Given by the Botanical Garden of Buitenzorg.)

5 specimens of flowering plants from Dutchess County, New York. (Given by Miss May K. Hoag.)

1 specimen of *Agarum cribrosum* from San Juan Island, Washington. (Given by Mr. Walter L. C. Muenscher.)

2 specimens of orchids from Pennsylvania. (Given by Miss Louisa M. Jacob)

2 specimens of *Triosteum* from Long Island, New York. (Given by Mr. E. N. E. Klein.)

10 specimens of flowering plants from New Jersey. (Given by Mr. O. P. Medsger.)

2 specimens of *Solidago puberula* from Putnam County, New York. (Given by Mr. George V. Nash.)

1 specimen of *Glycine Apios* from Ohio. (Given by Mr. C. C. Pearl.)

1 specimen of *Chrysanthemum segetum* from the New York Botanical Garden. (Collected by Dr. A. B. Stout.)

1,055 specimens of flowering plants from New Jersey. (Collected by Dr. F. W. Pennell.)

7 photographs of types of calcareous algae in the John Ellis collection. (Given by the Royal College of Surgeons of England.)

PLANTS AND SEEDS

1 plant, *Cheilanthes* sp., for Conservatories. (Given by Mr. F. E. Lutz.)

2 plants, *Alstroemeria*, for Herbaceous Collections. (Given by Dr. H. H. Rusby.)

475 plants for forcing experiment. (Purchased.)

3 plants, *Ficus* sp., for Conservatories. (Given by Mr. A. Giamondi.)

1 plant, *Citrus Limonium*, for Conservatories. (Given by Mrs. Perina.)

6 plants of *Livistona chinensis*, for Conservatories. (Given by Mrs. F. S. Holbrook.)

1 plant, *Marsilea* sp. (By exchange with Prof. Ben Hill.)

2 plants, *Echinocereus Fendleri*. (Collected by Prof. A. O. Garrett.)

268 plants from Venezuela. (Collected by Dr. J. N. Rose.)

4 plants, all cacti, for Conservatories. (By exchange with U. S. Nat. Museum through Dr. J. N. Rose.)

20 bulbs of *Quamassia esculenta*, for Herbaceous Collections. (Given by Mr. O. A. Farwell.)

2,025 bulbs for decorative use. (Purchased.)

1 pkt. seeds of Indian plant. (Given by Prof. F. Boas.)

1 pkt. seeds of the Royal Poinciana, *Delonix regia*. (Given by Mr. Joseph Hertschuh.)

5 pkts. of seeds from Apple Orchard Mountain, Virginia. (Collected by Dr. W. A. Murrill.)

2 pkts. seeds. (Given by Dr. H. H. Rusby.)

17 pkts. seeds of California plants. (Purchased.)

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Vol. 3, part 1, 1910. Nectriaceae—Fimetariaceae.

Vol. 7, part 1, 1906; part 2, 1907; part 3, 1912. Ustilaginaceae—Aecidiaceae (pars).

Vol. 9 (now complete), parts 1 and 2, 1907; part 3, 1910; part 4, 1915; parts 5, 6, and 7, 1916. Polyporaceae—Agaricaceae (pars). (Parts 1 and 2 no longer sold separately.)

Vol. 10, part 1, 1914. Agaricaceae (pars).

Vol. 15, parts 1 and 2, 1913. Sphagnaceae—Leucobryaceae.

Vol. 16, part 1, 1909. Ophioglossaceae—Cyatheaceae (pars).

Vol. 17, part 1, 1909; part 2, 1912; part 3, 1915. Typhaceae—Poaceae (pars).

Vol. 21, part 1, 1916. Chenopodiaceae.

Vol. 22, parts 1 and 2, 1905; parts 3 and 4, 1908; part 5, 1913. Podostemonaceae—Rosaceae (pars).

Vol. 25, part 1, 1907; part 2, 1910; part 3, 1911. Geraniaceae—Burseraceae.

Vol. 29, part 1, 1914. Clethraceae—Ericaceae.

Vol. 34, part 1, 1914; part 2, 1915; part 3, 1916. Carduaceae—Anthemideae.

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OF

The New York Botanical Garden

EDITOR

FRANCIS WHITTIER PENNELL

Associate Curator

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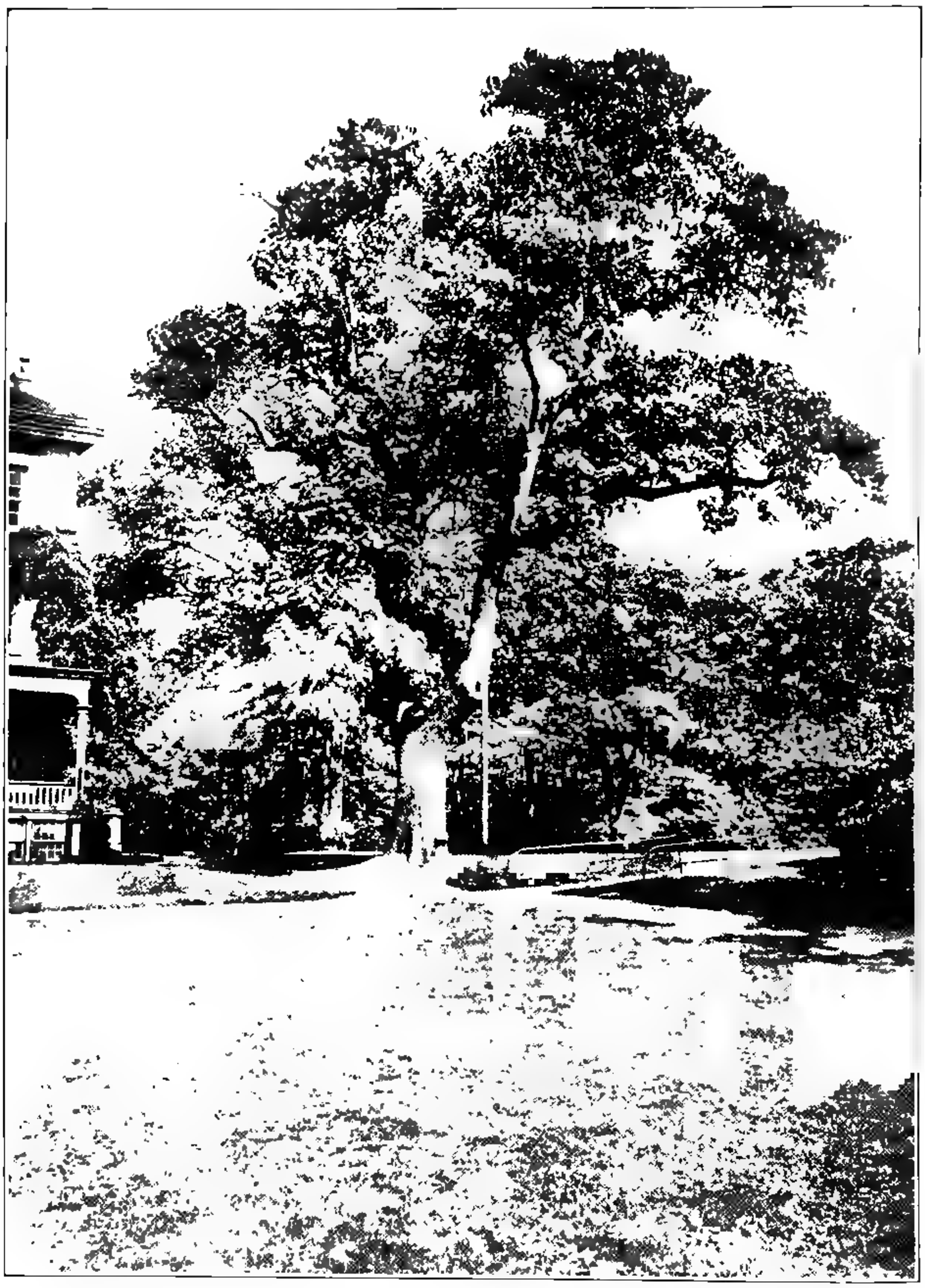

The Paulownia Tree at the Mansion.

JOURNAL

OF

The New York Botanical Garden

VOL. XVIII February, 1917 No. 206

FURTHER DEVELOPMENT OF THE NEW YORK BOTANICAL GARDEN.

A

TO THE BOARD OF MANAGERS OF THE NEW YORK BOTANICAL GARDEN,

Gentlemen: The Executive Committee has considered the communication relative to the further development of the Garden submitted by the Director-in-Chief on November 16, 1916, and would report the following presentation of the subject with the recommendation that it be published and transmitted to all members of the Garden.

A. The City of New York has granted the Garden:

1. The use of nearly 400 acres of land in Bronx Park; the value of this land is not less than $11,300,000
2. Funds which have been expended for buildings, driveways, bridges, fountains, paths, water-supply, drainage, and grading 1,400,000

B. The Garden's own activities have supplied:

1. Construction of paths, grading, water supply and minor construction, preparation of land for planting, furniture and equipment, costing about 150,000
2. About 14,000 species and varieties of living plants represented in the collections and valued at not less than 140,000
3. The library, containing about 28,000 volumes, valued at 112,000
4. Large collections in the public museums, valued at 50,000
5. The herbarium, consisting of about 1,500,000 specimens, valued at . 150,000
6. Endowment and permanent funds aggregating 550,000

This represents property of a total value of about $14,000,000

The contributions of the Garden to knowledge are noteworthy, and its publications are widely distributed. Many of its former students are occupying professorial and curatorial

[Journal for January (18: 1–27) was issued February 2, 1917.]

positions in institutions of learning. Through the teaching of children and the diffusion of information among adults, its direct educational work is continually expanding. Its collections are of very great scientific and educational value, are among the most important of any in the world, and have attained international significance. Its grounds are among the most beautiful and attractive of those of any public park.

To utilize properly this valuable property and to utilize as well our present efficient staff, more resources are urgently needed.

The completion of construction work during the next few years is much to be desired. This construction requires expenditure approximately as follows:

1. Completion of greenhouses	$150,000
Public Conservatory Range No. 2 is about one third built. The collections in both public ranges are crowded and greatly need more space. It is planned to make the central feature of Range No. 2 a display greenhouse for horticultural purposes. Space for the collections of economic plants is greatly desired. For experimental, cultural and student work, the propagating houses require additions.	
2. Completion of the Museum Building	250,000
The collections in the Museum Building are congested; they are continually increasing and becoming more complete and valuable; for their proper installation one of the two wings contemplated in the plans is required as soon as possible. More laboratory space is much needed for students, and more rooms for the preparation and storage of specimens. An additional lecture-room is needed and the library has outgrown its accommodations.	
3. Development of grounds and plantations	100,000
Only a beginning has been made in the development of the tract of about 140 acres added by the City in 1915 to the Garden reservation. Paths, drainage, water supply, grading and fencing are there required; also the preparation of ground for new plantations. Portions of the original area of 250 acres are also, as yet, undeveloped, needing grading, paths and planting.	
Total	$500,000

Our present resources are insufficient to accomplish this work.

We might continue to spend about $10,000 annually from our income as we have been doing for several years in developing the

grounds, but this is slow progress at the best and would not provide the needed buildings.

A gift of $500,000, or gifts aggregating $500,000, for expenditure would accomplish this work.

A gift of $500,000, or gifts aggregating $500,000, added to our present endowment, the interest only to be expended and the income made available for scientific and educational purposes subsequent to the completion of construction, together with such sums as might be added from other sources of income, would probably accomplish the work within about ten years. Such a foundation would be in many respects unique and its possibilities for usefulness would be enormous.

W. Gilman Thompson, *Chairman*,
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George McAneny,
Frederic S. Lee,
George W. Perkins,
Francis Lynde Stetson,
Frederic R. Newbold,
N. L. Britton, *Secretary*.

B

The foregoing report was accepted and approved by the Board of Managers at a meeting held January 8, 1917, and was referred to the Endowment Committee with power.

THE PAULOWNIA TREE AT THE MANSION

(With Plate 191)

The frontispiece to this issue shows a single large Paulownia tree which stands very near the Mansion in the New York Botanical Garden. This is one of several different kinds of ornamental trees used in the original scheme of decorative planting for the Mansion grounds.

This tree is about 62 years old, having been planted about 1857. When the photograph was taken last September, it

measured 14 feet in circumference, or over 4½ feet in diameter, one yard from the ground; and it will be noticed that the trunk increases considerably at the base. It has long since passed its prime, but still flowers and fruits abundantly nearly every year. The position is a sheltered one and the soil good. An immense Norway spruce, which stood 30 feet to the south and was doubtless planted at the same time, had to be cut a few years ago because it was badly decayed. It showed 65 annual rings and was over 10 feet in circumference.

The Paulownia also, I regret to say, is visibly decayed at the base and that this decay extends throughout most of the trunk was shown the past summer by the appearance at a knothole far up in the center of the tree of a clustered fruit-body of the sulfur-colored polypore, which is a deadly enemy of trees, causing a heart-rot for which there is no remedy. It may be only a short time before this disease will cause the destruction of the tree.

The old tree would be missed by many of our visitors and its removal would be a positive calamity to the birds that build regularly in its branches and to the squirrels that use the cavities in the larger divisions of its trunk as winter residences. Last August, I discovered that it had attracted new tenants. A swarm of bees had located in one of the hollow branches 20 feet or more from the ground and were busy storing up food for the winter. Could this swarm have come from the large tulip-tree near the Long Bridge, where a nest of bees was discovered several years ago? It may be that the scouts sent out to locate the new home had visited the Paulownia when in flower and knew of its possibilities!

The botanical name of the Paulownia is *Paulownia tomentosa*, sometimes called *Paulownia imperialis*, and it is apparently the only arborescent representative of the figwort or foxglove family grown in North America. About eight species are recognized in the genus, all from China or Indo-China, but most of them are little known here and are probably less hardy than the common species. They are large or medium-sized trees with immense leaves and showy terminal panicles of purple or nearly white flowers resembling the foxglove in form. The genus was named

in honor of the ill-fated Anna Paulowna, daughter of the Emperor of Russia and hereditary princess of the Netherlands.

The *Paulownia* is called "Kiri" in Japan, where it is much cultivated, and "Too" or "Hak-too" in China, where it grows wild. In England and America it is often called Empress-tree. Dr. Siebold considered it one of the finest trees in Japan, and it has been admired there for centuries. The famous Japanese hero Taikasma designed his coat of arms from its flowers and leaves.

The occidental history of *Paulownia tomentosa* dates only from 1835, when it was grown from seed in the Jardin des Plantes in Paris. It was first cultivated in a greenhouse, but was later found to do better outside. The first tree grown fruited in its eighth year and later attained a diameter of over three feet, measured a yard from the ground.

In 1843, Paxton figured the tree in his *Magazine* and made the following statement regarding it: "A considerable quantity of this noble tree has lately been introduced to Britain from France and elsewhere; and the circulated accounts, with the likelihood of its proving hardy, have excited so much attention, that we are induced to publish a drawing of it, which was made for us last year in the Garden of Plants at Paris, even though the species has not yet flowered in our own country. . . . It is one of the finest of Dr. Siebold's many introductions from Japan, where it grows to the height of thirty to forty feet, with a trunk from two to three feet in diameter."

In *Curtis' Botanical Magazine* for 1852, a plate appears with the following comment: "We have at length the satisfaction of giving a figure of this noble plant, the first published from flowers produced in the open air in England." These flowers came from southern England; in London, the flower buds are often killed.

The *Paulownia* was probably introduced into America between 1842 and 1845 in the form of seeds, which were grown in some of the prominent nurseries. This nursery stock was doubtless distributed far and wide and gave rise to the first trees to produce and scatter seed in various parts of the country. It would be interesting to locate any of these original trees, and especially any that may still exist in the vicinity of New York City.

In the Garden *Journal* for 1907, Mr. Nash described and figured a young tree planted near the Museum building which grew fourteen feet in one season. Dr. Siebold said that his young trees grew six to ten feet in a year and increased their diameter four or five inches in three years. This rapid growth makes soft, light, coarse-grained wood of little strength but durable when not exposed to the weather and valued in Japan for cabinet work and for the charcoal used in the best fireworks.

A curious discovery was made in Paris in working with the first seedlings. During the first year, they made no wood and consequently died down to the ground, sending up one or two hardy sprouts the following spring with leaves nearer their adult form and structure. The tree has been spoken of as a "large herb," resembling as it does in some respects when young many of the large tropical herbaceous plants.

In America, the *Paulownia* has escaped from cultivation and grows wild from southern New York southward along the Atlantic and Gulf coasts to Florida and Texas. It is also a common tree in Indiana, California, and certain other states. North of New York City, the flower buds are usually killed during the winter, although the tree itself may be hardy as far north as Massachusetts. In Montreal, it is killed to the ground every year and new shoots spring up which are highly ornamental as foliage plants. Similar growths are sometimes secured farther south by cutting back the trunk regularly.

As in the case of the *Ailanthus*, the rapid spread of the *Paulownia* is due to its adaptation to almost any soil, its quick growth, easy propagation, and comparative freedom from diseases and pests. Great numbers of winged seeds sift through the slits in the ripe capsules and scatter in every direction. Shoots arise from the roots or from any part of the stem that may be covered with soil. Cuttings may be made not only from the root and green wood, but also from the young, unfolding leaves, thus emphasizing the peculiar herbaceous character of the tree.

As a shade tree, it may be used for parks, lawns, and avenues, but is hardly desirable for ordinary street planting. Light, deep loam is the best soil for it, although it grows fairly well in poorer

soils. The flowers are large, delicately scented, and attractively colored, but they appear before the leaves and thus lack a suitable setting. The conspicuous ovoid pods remain on the tree during the winter and give it an unattractive appearance. The terminal branches, also, exhausted by fruit bearing, usually die back three or four feet and have to be removed.

Two varieties of *Paulownia tomentosa* are recognized. Variety *pallida* has pale blue-violet flowers and leaves that are obscurely green above. Variety *lanata* has flowers of the typical color, but its branches, leaves, and flowers are conspicuously woolly-pubescent, which makes it somewhat hardier. It is also larger and better for cultivation than the ordinary typical form.

W. A. MURRILL,
Assistant Director

BIRDS IN THE NEW YORK BOTANICAL GARDEN

II. BIRD FOODS

To give a complete list of all the various kinds of food to be found in the Botanical Garden suitable for birds would be impossible in the space at our disposal. For convenience it has been thought best, following two recent and authoritative lists compiled by experts, to indicate which foods mentioned by them may be found in the Garden.

The following list of fruit-bearing trees, shrubs, vines and herbaceous plants attractive to birds, showing the season when the fruit matures and when it is available for food, is adapted from that compiled by Mr. Wilson H. Fay for Edward Howe Forbush's "Useful Birds and Their Protection." We cite only plants known to grow in the Garden.

June.. ....Shad-bush, Juneberry, *Amelanchier canadensis* (tree).
June, July..... ...Red-berried elder, *Sambucus racemosa* (shrub).
June, July..... .. ...Wild red raspberry, *Rubus aculeatissimus* (shrub).
June, July, August... ...Blueberries, *Vaccinium* (shrubs).
June, July, August.....Black and white mulberries, *Morus* (trees).
July..... ...Wild strawberry, *Fragaria virginiana* (herb).
July.....Thimbleberry, *Rubus occidentalis* (shrub).
July.....Wild red cherry, *Prunus pennsylvanica* (tree).

July . . . . . Wild black currant, *Ribes floridum* (shrub).
July, August . . . . . Wild sarsaparilla, *Aralia nudicaulis* (herb).
July, August . . . . . False spikenard, *Vagnera racemosa* (herb).
July, August . . . . . Sassafras, *Sassafras variifolium* (tree).
July, August . . . . . High-bush blackberry, *Rubus allegheniensis* (shrub).
August . . . . . Black cherry, *Prunus serotina* (tree).
August . . . . . Choke cherry, *Prunus virginiana* (tree).
August, September . . . Gray cornel, *Cornus femina* (shrub).
August, September . . . . . Silky cornel, *Cornus Amomum* (shrub).
August, September . . . . . Red-osier dogwood, *Cornus stolonifera* (shrub).
August, September . . . . . Alternate-leaved cornel, *Cornus alternifolia* (shrub).
August, September . . . . . Beach plum, *Prunus maritima* (shrub).
August, September . . . . . Common elder, *Sambucus canadensis* (tree).
August, September . . . . . Dewberry, *Rubus villosus* (vine).
August, September . . . . . High blueberry, *Vaccinium corymbosum* (shrub).
September . . . . . Climbing bitter-sweet, *Celastrus scandens* (vine).
September . . . . . Moonseed, *Menispermum canadense* (vine).
September . . . . . Cranberry-tree, *Viburnum Opulus* (shrub).
September . . . . . Arrow-wood, *Viburnum acerifolium* (shrub).
September . . . . . Black haw, *Viburnum prunifolium* (shrub).
September . . . . . Withe-rod, *Viburnum cassinoides* (shrub).
September . . . . . Sweet gum, *Liquidamber Styraciflua* (tree).
September, October . . . . White thorn, *Crataegus coccinea* (tree).
September, October . . . Tupelo, sour gum, *Nyssa sylvatica* (tree).
September–October . . . . Northern fox grape, *Vitis labrusca* (vine).
September-November . . . Sheepberry, *Viburnum Lentago* (shrub).
September–winter . . . Flowering dogwood, *Cornus florida* (tree).
September–winter . . . . Hackberry, nettle-tree, *Celtis occidentalis* (tree).
September–winter . . . . Spice bush, *Benzoin aestivale* (shrub).
September-winter . . . . . Snowberry, *Symphoricarpos racemosus* (shrub).
September–winter . . . . . Inkberry, *Ilex glabra* (shrub).
September–winter . . . Black alder, *Ilex verticillata* (shrub).
September–winter . . . . American holly, *Ilex opaca* (tree).
September, winter . . . . . American mountain ash, *Sorbus americana* (tree).
September–winter . . . . . European mountain ash, *Sorbus Aucuparia* (tree).
September–winter . . . . . Red cedar or savin, *Juniperus virginiana* (tree).
September–winter . . . . . Common juniper, *Juniperus communis* (shrub).
September–winter . . . . . Poison ivy, *Rhus Toxicodendron* (shrubby vine).
September–winter . . . . . Checkerberry, *Gaultheria procumbens* (herb).
September–winter . . . . . Partridge berry, *Mitchella repens* (vine).
September–winter . . . . . Pokeweed, *Phytolacca decandra* (herb).
September–winter . . . . . Barberry, *Berberis vulgaris* (shrub).
September–winter . . . . . Common greenbrier, *Smilax rotundifolia* (vine).
September–winter . . . . . Bayberry, *Myrica carolinensis* (shrub).
September–winter . . . Privet or prim, *Ligustrum vulgare* (shrub).
September–winter . . . . . Virginia creeper, *Psedera quinquefolia* (vine).
September–winter . . . . . Common night-shade, *Solanum nigrum* (vine).
September -winter . . . . . American hornbeam, *Carpinus caroliniana* (tree).

September–winter. . . . . Cockspur thorn, *Crataegus Crus-galli* (tree).
September–winter. . . . . Wild rose, *Rosa humilis* (shrub).
September–winter. . . . . Staghorn sumach, *Rhus hirta* (shrub).
September–winter. . . . . Dwarf sumach, *Rhus copallina* (shrub).
September–winter. . . . . Smooth sumach, *Rhus glabra* (shrub).
November. . . . . Frost grape, chicken grape, *Vitis cordifolia* (vine).

Not included in the above list, but also in the Garden, are the following from a list compiled by Mr. William L. G. Edson for *Bird Lore*, December, 1915:

June, July. . . . Ruprecht's Honeysuckle, *Lonicera Ruprechtiana.*
July. . . . . Morrow's honeysuckle, *Lonicera Morrowi.*
July. . . . . Bush honeysuckle, *Lonicera bella.*
July. . . . . Tartarian honeysuckle, *Lonicera tatarica.*
September. . . . . English Fly-honeysuckle, *Lonicera xylosteum.*
July. . . . . Mahaleb cherry, *Prunus Mahaleb.*
July, August. . . . . White-fruited dogwood, *Cornus alba.*
July. . . . . Mountain currant, *Ribes alpinum.*
July. . . . . Buffalo currant, *Ribes aureum.*
October. . . . . Dogwood, *Cornus controversa.*
August. . . . . Purpus's dogwood, *Cornus Purpusii.*
July. . . . . Japanese oleaster, *Elaeagnus multiflorus.*
July, August. . . . . Smoke tree, *Rhus Cotinus.*
July. . . . . Japanese viburnum, *Viburnum tomentosum.*
August . . . Wayfaring tree, *Viburnum lantana.*
August. . . . . Arrow-wood, *Viburnum dentatum.*
August. . . . Pubescent viburnum, *Viburnum pubescens.*
September. . . . . Canby's viburnum, *Viburnum Canbyi.*
July. . . . . European bird cherry, *Prunus Padus.*
September. . . . . Thorns, *Crataegus.*
September, winter. . . . . Buckthorn, *Rhamnus cathartica, lanceolata, Purshiana.*
September. . . . . Sea buckthorn, *Hippophae rhamnoides.*
September, October. . . . . Silver thorn or oleaster, *Elaeagnus angustifolius.*
September to March. Crab-apple, *Malus floribunda.*
October. . . . . Crab-apple, *Malus Ringo.*
September. . . . . Barberry, *Berberis Poirettii.*
September. . . . . Common barberry, *Berberis vulgaris.*
March, April. . . . . Thunberg's barberry, *Berberis Thunbergii.*
October. . . . . Spindle-tree, *Euonymus Sieboldianus.*
November. . . . . Matrimony vine, *Lycium haliminifolium.*
Fall, winter. . . . . Weigelia, *Diervilla hybrida* variety.
Spring. . . . . Dandelion, *Leontodon Taraxacum.*
December. . . . . Sweet birch, *Betula lenta.*
August to March. . . . . European white birch, *Betula alba.*
August, September. . . . . Black birch, *Betula nigra.*
September to June. . . . European and Japanese larches, *Larix europaea, leptolepis.*

Fall, winter.....St. John's wort, *Hypericum prolificum.*
July..... .....Goumie, *Elaeagnus longipes.*

"Nearly all the winter birds, from the kinglet to the crow, eat the barberry," says Mr. Forbush, who is State Ornithologist of Massachusetts. "The supply at Wareham usually becomes exhausted in February, after which the Myrtle warbler and many of the winter sparrows disappear." On the contrary, the barberry, which is prolific and of which several varieties are to be found in the Garden, does not seem to be a favorite with birds, although a few of them occasionally partake.

Robins feed on elder-berries, honeysuckles, dogwoods, mountain currant, oleaster, mountain ash, viburnums, sheep-berry, blueberries, hawthorn, buckthorn, crabapples, matrimony vine and barberries.

Bluebirds prefer wild cherries, sumachs, poke-berry and elder-berries.

Cuckoos like mulberries and elders.

Orioles choose mountain ash, wild cherries and service-berries.

Pine grosbeaks select poplars, pines, cedar, spruces, tamarack, maples and mountain ash.

Grackles favor elders and mountain ash.

Blueberries suit the chewink.

Cardinals partake of red cedar, catbrier, bittersweet, sumachs and haws.

Rose-breasted grosbeaks like buds and blossoms of all fruit trees and seed of alders and birches.

Thrushes eat small fruits and Virginia creeper.

Purple finch fares equally well on seeds of white ash or berries of red cedar and mountain ash.

Cedar waxwing visits dogwoods, oleaster, mountain ash, sheep-berry, blueberry, wild cherry, crabapple and of course cedar.

Of the vireos the yellow-throated prefers fruit of red cedar, and the red-eyed prefers prickly ash, dogwoods, sassafras, magnolias, hornbeam, spice-bush, mulberries, pokeberries and viburnums.

Even the woodpeckers spare time for a taste occasionally—the hairy of sumachs, Virginia creeper, and dogwoods; the downy of

sumachs and poison ivy; the red-head of mountain ash, acorns and beechnuts; the flickers of honeysuckles, dogwoods, bayberries, sumachs, and wild cherries.

The kingbirds find food on the dogwoods, and the phoebes on the hawthorns.

Look for crossbills where you find arbor-vitae, tamarack or firs; redpolls on birches, alders, buttonbush or larches; siskins on sweet gum, maples or elms; gold-finches on smoke-tree, birches or larches.

Thrashers visit viburnums, mountain ash, honeysuckles, dogwoods, currants and cherries.

Tennessee, black-throated, green and myrtle warblers are fond of poison sumach and ivy.

St. John's-wort is a favorite with junco and tree sparrow.

Catbirds eat dogwoods, oleaster, viburnums, Virginia creeper, sassafras, spice-bush, honeysuckles, cornels and blueberries.

F. A. H.

NOTES FROM THE HERBACEOUS COLLECTIONS—I

Plants of a possible horticultural value or of especial botanical interest are grown in the Herbaceous Grounds. It is planned to present from time to time notes concerning these. In this number are considered four plants of the Poppy family, all of which have flowered during the past summer.

Hypecoum procumbens L. is a delicate annual which flowered for a short time in mid-summer. While it promises little of horticultural value, it proves of interest from a botanical standpoint. Several stems less than 1 foot high rise from amongst leaves slightly glaucous, resembling those of the fumitories. Lightly carried on the stems are bright yellow flowers each less than 1 inch in diameter. The two sepals drop when the flower expands, and the four petals also fall after a short time. Of the latter the two outer ones are ovate and bluntly three-lobed, the two inner are much smaller, and nearly trifid. This is, perhaps, the most striking irregularity of corolla in the Papaveraceae. The long slender capsule is transversely ridged, and at first glance suggests that of some member of the Mustard family.

This plant, which is a native of parts of Europe, Asia, and northern Africa, is said to sow itself freely in England, being treated as a hardy annual. In conditions such as those given it at the Garden, it needs to be grown each year from planted seed, preferably in its permanent location.

Another interesting plant is the yellow or Celandine poppy, *Stylophorum diphyllum* (Michx.) Nutt., an herb of use to the horticulturist. It is the American representative of a small genus, of which another species is in our herbarium from China. It is a robust perennial, with leafy stalks, 1 foot high, arising from a large rootstock. The leaves are ovate-oblong, varying from bluntly lobed to nearly crenate-margined. They are slightly glaucous above and almost scurfy beneath. Two small stem-leaves are usually borne together at the top of the stem, hence the specific name. Above these two leaves are the blossoms in a few-flowered terminal raceme. The hairy sepals drop away when they are no longer needed to enclose the folded flower, and disclose a corolla 2 inches in diameter, made up of four rounded yellow petals. The center of the flower is made prominent by the large green style and stigma with the yellow anthers as body-guard. The capsule is four-valved, oval, and tipped with the persistent style.

In the presence of a copious orange-yellow sap, and in the appearance of its leaves, the Celandine poppy resembles that old favorite, the Celandine, but has flowers much larger and capsules distinct in size and shape.

Stylophorum diphyllum is native to the east-central United States, where it grows in low, moist woods. Our plant flourishes in the open, doing much better for us there than does its relative the blood-root. It is very floriferous, blooming in the spring and early summer, and is quite hardy. A somewhat shaded location may improve it. Easily grown from seed, it may also be propagated by dividing the roots. However, this should be attempted with the care needed in the treatment of plants of the poppy and fumitory families.

During the summer of 1915, in the nursery of the Garden, a group of scurfy gray leaves appeared to be the only manifestation

of a plant designated as a *Glaucium*. The following year, however, a strong branching stem grew to a height of nearly 3 feet, bearing rounder, smoother and clasping leaves, which were quite different from the radical ones below. This stem bore several large yellow flowers of short duration, but which were quickly followed by others. The capsules were long, slender, and slightly curled, with a dryness and brittleness which gave them an appearance of being carved out of some light wood.

This plant, the yellow-horned or sea poppy (*Glaucium Glaucium* (L.) Karst.), is a native of Europe, but is now found adventive in parts of the eastern United States. On account of its silvery-gray root-leaves, it may be used as a foliage plant; however, its coarse habit makes it of little value for the flower garden. It appears to be biennial here, and is easily propagated by seeds sown directly in the permanent location.

After a complete failure one season, the cream-cups, *Platystemon californicus* Benth., has been grown in the Herbaceous Grounds this summer. This species is a dainty annual from the Pacific slope of this country. In habit it is low and branching, and is clothed with an abundance of long spreading hairs. The leaves are linear-lanceolate and entire. The flowers are borne on slender pedicels 4 to 5 inches long. The sepals are three in number, one more than most of the plants of the order possess. The six cream-colored petals remain expanded longer than do those of the other genera of the family, but our specimen did not show the corolla persistent over the capsule, an interesting habit claimed for *Platystemon*. This name, which is Greek for "broad stamen," is derived from the dilatation of the filaments of the cluster of stamens which surround the style. The capsule is divided to the base into moniliform carpels, a very singular character which has suggested to botanists a kinship to the Crowfoot Family.

This plant is native to California, Utah, and Arizona, living in sandy soil. It is occasionally grown as a border annual, and is to be propagated by seeds sown in the open ground.

The Eschscholtzias, Hunnemannias and Argemones, more familiar members of the poppy family, by reason of the beauty

and oddity of their leaves and the varied yellow shades of their flowers, furnish us with plants so attractive that these others of their clan may seem scarcely needed in our gardens. However, these others show no lack of interesting characters, and it is to be hoped that they may be kept in our collections.

KENNETH R. BOYNTON

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R. S. Williams

NOTES, NEWS AND COMMENT

Professor F. D. Kern, of the Pennsylvania State College, recently spent several days at the Garden working over manuscript on rusts preparatory to the work in *North American Flora.*

Dr. O. Kunkel, of the United States Department of Agriculture, recently spent a day at the Garden conferring with Dr. Arthur in connection with rust work.

Dr. W. C. Sturgis, formerly Dean of the College of Forestry in Colorado College, was a recent visitor at the Garden. Dr. Sturgis expects to spend several weeks in Bermuda where he will collect fungi and slime moulds.

Dr. Henri Hus, who is on leave of absence for three years from the University of Michigan, is spending several months at the Garden prosecuting investigations of various rubber-producing plants. He has recently returned from Java, with considerable material for his studies.

The following persons enrolled in the library during January as visitors to the Garden: Dr. C. H. Kauffman, Ann Arbor, Mich.; Dr. Caroline A. Black, Durham, N. H.; Dr. A. G. Johnson, Madison, Wis.; Dr. H. B. Humphrey, Washington, D. C.; Dr. J. C. Arthur and Prof. H. S. Jackson, Lafayette, Ind.; Dr. D. T. MacDougal, Tucson, Ariz.; Dr. E. E. Free, Baltimore, Md.; Dr. Alfred Gunderson, Brooklyn, N. Y.; Dr. H. Hus, Ann Arbor, Mich.; Dr. Philip Dowell, Port Richmond, N. Y.; Prof. Frank D. Kern, State College, Pa.; Miss Caroline C. Haynes, Highlands, N. J.; Dr. Ezra Brainerd, Middlebury, Vt.; Dr. Wm. C. Sturgis, Colorado Springs, Colo. and Prof. Alexander W. Evans, New Haven, Conn.

Dr. C. L. Shear visited the Garden on February 3 to consult the library and mycological collection. He then went with Professor J. C. Arthur to Philadelphia to examine the Schweinitz collection of fungi to determine how it may be made more available to American mycologists. Dr. Shear and Dr. Arthur are members of a committee appointed for this purpose by the American Pathological Society.

Dr. W. A. Murrill, assistant director, visited the state museum at Albany, January 12–16, to study certain types of fleshy fungi described by Dr. C. H. Peck. The herbarium is now safely housed in new steel cases in the Education Building, and most of the types appear to be in excellent condition. Dr. H. D. House, state botanist, has spent considerable time getting the specimens of fungi together so that they might be available for study.

Dr. Marshall A. Howe, curator, gave an illustrated lecture on "Planning Next Summer's Flower Garden" before the Garden Club of Pleasantville, New York, on the evening of February 6.

The second lecture and conference of the course for Garden members being given at the Mansion was delivered on Thursday, February 8. The subject was "Winter Fruits" and was presented by Mr. George V. Nash, head gardener. A collection of specimens from the Garden collections of about thirty kinds of shrubs and trees, still retaining their fruits, was exhibited. About two dozen colored drawings of shrubs and trees in fruit were also displayed; these drawings were prepared for future illustrations in "Addisonia."

Nearly 700 biology pupils from Evander Childs High School spent the forenoon of January 23 at the Garden studying the conservatory and museum collections under the guidance of their teachers and members of the Garden staff, following a schedule and series of exercises prepared by Mr. Paul B. Mann. The subject of forestry was presented by an illustrated lecture given in the lecture hall by Mr. George E. Hewitt. In connection with this subject, various trees on the grounds were examined with special reference to their appearance and protection during the winter months.

About 600 biology pupils from Morris High School assembled in the lecture hall of the museum building shortly after eight o'clock on the morning of January 25 to hear a lecture on forestry by Mr. Sherwood, of the American Museum of Natural History. After the lecture, the pupils in groups of fifty were conducted through the museum to observe plant products; through the grounds to examine trees in winter condition; and through the conservatories to see tropical economic plants. A list of carefully prepared questions was submitted to each pupil to be answered in writing while making the observations.

An attractive place in conservatory range 1 during this month is the aquatic house, no. 9. Here are two tender water-lilies,

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Vol. 3, part 1, 1910. Nectriaceae—Fimetariaceae.

Vol. 7, part 1, 1906; part 2, 1907; part 3, 1912. Ustilaginaceae—Aecidiaceae (pars).

Vol. 9 (now complete), parts 1 and 2, 1907; part 3, 1910; part 4, 1915; parts 5, 6, and 7, 1916. Polyporaceae—Agaricaceae (pars). (Parts 1 and 2 no longer sold separately.)

Vol. 10, part 1, 1914. Agaricaceae (pars).

Vol. 15, parts 1 and 2, 1913. Sphagnaceae—Leucobryaceae.

Vol. 16, part 1, 1909. Ophioglossaceae—Cyatheaceae (pars).

Vol. 17, part 1, 1909; part 2, 1912; part 3, 1915. Typhaceae—Poaceae (pars).

Vol. 21, part 1, 1916. Chenopodiaceae.

Vol. 22, parts 1 and 2, 1905; parts 3 and 4, 1908; part 5, 1913. Podostemonaceae—Rosaceae (pars).

Vol. 25, part 1, 1907; part 2, 1910; part 3, 1911. Geraniaceae—Burseraceae.

Vol. 29, part 1, 1914. Clethraceae—Ericaceae.

Vol. 34, part 1, 1914; part 2, 1915; part 3, 1916. Carduaceae—Anthemideae.

Memoirs of the New York Botanical Garden. Price to members of the Garden, $1.00 per volume. To others, $2.00. [Not offered in exchange.]

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. viii + 138 pp., with 29 plates. 1909.

Vol. IV. Effects of the Rays of Radium on Plants, by Charles Stuart Gager. viii + 278 pp., with 73 figures and 14 plates. 1908.

Vol. V. Flora of the Vicinity of New York: A Contribution to Plant Geograhy 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 + 592 pp., with 43 plates and many text figures. 1916.

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NEW YORK BOTANICAL GARDEN
BRONX PARK, NEW YORK CITY

Vol. XVIII March, 1917 No. 207

JOURNAL

OF

The New York Botanical Garden

EDITOR

FRANCIS WHITTIER PENNELL

Associate Curator

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JOURNAL

OF

The New York Botanical Garden

VOL. XVIII March, 1917 No. 207

INSTRUCTION IN GARDENING, IN COOPERATION WITH THE INTERNATIONAL CHILDREN'S SCHOOL FARM LEAGUE

(WITH PLATE 192)

A

INTERNATIONAL CHILDREN'S SCHOOL FARM LEAGUE
47 West 34th Street, New York City

October 4, 1916.

TO THE PRESIDENT AND BOARD OF MANAGERS
OF THE NEW YORK BOTANICAL GARDEN

Gentlemen: For some years I have been conducting children's gardens in New York City, and I respectfully ask for your consideration the proposition of establishing in The New York Botanical Garden a training school for teachers of children's gardens, and others who may be interested in home gardens along the same lines and methods which have been so successful in the gardens under my care. The New York Botanical Garden would seem to be the most desirable place because of the scientific knowledge and sympathetic educational environment.

The Board of Education is showing a disposition to purchase land for school gardens and has already authorized the purchase of land for this purpose in connection with Public School No. 45, Bronx, thus showing a recognition of the value of the school garden to the curriculum. For years many teachers have struggled with small gardens entirely on their own initiative.

[Journal for February (18. 29–52) was issued February 27, 1917.]

Last spring, two hundred public school teachers worked with their classes during school hours in the Manhattan Park gardens that are under my direction. Their being allowed to do this in school hours shows the awakening of the Board of Education to the value of this work in connection with their curriculum.

I was invited by the Board of Education and City Superintendents to become one of their lecturers at the Institutes held from the 11th to the 25th of September, which gave an opportunity of bringing this work and my methods before over 2,000 teachers. Yesterday, a conference was held by the direction of the District Superintendent of seventy-two teachers in the DeWitt Clinton Park garden, my son and I both speaking to them on the subject of the value of children's gardens to the curriculum.

It would require the use of about an acre of land for outdoor work and room indoor for lecture and laboratory work. The cost would be in the neighborhood of $4,000 per annum, which I believe is feasible to secure after your favorable action, based upon the fact that I have now a promise of $100 per annum from one person and another $100 in hand, which I am quite sure would be given annually if his health permits. For several years, the above League has been receiving $1,000 or $1,500 from another source for a similar purpose which it is probable they would transfer to this. The Brooklyn Botanic Garden established such classes two years ago with success. Nominal fees were charged.

The cost would be approximately as follows:

Maintenance		
Salary of Supervisor	$2,500	
Gardener	480	
Extra Labor	270	
		$3,250
Construction		
Grading and water supply	500	
Laboratory equipment	250	
		750
Total		$4,000

First year

Possibility of what I could obtain:

Annually donated to the above League for similar purposes	$1,000	
Promised annually for the purpose	100	
In hand for the same purpose	100	
		$1,200

I am, gentlemen,

Cordially yours,

FANNIE GRISCOM PARSONS,
President.

B

THE NEW YORK BOTANICAL GARDEN, BRONX PARK, NEW YORK CITY.

November 18, 1916

MRS. HENRY PARSONS,
29 West 56th Street, New York City.

Dear Madam: I presented your letter of October 4th, 1916, and subsequent letters to the Board of Managers of The New York Botanical Garden at their meeting held November 16th, and was authorized to make the following reply:

The Managers of The New York Botanical Garden will, at such time as you may obtain, within one year, guarantees of financial cooperation of not less than $4,000 a year for a term of not less than two years, independent of contributions for the direct and essential purposes of the Garden, enter into an agreement to set apart and prepare about one acre of land near the Mansion and three rooms on the third floor of the Mansion for the purposes of training teachers for school gardens, said $4,000 or more to be annually paid to the Treasurer of The New York Botanical Garden and disbursed by him on warrants approved by the Director-in-Chief of the Garden or the Assistant Director.

It is understood that the Supervisor would be the officer of instruction and control of all students, to be appointed by the Managers of The New York Botanical Garden after nomination by the International Children's School Farm League, and he

would be ranked as a member of the Garden staff under the jurisdiction of the Scientific Directors.

The Managers of the Garden will further agree, after receiving the aforesaid guarantees, to provide lecture-room accommodations in the Mansion, library and herbarium facilities in the Museum Building, and, if funds become available, greenhouse facilities; also the advice of the Head Gardener and Foreman Gardener and of the Director of the Laboratories, the use of teams, carts, and agricultural machinery when required, and will construct such paths as may be necessary; members of the scientific staff of the Garden may deliver occasional lectures; the Saturday afternoon lectures in the Museum Building would be available for students, as well as the system of docentry already established.

The Managers further authorized me to say that while they are willing to take up the proposition as above outlined, the only quite satisfactory means to ensure the perpetuation of the work is through endowment specified for the purpose, and that they would be willing to hold and administer such endowment; the amount should not be less than $100,000.

The Managers also instructed me to express to you their high appreciation of the valuable instructive work you have accomplished in the development of the school garden system of the City, and to wish you all success in accomplishing the enterprise you now have in hand.

Yours respectfully,

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

C

PLEDGES TO THE INTERNATIONAL CHILDREN'S SCHOOL FARM LEAGUE FOR THE NEW YORK BOTANICAL GARDEN SCHOOL FOR GARDENING, YEARLY FOR TWO YEARS.

Russell Sage Foundation	$1,000.00	Mrs F. Kingsbury Curtis	$ 25.00
Mrs. Andrew Carnegie	400.00	Miss Georgine Iselin	25.00
Henry C. Frick	250.00	Miss Mary T. Bryce	25.00
Andrew Carnegie	250.00	Mrs. James Roosevelt	25.00
Mrs. Cleveland H. Dodge	200.00	Mrs John Wells	20.00
Edward H. Kidder	100.00	Mrs. Henry M. Tilford	12.50
V. Everit Macy	100.00	Mrs. F. P. Frazier	12.50
Cleveland H. Dodge	100.00	Mrs. Frederick H. Eaton	12.50
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Miss Emily L. Tuckermann	50.00	Mrs. J. J. Chapman	5.00
Mrs. Archibald D. Russell	50.00	Henry Parsons	5.00
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Intl. Ch. School Farm League	37.50	Mrs. Charles Phelps	5.00
Herbert L. Satterlee	25.00	Mrs. John T. Terry	5.00
Mrs. Willard D. Straight	25.00	Mrs. James R. Parsons	5.00
Mrs. Seth Low	25.00	Mrs. Henry N. Munn	5.00
Jesse Isidor Straus	25.00	Miss Louise Wicke	2.50
Clarence H. Mackay	25.00	Mrs. Douglas Robinson	2.50
John Markle	25.00		
Total			$4,000.00

D

Pursuant to the above correspondence, the subject having been referred by the Board of Managers on January 8, 1917, to the President of the Board and the Director-in-Chief, with power, a tract of land near the Arboretum Entrance on the eastern side of the grounds, about nine hundred feet south of the Mansion, has been set apart and prepared for cultivation, path

approaches to it are under construction, a suite of rooms in the Mansion has been prepared for use, and the agreement will be operative as of April first, 1917.

The instruction in gardening will be in charge of Mr. Henry Griscom Parsons as Supervisor, and will include the following courses:

E

COURSES OF INSTRUCTION

I. *Simple Home Garden Courses for those desiring to conduct their own gardens.*

Mondays in April, 2.30 P.M.
Tuesdays in May, 4.30 P.M.
Tuesdays in June, 4.30 P.M.

The fee for each course will be five dollars, which will include necessary supplies and materials.

TALKS.

Soil and preparation.
Cultivation and weed control.
What and how to plant. Transplanting. Food values.
Relation of sunlight, air, and water to the garden.

GARDEN PRACTICE, AND OBSERVATION.

Planting, transplanting, thinning, spading, raking, hoeing, cultivating, weeding.

To be repeated, as needed, monthly, hours to be arranged.

II. *Training Courses for Teachers for School Gardens*

Mondays, Tuesdays, Wednesdays, Thursdays and Fridays May 14th to June 22nd, 1917, from 2.30 to 5.30 P.M. Mondays, Tuesdays, Wednesdays, Thursdays and Fridays July 9th to August 17th, 1917, from 9.30 A.M. to 12.30 P.M.

This course will show the pedagogical value of the school garden, and how it may fit into the curriculum without disturbing it.

How, by proper planning, a teacher may take a full class into the garden and do effective work in the ordinary class period.

How the garden will furnish material of educational value, alive with interest, which will aid and inspire the regular classroom studies of reading, writing, arithmetic, language, drawing, geography, and history.

Instruction will be given, by lectures, practice work, and reading, in those subjects needed by teachers in school garden work, and connected classroom experiments.

Laboratory and garden tools will be supplied without charge.

The fee for each course will be twenty-five dollars, which will include necessary materials and supplies.

A certificate will be awarded by The New York Botanical Garden to students satisfactorily completing the course.

LECTURES. 30 one-hour periods.

Introduction. The school garden an educational laboratory, planned for the child's development. The teacher's attitude.

Correlation. Examples of how to use the garden problems in classroom work.

Planning the School Garden. The ground plan and planting scheme.

Soil and fertility. Fertilizers and manures.

Seeds. Selection. Germinating. Planting. Transplanting. Thinning. Proper spacing.

Relation of water, air, sunlight to the garden.

Insects and animals of the garden.

Hygiene and physical culture lessons drawn from the garden work and study, to be applied by the teacher in guiding the child at work, and in talks in the classroom.

Studies of growing plants. Lessons in observation.

Short histories of several vegetables. Uses.

Elementary forestry and soil conservation.

GARDEN PRACTICE. 30 one-hour periods.

Spading, raking, hoeing, cultivating, planting, thinning, transplanting, weeding. Weed and insect studies. Harvesting and exhibit preparation. General and special observation.

LABORATORY AND SHOP PRACTICE. 30 hours.

Cultivating stick, garden line and knots, plot stake, marking board, hand carrier, root and insect cages, flat or window box, butterfly net, poison jar, spreading board, map, stencils, and studies and experiments with student-made apparatus.

III. *Special or Partial Courses* in gardening may be arranged if applications are sufficiently numerous.

IV. *Autumn Course.*

Mondays, Tuesdays, Wednesdays, Thursdays and Fridays, September 10th to October 26th, from 4 to 5.30 P.M. The fee for this course will be twenty dollars, which will include necessary supplies and materials.

LECTURES.

Seeds, weeds, composting, fertilizers, fall tillage, cover crops. Food values.

GARDEN PRACTICE.

Harvesting of seeds, of plants and of root crops. Fall fertilizing and spading. Compost pits and their contents. Fall planting. Plant protection for the winter.

LABORATORY.

Experiments and shop work.

V. *Greenhouse Courses* will be organized for November and December, 1917, and for January and February, 1918, to include lectures, greenhouse bench work, propagating, potting, seed testing, hot-bed and mold-frame practice.

All correspondence relative to these courses should be addressed to

HENRY GRISCOM PARSONS,
Supervisor of Gardening Instruction,
Mansion, New York Botanical Garden,
Bronx Park.

Access to the School Garden and to the Mansion is most convenient from the new Pelham Parkway Station of the White Plains Road extension of the Subway, walking west on the Bronx and Pelham Parkway and north on either the Bronx Boulevard or on paths which lead to the Mansion. Access can also be had by a somewhat longer walk from the terminal (Botanical Garden or Bronx Park) station of the Third Avenue Elevated Railway, walking east through the Flower Gardens and Hemlock Forest to the Mansion. The Southern Boulevard trolley line reaches the southwestern corner of the Botanical Garden at the junction of Southern Boulevard and Pelham Avenue, from which point access to the Mansion and School Garden can be had by walking east on Pelham Avenue and north to the Mansion.

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

BIRDS IN THE NEW YORK BOTANICAL GARDEN

III. Migration

The New York Botanical Garden was favored the past year, in common with the other parks in the city, with a host of birds in migration. Conspicuous among these, seen in increased numbers, were Canadian, bay-breasted, black-poll, magnolia, Wilson, and palm warblers; red-breasted nuthatches, fox sparrows, scarlet tanagers, and sapsuckers.

During migration there is no particular spot in the Garden where the birds assemble—they are everywhere. With the Bronx River in the center, the orchard on the one side and the Fruticetum and Herbaceous Garden on the other, even the stranger may not go wrong. He has but to follow the generous paths up one bank of the river and down the other, and detour over the contiguous heights.

Along the shore of the river may be seen solitary, spotted, pectoral, semipalmated and least sandpipers, and both the water-thrushes; in the water plenty of mallard-ducks, occasionally black-ducks, and, the past summer, a solitary female wood-duck;

coming down the air-lane great-blue, black-crowned, and green herons, kingfishers, nighthawks and all the swallows; and, far aloft, swifts, gulls, and an occasional hawk.

At the Boulder Bridge, if anywhere in particular, bird-life centers, or at least that is where observers foregather. Toward evening is a favorite time. The bridge is then in shadow and the foreground in sunlight. Then the trees, the bushes, the interlacing vines are full of feathered beauties, so plentiful that one is confused in trying to identify them.

At the base of the bridge on the north side is a spot that observers call the birds' bathtub. Running water has washed a sandy pool and made it most enticing. There come the thrushes, warblers and sparrows for their ablutions, and they are so accustomed to a head thrust over the stones above that most of them don't seem to mind it. There are exceptions: two thrushes were there at one time and while the unfamiliar olive-back was not at all disturbed, a wood thrush that nested but a rod away, and ought to know his friends, was greatly excited, and would dodge into the underbrush every time a pair of human eyes came into his view.

To name the birds seen from this bridge would be to list about all those of the Garden. The flycatchers, vireos, woodpeckers, and the ubiquitous catbird claim it for their very own, and the orioles and cuckoos drop in after the duties of nesting are less pressing. It is not a retired spot as one might expect, but a highway over which pass the throngs that frequent the garden, and an increasing number of appreciative visitors find there a most delightful place to view wild life among surroundings that are appealing.

One well-remembered afternoon a turtle dove flew over, a water-thrush was in the bathtub and an indigo bunting in the tiptop of a tree, two humming birds were passing up and down the river, and redstarts, Maryland yellow-throats, blue-winged, and yellow warblers in the bushes.

The red-letter days of bird observing are of course in the spring, when birds are in song and leaves do not hide them. Get out in the early morning when the sun is just gilding the

"Cloud-tipped hills, where bold blue shadows play
At hare-and-hounds with April's madcap sky"

Then nature is at its best. Your heartstrings are attuned to the music of the swaying trees. The fresh sweet air fills your lungs with the ozone of life. Birds are most active in early morning and late afternoon.

One memorable morning a group of bird-lovers gathered on the high bank to the north of Long Lake. Low trees fringe the shore below, and these trees were full of birds—mostly warblers. There was no mistaking identification, since the birds were mostly in limbs on a level with the eye, and on the shore below. It was the height of migration, for there were many black-polls—the last of the warblers to arrive. Equally conspicuous were magnolias, by some thought to be most beautiful among warblers. Blue-wings were plentiful, their yellow crowns glittering. The Canadian with necklace of black beads, the *petite* parula with its drowsy buzz, the bay-breasted with its cream-white cheek patch, the yellow and white chestnut-sided, the cheery yellow warbler like the blossom of a dandelion, the Maryland yellow-throat with highwayman's mask, the dainty little black-throated blue, the yellow cheeked black-throated green, and the trim black-and-white were abundant. The blazing Blackburnian and the conspicuously attired Cape May lent an air of exclusiveness to the gathering. It was a dressy assemblage, the featherings of the warblers being almost endlessly varied.

Along the farther shore walked blackbirds, starlings, grackles, water-thrushes and sandpipers, kingfishers and bluejays flew across, and a mother mallard and her early brood floated on the surface of the rippling water.

Spring brought to the Boulder Bridge the uncommon black-capped Wilson warbler, so often mistaken for a goldfinch, the mourning warbler that gay widow in her weeds, and the small olive-green Tennessee that loves the poison ivy berry and scatters its seeds; and in autumn assembled the big-eyed Connecticut, the small prairie with reddish back, the plain worm-eating warbler, the green and yellow pine-warbler, the bluish-gray Nashville, and the beautiful steel and molten-gold hooded warbler.

For several days trees east of the Museum were full of yellow palm warblers, and, especially in the fall, the whole garden seemed to be taken up by myrtles.* Only one specimen of the eccentric and assertive yellow-breasted chat was recorded, and that near the Woodlawn entrance.

If any reader is especially interested in the sparrows, he should "get around" in the fall where the yew-trees grow in the Herbaceous Garden. Come when the exquisite waxen viscous berries are ripe. All the sparrows will be there—all the writer is acquainted with, and some that "never were on sea or land." Perhaps to say so much is to acknowledge no very intimate acquaintance with the tribe; and then again perhaps there are other puzzled observers. At any rate, there are white-throat, song, field, vesper, savannah, and grasshopper sparrows, and as many others as the visitor may be acquainted with.

At migration time this is a famous place for all kinds of birds, and when the yews cease to yield fruit there will come the dogwood berries and the nannie berries, and later still, the bittersweet berries.

The writer walked up from the Iris Garden entrance in the late afternoon of a very cloudy spring day. Rain had fallen heavily, and there were pools of water in every depression. It seemed that nearly every pool had its pair of mallard ducks, and they fairly beamed contentment. "What a jolly day," they seemed to say. But it was impossible for a bird observer to agree with them. The trees were full of birds, never before so many, but all the birds were in the lofty places and he could be sure only of the redstarts and was obliged to leave the rest to guesswork. More birds were seen by the writer that day than at any other one time.

It is well to mention this lest the reader should get the idea that every day to a birdman is a perfect day. There are discouragements to be met and failures to record, just as in any other line of investigation.

Finally he came to a score of larger birds in a smaller tree, and

* It is the bayberry upon which the myrtle-warbler feeds and not the barberry as erroneously printed in article II, page 38, line 4.

this time there could be no mistake—they were scarlet tanagers and Baltimore orioles, a rare combination for beauty. It was a bit of unexpected good fortune. Not even the shower that followed could drive him away.

FRED F. HOUGHTON

HARDY WOODY PLANTS IN THE NEW YORK BOTANICAL GARDEN

GEORGE V. NASH

The following is an enumeration of the hardy woody plants, growing wild or cultivated, within the grounds of the New York Botanical Garden.

Systematic collections of trees and shrubs are maintained here; in these the species are grouped in families and the botanical relationship of the families indicated by juxtaposition. The Pinetum is located near Conservatory Range 1, in the area between that range and the Museum Building, thence to the east on the ridge west of the Herbaceous Grounds valley. Here are to be found the conifers, yews, and ginkgo—plants evergreen for the most part and commonly with narrow or needle-shaped leaves; in the larch, Chinese larch and bald cypress the leaves are deciduous, and in the ginkgo or maiden-hair tree the leaves are fan-shaped. The Deciduous Arboretum occupies much of the area to the east of the Bronx river; here are brought together deciduous hardy woody plants of tree form. At the Fruticetum, located on the level plain north of the lakes, is the collection of shrubs or bushes. In the Salicetum, to the north of the Fruticetum, is a collection of the poplars and willows. The Viticetum, the home of the hardy woody vines, is near the northern end of the ridge east of the Herbaceous Grounds valley.

The specimens in these collections are plainly labeled, each plant, where the determination is accurate, bearing a label giving information as to the common name, botanical name, natural distribution, and the family to which the individual belongs. This makes these collections of value for scientific study and investigation. To the horticulturist the collections are of especial

service in bringing together so many kinds of plants which may here be conveniently compared and examined as to their adaptability for decorative use.

In addition to the systematic collections there are many groups of shrubs and many kinds of trees planted in various parts of the grounds. It has been the aim to place along the roads and paths many different kinds of trees in order that all may be impressed by the beauty and variety of arboreal vegetation. The species used here are also plainly labeled.

Active steps are now being taken to increase the collections of hardy woody plants by the addition of species and varieties not already represented. With adequate facilities these collections can be much enlarged, thus greatly enhancing their educational value.

In the following enumeration the trees and shrubs are arranged by families, and these in botanical sequence so as to express plant relationship.

PINACEAE. Pine Family

ABIETINEAE. Fir Tribe

Pinus. Pines

Pinus Banksiana. Jack or Grey Pine.

Location: Pinetum, along west side of ridge west of Morphologic Garden. Knoll northeast of Conservatory Range 1.

Natural distribution: Northern North America.

Pinus Bungeana. Bunge's Pine.

Location: Pinetum, along west side of ridge west of Morphologic Garden.

Natural distribution: Japan.

Pinus Cembra. Swiss Stone Pine.

Location. Pinetum, along west side of ridge west of Herbaceous Grounds. Court of Conservatory Range 1. West end of Long Bridge.

Natural distribution: Europe and Asia.

Pinus densiflora. Japanese Red Pine.

Location: Pinetum, west side of ridge west of Morphologic Garden, and on slope northeast of Conservatory Range 1.

Natural distribution: Japan.

Pinus densiflora var: **aurea.** GOLDEN JAPANESE RED PINE.
Location: Pinetum, along west side of ridge west of Morphologic Garden.

Pinus densiflora var: **globosa.** DWARF TABLE PINE.
Location: Pinetum, with the above.

Pinus densiflora var: **pendula.** WEEPING JAPANESE RED PINE.
Location: Pinetum, with the above.

Pinus densiflora var: **umbraculifera.** DWARF JAPANESE RED PINE.
Location: Pinetum, with the above.

Pinus edulis. ROCKY MOUNTAIN NUT PINE.
Location: Pinetum, along path northeast of Conservatory Range 1.
Natural distribution: Western North America.

Pinus flexilis. ROCKY MOUNTAIN WHITE PINE.
Location: Pinetum, on knoll east of Conservatory Range 1.
Natural distribution: Western North America.

Pinus Jeffreyi. JEFFREY'S PINE.
Location: Pinetum, south slope of knoll northeast of Conservatory Range 1.
Natural distribution: Western North America.

Pinus koraiensis. KOREAN WHITE PINE.
Location: Pinetum, on knoll northeast of Conservatory Range 1, and knoll east of same range.
Natural distribution: Northeastern Asia.

Pinus montana var: **Mughus.** KNEE PINE.
Location: Pinetum, north side of path between Herbaceous Grounds and Morphologic Garden. Court of Conservatory Range 1. West end of Long Bridge.
Natural distribution: Eastern Alps.

Pinus monticola. WESTERN WHITE PINE.
Location: Knoll east of Conservatory Range 1.
Natural distribution: Northwestern North America.

Pinus Murrayana. LODGE-POLE PINE.
Location: Pinetum, north side of knoll northeast of Conservatory Range 1.
Natural distribution: Mountains of Northwestern America.

Pinus nepalensis (*P excelsa*). HIMALAYAN WHITE PINE.

Location: Pinetum, west side of ridge west of Herbaceous Grounds; and on the knoll opposite to the west. East end of the approach to the elevated railroad.

Natural distribution: Temperate Himalayan Region.

Pinus nigra (*P. austriaca*). AUSTRIAN PINE.

Location: Pinetum, knoll northeast of Conservatory Range I, and knoll east of same range. West Border, near lake and at Woodlawn Road Bridge.

Natural distribution: Austria to Balkan Peninsula.

Pinus nigra var: **Pallasiana.** CRIMEAN or TARTARIAN PINE.

Location: Pinetum, southeast of Fountain Enclosure; knoll east of Conservatory Range I.

Natural distribution: Asia Minor to Crimea.

Pinus parviflora. SMALL-FLOWERED WHITE PINE.

Location: Pinetum, along west side of ridge west of Economic Garden and Morphologic Garden; knoll northeast of Conservatory Range I.

Natural distribution: Japan.

Pinus parviflora var: **brevifolia.** SHORT-LEAVED SMALL-FLOWERED WHITE PINE.

Location: Pinetum, east foot of knoll east of Conservatory Range I.

Pinus Peuce. MACEDONIAN WHITE PINE.

Location: Pinetum, west side of ridge west of Herbaceous Grounds; east foot of knoll east of Conservatory Range I.

Natural distribution: Southeastern Europe.

Pinus ponderosa. YELLOW or BULL PINE.

Location: Pinetum, north and south of knoll northeast of Conservatory Range I.

Natural distribution: Western North America.

Pinus pungens. TABLE-MOUNTAIN PINE.

Location: Pinetum, knoll northeast of Conservatory Range I; knoll east of same range.

Natural distribution: Southeastern United States.

Pinus resinosa. RED or NORWAY PINE.

Location: Pinetum, knoll northeast of Conservatory Range I.

Natural distribution: Northeastern North America.

CONFERENCE NOTES

A monthly conference of the staff and registered students of the Garden was held on the afternoon of February 7th.

Mrs. N. L. Britton gave an outline of the special characters of the genus *Fissidens* which she is studying for *North American Flora*, illustrating by drawings, specimens, books, and slides for microscopic examination and indicating the groups into which the genus is subdivided, giving several extensions of ranges and changes in names. She also exhibited specimens of *Syrrhopodon parasiticus* (Sw.) Besch., which has hitherto only been known from the type locality in Haiti, and stated that it had been rediscovered in Yucatan by Dr. Gaumer, in Porto Rico by Mrs. Britton, and in Cuba by Mrs. Britton and Brother Leon.

Mr. R. S. Williams exhibited specimens of a peculiar specimen of *Didymodon* collected near Albany by Miss Kolk, and stated that it does not agree with any known species.

A. B. Stout,
Secretary of the Conference.

NOTES, NEWS AND COMMENT

The regular course of public lectures at the Garden begins on the afternoon of Saturday, April 28. Announcement cards will shortly be distributed to all members.

The following persons are among those who have registered in the library during February: Gerald H. Thayer and Dr. Henryk Arctowski, New York City; C. L. Shear and Walter Swingle, Washington, D. C., and Ferdinand W. Hassis, Jenkins, Ky.

In the December number of the Bulletin of the Torrey Botanical Club (issued January 10), Dr. Marshall A. Howe published "A Note on the Structural Dimorphism of Sexual and Tetrasporic Plants of *Galaxaura obtusata*," one of the calcified red seaweeds of our West Indian region. In this note it is

indicated that certain constant and striking differences in the microscopic structure of the cortex, used by the late Professor Kjellman as a basis for a subgeneric grouping of species in this genus, are, in fact, merely characteristics of the sexual and non-sexual phases in the life-cycle of a single species.

In the February number of the Bulletin of the Torrey Botanical Club, appeared a paper written by Dr. P. A. Rydberg on the "Roses of California and Nevada." The genus *Rosa* is represented in these two states by thirty-three native or naturalized species. Of these thirty-one are found in California; only two are restricted to Nevada, and two, or perhaps three, common to both states. One species from Lower California was also included. The paper contained the description of eleven species new to science.

Through the kindness of Mr. Walter Swingle the library has recently received a photostatic reprint of *Observationes botanicae in horto Dyckensi notatae*, by Joseph Salm Reifferscheid-Dyck. The original work appeared in three fascicles from 1820 to 1822.

The Japanese witch hazel (*Hamamelis japonica*) came into full bloom by March 27 this year in the Fruticetum, and is thus the earliest-flowering woody plant with conspicuous flowers in that collection. Its petals much resemble those of our own autumn-flowering witch hazel (*Hamamelis virginiana*), but the calyx of *japonica* is brownish-red, while that of *virginiana* is greenish-yellow. A painting of the Japanese species for reproduction in "*Addisonia*" has been made by Miss Eaton. The American shrub blooms in the late autumn in this latitude, mostly after its leaves have fallen, and thus anticipates the spring; the Japanese plant blooms in earliest spring, long before its leaves have unfolded.

The outbreak of the tussock moth during the past season was the most serious for several years, and resulted in large numbers of egg masses which promise a similar condition during the next

season. In order to forestall the work of these insects, the egg masses have recently been treated with creosote which prevents the hatching of the eggs. While it is difficult to locate and reach all of these egg masses, it is hoped that this remedy will result in a retardation of the work of this pest in the Garden.

Meteorology for February.—The total precipitation for the month was 2.57 inches, of which 1.3 inches (13 inches snow measurement) fell as snow. The maximum temperatures for each week were 48° on the 1st, 46° on the 8th, *52° on the 18th*, and 49° on the 24th. The minimum temperatures were 6° on the 3d, 3½° on the 12th, *0° on the 13th*, and 11° on the 23d.

ACCESSIONS

MUSEUMS AND HERBARIUM

250 specimens of fungi from New Mexico. (By exchange with Mr. Paul C. Standley.)

1 specimen of *Fomes ungulatus* from Wisconsin. (By exchange with Mr. Albert A. Hansen.)

25 specimens of fungi from Corvallis, Oregon. (By exchange with Mr. H. C. Gilbert.)

2 specimens of *Hygrophorus* from New York. (By exchange with Dr. L. H. Pennington.)

2 specimens of fungi from New Jersey. (Given by Mr. Carl A. Schwarze.)

2 specimens of *Phyllacora* from Virginia. (Given by Professor C. R. Orton.)

22 specimens of marine algae from Bermuda. (Collected by Mr. F. S. Collins.)

3 specimens of *Hieracium* and *Geranium* from Pennsylvania. (Given by Mr. A. A. Hansen.)

1 specimen of *Cyperus Eggersii* from Trinidad. (Given by Mr. W. E. Broadway.)

14 specimens of *Quercus* from southern New Jersey. (Given by Mr. Percy Wilson.)

5 specimens of flowering plants from Maryland. (Collected by Dr. F. W. Pennell.)

132 specimens of flowering plants from Mexico. (By exchange with the herbarium of Prince Roland Bonaparte.)

3 specimens of flowering plants from Scarsdale, New York. (Given by Mr. Percy Wilson.)

33 specimens of flowering plants from southern California. (Given by Mr. S. B. Parish.)

1 specimen of *Uromyces* from Utah. (Given by Professor A. O. Garrett.)

3 specimens of oaks from Arizona. (Given by Dr. D. T. MacDougal.)

14 specimens of marine algae from Honduras and Alaska. (By exchange with the United States National Herbarium.)

19 specimens of Scrophulariaceae from Colorado. (By exchange with the University of Colorado.)

2 specimens of flowering plants from Colorado. (By exchange with Mr. George E. Osterhout.)

480 specimens of flowering plants from New Mexico and other states. (By exchange with the United States National Museum.)

5 specimens of North American Hepaticae. (Given by Professor A. W. Evans.)

10 specimens of orchids from the Philippine Islands. (By exchange with Mr Oakes Ames.)

293 specimens of West Indian plants. (By exchange with the Royal Botanic Gardens, Kew.)

1 specimen of *Sphaerocarpos texanus* from Florida. (By exchange with the Carnegie Museum, Pittsburgh.)

35 specimens of *Aster* from British Columbia. (By exchange with Mr. J. K. Henry.)

3 specimens of flowering plants from California. (By exchange with Mr. S. B. Parish.)

9 specimens of fungi from New York. (By exchange with Mr. Stewart H. Burnham.)

1 specimen of *Aleuria proteana sparassoides* from New York. (Given by Professor George T. Atkinson.)

52 specimens of parasitic fungi from Texas. (By exchange with Professor B. C. Tharp.)

1 specimen of *Cordyceps* from North Carolina. (By exchange with Professor W. C. Coker.)

4 specimens of cup-fungi from western Washington. (By exchange with Mr. J. M. Grant.)

3 specimens of fungi from New York. (By exchange with Mr. V. F. Tapke.)

188 specimens of flowering plants from the western United States. (Given by Miss Margaret Armstrong.)

13 specimens of *Rosa* from Indiana. (By exchange with Mr. Charles C Deam.)

11 specimens of flowering plants from Arizona (Given by Mr. Frank E Lutz.)

4 specimens of flowering plants from Jamaica, West Indies (Given by Mr. E. P Killip.)

1 specimen of *Coelopleurum actaeifolium* from Fishers Island, New York. (Given by Professor A. W. Evans.)

70 specimens of flowering plants from Yukon. (By exchange with the Geological Survey of Canada.)

275 specimens of flowering plants from Colorado, California, and Arizona. (By exchange with Miss Florence Beckwith.)

PLANTS AND SEEDS

2 plants of *Zamia* sp. (Given by Mr. Ira E. Soar through Dr. J. K Small.)

3 plants of *Acanthocereus* sp. (Given by Mr. Karl Snow.)

5,425 tulip bulbs. (Given by John Scheepers & Co., Inc.)

7 plants for Conservatories. (Given by Mr. John Sommer.)

1 plant for Conservatories. (By exchange with U. S. Dept. of Agr., Bureau of Plant Industry.)

4 packets of seeds. (By exchange with Mr. Henry Natho.)

1 packet of seeds of Upland Big Boll Cotton. (Given by Mr. Wm. Cook.)

1 packet of seeds of *Taxodium* sp. (Given by Mr. R. M. Harper.)

8 packets of seeds. (By exchange with American Museum of Natural History.)

LIBRARY ACCESSIONS FROM NOVEMBER 1, 1916, TO FEBRUARY 28, 1917.

BAILY, WILLIAM. *Trees, plants and flowers.* Philadelphia, 1870

BEADLE, DELOS WHITE. *Canadian fruit, flower and kitchen gardener.* Toronto, 1872.

BRUNET, LOUIS OVIDE. *Énumeration des genres de plantes de la flore du Canada.* Quebec, 1864.

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CHIOVENDA, EMILIO. *Resultati scientifici della missione Stefanini-Paoli nella Somalia italiana.* Vol. 1. Le collezioni botaniche. Firenze, 1916.

COKER, WILLIAM CHAMBERS, & TOTTEN, HENRY ROLAND. *The trees of North Carolina.* Chapel Hill, N. C. (Given by Dr. N. L. Britton.)

DENMAN, JAMES LEMOINE *The vine and its fruit, more especially in relation to the production of wine.* [New ed.] London, 1864. (Given by Dr. J. H. Barnhart.)

HOUGH, ROMEYN BECK. *American woods, exhibited by the actual specimens and with copious explanatory text.* Vols. 11, 12. Lowville, 1910, 11.

HULME, FREDERICK EDWARD. *Plants; their natural growth and ornamental treatment.* London, 1874.

LOTSY, JOHN PAUL. *Evolution by means of hybridization.* The Hague, 1916.

MARCHAND, LOUIS. *Mission forestière in Autriche.* Arbois, 1869. (Given by Dr. J. H. Barnhart.)

MASSICOTTE, EDOUARD Z. *Cent fleurs de mon herbier . . . suivies d'un calendrier de la flore de la Province de Quebec.* Montreal, 1906.

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MOLISCH, HANS. *Pflanzenphysiologie als Theorie der Gärtnerei.* Jena, 1916.

MOYEN, JEAN. *Cours élémentaire de botanique et flore du Canada.* Ed. 2. Montreal, 1885.

NEWHALL, CHARLES STEDMAN. *The leaf-collector's hand book and herbarium.* New York, 1891. (Given by Dr. J. H. Barnhart.)

PINDAR, GEORGE NEWTON, PEARSON, MABEL HATTERSLEY, & FISHER, GEORGE CLYDE. *Guide to the nature treasures of New York City.* New York, 1917. (Given by Dr. N. L. Britton.)

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RAND, EDWARD SPRAGUE. *Flowers for the parlor and garden.* Boston, 1863. (Given by Dr. J. H. Barnhart.)

Revue agricole, manufacturie, commerciale et de colonisation. Vol. 1–7. Montreal, 1861–68.

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SOWERBY, JOHN EDWARD. *An illustrated key to the natural orders of British wild flowers.* London, 1865.

STOWELL, CHARLES HENRY, & STOWELL, LOUISA REID. *Microscopical diagnosis.* Detroit, 1882. (Given by Dr. J. H. Barnhart.)

The orchardist's companion; a quarterly journal devoted to the history . . modes of cultivation, and all other matters appertaining to the fruits of the United States, vol. 1. Philadelphia, 1841.

The transactions of the royal Hawaiian agricultural society. Vol. 1. Honolulu, 1850–53.

ULRICH, WILHELM. *Internationales Wörterbuch der Pflanzen-namen.* Leipzig. (Given by Dr. J. H. Barnhart.)

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Vol. 7, part 1, 1906; part 2, 1907; part 3, 1912. Ustilaginaceae—Aecidiaceae (pars).

Vol. 9 (now complete), parts 1 and 2, 1907; part 3, 1910; part 4, 1915; parts 5, 6, and 7, 1916. Polyporaceae—Agaricaceae (pars). (Parts 1 and 2 no longer sold separately.)

Vol. 10, part 1, 1914. Agaricaceae (pars).

Vol. 15, parts 1 and 2, 1913. Sphagnaceae—Leucobryaceae.

Vol. 16, part 1, 1909. Ophioglossaceae—Cyatheaceae (pars).

Vol. 17, part 1, 1909; part 2, 1912; part 3, 1915. Typhaceae—Poaceae (pars).

Vol. 21, part 1, 1916. Chenopodiaceae.

Vol. 22, parts 1 and 2, 1905; parts 3 and 4, 1908; part 5, 1913. Podostemonaceae—Rosaceae (pars).

Vol. 25, part 1, 1907; part 2, 1910; part 3, 1911. Geraniaceae—Burseraceae.

Vol. 29, part 1, 1914. Clethraceae—Ericaceae.

Vol. 34, part 1, 1914; part 2, 1915; part 3, 1916. Carduaceae—Anthemideae.

Memoirs of the New York Botanical Garden. Price to members of the Garden, $1.00 per volume. To others, $2.00. [Not offered in exchange.]

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. viii + 138 pp., with 29 plates. 1909.

Vol. IV. Effects of the Rays of Radium on Plants, by Charles Stuart Gager. viii + 278 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 + 592 pp., with 43 plates and many text figures. 1916.

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JOURNAL

OF

The New York Botanical Garden

EDITOR

FRANCIS WHITTIER PENNELL

Associate Curator

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Phlox subulata on serpentine barrens near Lima, Pennsylvania, May 9, 1914.

Near view of *Phlox subulata* showing general character of flowers. Plants of *Cerastium velutinum* intermingled. Above photos by courtesy of Wm R Taylor.

JOURNAL

OF

The New York Botanical Garden

VOL. XVIII April, 1917 No. 208

VARIATION IN THE MOSS PINK, PHLOX SUBULATA

(WITH PLATE 193)

The ground or moss pink has long been recognized as a species that is variable in its natural habitat. The most noticeable variations pertain to the color of the flowers and to the shape and size of the corolla-lobes; these are indicated in the standard taxonomic treatments of the species by such descriptions as the following: "corolla pink, purple or white, with a darker eye, its lobes emarginate or entire."*

Such polymorphism is, of course, not uncommon in rather well-defined species. In some species, as for example of the violets and of the hawthorns, the very marked and rather indiscriminate variation makes the identification of species rather difficult. Usually such variability is more or less geographic with an isolation of different types in different areas of the range of distribution, the facts of which can only be determined by extensive field observations by one person or by a coordination of the observations and collections of numerous persons. Very often, however, it happens that the individuals of a species growing in a rather limited area exhibit a very decided variability that is equal, or nearly equal, to that for the species throughout its range. It appears that there are localities where this is the case with *Phlox subulata*.

This species is not of cosmopolitan or general distribution

* Britton, N. L., and Brown, Addison. Illustrated Flora of the Northern United States, ed. 2. 3. 57. 1913.

[Journal for March (18: 53–74) was issued April 13, 1917.]

throughout its range. It seems, rather, to be restricted to somewhat isolated localities where it thrives in such great abundance that it forms a dense mat of vegetation, which though less than a foot in height decidedly dominates the habitat. Some conception of this can be gained from the photographs reproduced in the accompanying plate. On account of the perennial habit and its evergreen nature, such a growth is noticeable throughout the year. When the plants are in full bloom the profusion of flowers gives a veritable sea of color all the more conspicuous because the species grows best on dry rocky hills or banks where the nature of the terrain affords a rather wide outlook.

These conditions are well exemplified by the development of this species along Johnson's Creek just outside the city limits of New Brunswick, New Jersey. For a distance of about a mile along the sandy and rocky banks and upper slopes bordering this creek there is a luxuriant growth of the "moss pink." A line of the Pennsylvania Railroad passes through the area, and when the flowers are in evidence many a traveler is surprised at the extensive views that are solid with red color. Along Bound Brook, some miles distant from New Brunswick, this species is also rather abundant, but there the plants are somewhat more scattered and less numerous than along Johnson's Creek.

Perhaps the best development that is to be found throughout the range of this species is to be seen on what is known as the Serpentine Barrens of Unionville, Chester County, Pennsylvania. There the species covers about one hundred contiguous acres with a dense mat growth. It is difficult to conceive of a more dominating or a more vigorous growth of this species. There may be areas of larger extent, but it is doubtful if the development is ever more luxuriant per unit of area. When covered with the full bloom of the flowers, the general red hues of the hills are visible for a distance of several miles.

The writer visited this locality on May 8, 1916, in the company of Dr. F. W. Pennell and Mr. James R. Pennell. It was an ideal May day and the phlox was in full bloom with a brilliance

of color that defies description. A general survey was made of the variations, and living plants representative of the various forms observed were taken and later planted in the experimental plots at the New York Botanical Garden for use in breeding and in propagation. The following description of these on the basis of flower color will give some idea of the wide extremes of variability observed and of the almost endless gradations that exist between the extremes.

The descriptions were made from fresh and fully developed flowers and the terminology used in reference to colors is that of Ridgway's Color Standards and Nomenclature.

It may be noted that the corolla of this species is salverform with the expanded portion cut into lobes quite as in the familiar garden varieties of phlox. The three parts of the corolla especially to be noted in the descriptions are the tube, the expanded blades or corolla-lobes, and an eye area in the base of the lobes just outside the throat. No attempt has been made to give varietal terminology: the various forms have simply been given numbers and have been grouped according to the prevailing colors.

I. Group with flowers white or prevailingly white

1. Pure white corolla with no trace of color in tube, blades or eye area.

2. Completely white in blades and in eye; pale and faint pink in tube.

II. Group with flowers prevailingly of pink shades

3. Rather diffuse pale amaranth pink in blades; slightly more intense in eye with faint suggestion of eye spots; tube less intense.

4. Paler than no. 3 in blades; faint but decided pair of spots in eye area at base of each blade; tube more deeply colored than blades and of a pale amaranth tint.

5. Blades white; two large pale bluish violet eye spots at base of each blade; tube pale bluish violet.

6. Blades white; intense almost amethyst violet eye spots (two for each blade); tube diffuse pale violet.

7. Blades pale amaranth pink as in no. 3, but with two decided eye spots of Tyrian pink in each blade; tube almost white.

8. Blades pale amaranth pink; eye spots decided and of amaranth purple; tube darker than blade.

9. Blades pale amaranth pink; eye spots amaranth purple joining to form a rather broad band or eye ring; tube darker than blade.

10. Blades pale amaranth pink; eye spots and tube intermediate between those of nos. 7 and 8.

11. Blades and tube light mallow purple; eye spots two for each blade, their margins joining to form a ring darker in color than that of no. 9.

12. Blades pale mauve; tube darker; eye spots small but very definite and manganese violet.

13. Darker than no. 21; eye spots of same color as in no. 12, but blending in a ring.

14. Blades and tube as in no. 13; eye as in no. 12.

III. Group with flower colors of lavender tints

15. Blades and tube mauvette; eye spots small but decided and of Mathew's purple.

16. Intermediate between nos. 15 and 17.

17. Blades and tube light phlox violet; eye spots pansy violet with rather indistinct borders.

18. Color of blades and tube as in no. 17; eye spots of same color, but more distinct and much more elongated into blade.

19. Colors as in no. 17; eye spots more distinct and broader (eye spots in no. 18 are long and narrow, these are short and broad).

20. Blades and tube deep pink lilac; darker colored eye spots elongated into blades, but with bases run together in an eye ring.

IV. Group with flower colors of purple tints

21. General color mallow purple; the more darkly colored eye spots small and the two for each blade somewhat run together.

22. Colors darker throughout than no. 21.

23. General colors as in 21, but eye spots broken into fine lines.

24. General color Liseran purple; small eye spots of darker shade.

25. Blades and tube magenta; eye spots of darker shade, small and very definite.

26. Colors intermediate between nos. 24 and 25.

27. Blades dull magenta purple; tubes of darker shade; eye spots of darker color than blades, broad and run together.

28. Blades and tube Schoenfeld's purple; an eye ring of pansy purple, the two eye spots in each blade indicated in the ring.

29. Blades and tube Rosaline purple; eye spots rather faintly defined.

The above list does not exhaust the possibilities of classification of the color variations. It only recognizes the most conspicuous and the most distinct variations that were seen during a few hours of observation in the field.

Neither is the grouping to be considered as fully adequate. The colors predominating in the forms listed before no. 14 are pink; in forms from 15 to 20 the lavender or lilac tints prevail, and from 21 to 29 inclusive the colors are of a purple series and are the darkest of all. The extremes are very decided: no. 1 is a pure white, nos. 13 and 10 are the darkest of the pink group; no. 20 is the form with strongest development of lilac tints; no. 25 is a full magenta, and no. 29 is the darkest of the purple tints. Within each group the forms are in general graded according to intensity of coloration, the paler tints being given the lower numbers. Perhaps some of the paler tints classed with the pink group could as well be placed with the palest of the lavender or the purple group. Although the extreme types are very distinct, there is almost every conceivable variation between them.

A rather marked feature of the coloration is the quite general intensification of color in two rather limited areas near the base of each corolla-blade forming the eye spots. Often, as noted in the above descriptions, there were shades rather distinct from the general colors of the blades. Even in no. 6, with blades lacking in color, the eye spots were of intense coloration. The size, shape and configuration of the eye spots also varied much.

It was very noticeable that all the flowers of a plant were remarkably uniform in respect to coloration and to the rather minute differences that often marked it from other plants around it.

It may be noted that in the development of eye spots, the localization and intensification of pigments in a particular area or zone produces color patterns instead of solid colors. Such results illustrate excellently how the production and flow of substances concerned with the production of pigments may act in the development of such many-celled organs as leaves and petals.

It would be rather difficult to estimate which of the various forms described is most abundant. The pure white-flowered form is conspicuous and readily identified, and plants of this form were quite frequently seen; they were scattered rather promiscuously over the area, but constituted only a small proportion of the total population. Representatives of pink, lavender and purple-colored forms were seemingly nearly equal in number and were very generally mixed together throughout the entire area.

In respect to a color analysis, the variations involve only blue and red of the primary colors. The pink colors are red, diluted: the lavender and lilac are blue and red with less in proportion of the red; and the purple series are blue and red in nearly equal amounts. A simple dilution, of course, gives endless gradation of intensity. There is no suggestion of yellow pigments in any of the combinations. This is, perhaps, indicative that the actual chemical substances involved in the production of the various shades of color are few and that the variations are due to a series of quantitative differences in the production of the fundamental chemical substances that are interacting.

There also were very noticeable variations in the size of the flowers borne by different plants, the largest being about twice as large in the diameter of the open corolla as the smallest. The shape of the corolla-lobes varied greatly; one extreme had rounded and overlapping lobes, while the opposite extreme had narrow and widely separated lobes. Another very decided variation in shape was seen in the character of the apex of the lobes,

which ranged from fully rounded to truncate and to deeply notched. The unnotched lobes were either flat, smooth, or very much crumpled, fluted or ruffled. With respect to these characters of size and shape, many forms could be described, any one of which would include plants of widely different types in respect to color.

Considerable difference was observed in the general habit of growth; some plants were more erect than others; some were more branched, some were more leafy, etc. Also, in size of leaves and degree of hairiness, various plants differed greatly.

Through the kind courtesy of Dr. and Mrs. A. L. Smith of New Brunswick, New Jersey, the writer was favored by guidance and with conveyance by motor car which facilitated a general survey of the areas of phlox growing along Bound Brook and along Johnson's Creek. Only one white-flowered plant was seen at Bound Brook, and none were observed at Johnson's Creek, otherwise much the same variations as were seen on the Serpentine Barrens were observed here. It seemed, however, from the hasty survey made, that at Johnson's Creek there was perhaps a greater proportion of the lavender colors than was seen at the Serpentine Barrens.

It will at once occur to the reader that much of the variation discussed above may be regarded as what are rather popularly called "mutations." If we consider that these are spontaneous variations that may breed somewhat true, this conception may perhaps be applied. It appears that some of the forms do breed sufficiently true to be considered as good horticultural races. Of these an *alba* and a *lilacina* are frequently seen in cultivation, as is also a variety named *frondosa* which is of rather vigorous growth. The New Standard Cyclopedia of Horticulture lists twelve varieties now recognized in cultivation.

It may be noted in this connection that when the conception of mutation was first developed by de Vries, it was thought that the Mendelian conception of unit characters was very generally valid and that hybridization could not increase variability of the offspring with respect to a single character over that of the parents. Mutation was considered as a change in the organiza-

tion and nature of the germ plasm which brought new characters into existence by sudden and discontinuous variation.

These conceptions have become much modified by recent investigations. Characters come into expression not so much by independent action of units of plasm as by complicated interactions between such elements of germ plasm as can be roughly located by genetical analysis. Mutations have accordingly come to be regarded as spontaneous change, both of qualitative and quantitative nature, in one or more of the assumed units which are individually only indirectly concerned with the expression of a character.

Furthermore, the results of extensive experimental selections indicate clearly that the heritable variations in a species or even in a race are often very slight differences which present numerous gradations between the limits. The distinction between discontinuous variation or mutation, and variation that is decidedly indiscriminate and continuous in quite the Darwinian sense, is not at all clear on any basis of definition and classification.

The conditions seen in *Phlox subulata* also illustrate very well the fact that seldom does such indiscriminate variability seem to be a direct response to environment. The plants live side by side under the same environmental influences and the variations, or at least many of them, seem not to be related as cause and effect to these influences. This is one of the reasons for the tendency of our times to minimize the Darwinian view that hereditary and evolutionary changes are induced by environment. How, for example, can all the different flower colors seen in phlox be a direct or even an indirect response to the external conditions? Hence the general feeling that the changes upon which natural selection may later work are internal and are to large degree independent of environment.

Perhaps the variability seen for *Phlox subulata* as it grows at such localities as Unionville is largely produced by a result of the ability of the species to make a dense growth composed of great numbers of perennial plants, with the resulting interbreeding that ensues especially between forms that may arise by spontaneous variation.

Compared with a sister species, *Phlox Drummondii*, the "moss pink" appears to be much more variable in nature. The former, however, has been under cultivation since 1835, during which time there have developed over 200 recognized horticultural varieties,* which, considered as a whole, exhibit a much wider range of variability than is now seen in *Phlox subulata*. The conditions in *Phlox Drummondii* are an excellent example of the results of sporadic variation, of crossing between variations, and of selection, when a relatively simple species is cultivated intensively in new climates and special attention paid to the propagation of variations. What the limits of such variation would be for *Phlox subulata* were it given the same floricultural treatment can only be conjectured.

It would be of interest to know whether the "moss pink" exhibits much the same degree and intensity of variation throughout its range as is seen in the localities noted above, or whether there is a tendency to a geographic isolation or segregation of various forms. It would also be of interest to learn what the present biological type of the species is; that is, the form that is most widely distributed and which constitutes a plurality of individuals belonging to the species.

A. B. STOUT

FURTHER OBSERVATIONS ON PHLOX DRUMMONDII†

An account of the origin and history of the cultivated varieties of *Phlox Drummondii* has already been presented to readers of the *Journal*.‡ As there reported, it appears from the evidence that the many varieties of this species now in cultivation have descended as progeny of one collection of seed made by Thomas Drummond in 1835, and that the wild species of that time and even of the present time exhibits comparatively limited variability.

* Kelly, James P. Cultivated varieties of *Phlox Drummondii*. Jour. N. Y. Bot. Gard. **16**: 179–191. 1915.

† Contributions from Dept. of Botany, no. 9. The Penn. State College.

‡ Cultivated Varieties of *Phlox Drummondii* by James P. Kelly. Jour. N. Y. Bot. Gard. **16**: 179–191. 1915.

The writer can now report some observations on the variability of certain plants grown from seed recently obtained from wild plants near Austin, Texas, by Professor F. McAllister. Eight plants constituting a first generation were grown from this seed, and from the self-pollinated seed of one of these plants nineteen plants of a second generation were grown. All of these plants were remarkably uniform in habit of growth and in the color of the flowers. They were scarcely as robust as the larger of the cultivated varieties and the leaves were somewhat more hairy. The flowers were quite uniformly of a "phlox purple" color as classified by Ridgway's *Color Standards and Nomenclature.*

The plants derived from the seed collected by Drummond bore flowers of a rose-purple, as a plate accompanying the original description by Hooker shows.

In the case of the above mentioned twenty-seven plants derived from wild seed, however, there were somewhat noticeable variations in respect to the shape of the corolla-lobes. Among the eight plants of the first generation there were gradations from narrow to rather wide lobes. The second generation was grown from seeds of a plant with fairly wide-lobed flowers but among these plants the variation in the width of lobes was very decided, and presented a range from very narrow and widely separated to quite wide and slightly over-lapping.

One of the flowers of the plate published in 1835 to illustrate Hooker's description is so oriented as to show that the corolla-lobes were of medium width, that is, they were not exceedingly narrow, nor were they wide enough to overlap.

In the course of the many generations of *Phlox Drummondii* that have been cultivated, a wide range of variability has appeared. Many modern varieties show lobes so wide that they greatly overlap and, of course, are wider than the widest noted above. The writer has never seen a plant of the variety *radiata* mentioned in *Gartenflora* in 1903, but it evidently possesses corolla-lobes narrower than any described above. The limits of variation are wider apart in the species as it exists in cultivation to-day than they are in the wild strain of plants under observation.

Mention may here be made of a variation that has appeared in

the writer's cultures of hybrids between the two cultivated varieties *alba* and *Radowitzii*. *Alba* has pure white flowers whose corolla-lobes stand at right angles to their tubes. The corolla-lobes of *Radowitzii* are rose-colored, streaked with white, and occasionally showing green in narrow streaks; the *Radowitzii* lobes stand at an acute angle to the flower-tube, making the flower funnel-shaped. The first generation of four plants bore flowers which had the form of *alba* and the color was "phlox purple" with "aster purple" near the throat of each flower.

From self-pollinated seed of one of these plants a second generation of twenty-nine plants was grown. Of these twenty-one had flowers that were salverform, typical of *alba;* the other eight had funnel-shaped flowers. There was considerable variation in flower-color in this generation. Of the eight plants bearing funnel-shaped flowers one had flowers that were nearly pure white, but upon close examination these were found to be somewhat streaked with faint color. A second had a ground color also light, but strong enough to be identified as nearly "light hortense violet"; the lobes of the flower of this were also streaked with white. The other six plants with funnel-shaped flowers had these similarly streaked with white, but the ground colors varied; in one the ground color was "phlox pink"; in two it was "phlox purple"; in the sixth it was between "phlox purple" and "true purple"; the seventh had it "rose-pink" and the last was like the original *Radowitzii* parent.

The plant with funnel-shaped flowers described as the sixth in the last paragraph was the parent of an F_3 generation of fifteen plants. All of these bore funnel-shaped flowers, but there was some variation in flower color. Eleven had flowers of purplish color, the purple varying somewhat in hue, and four had pure white flowers.

An F_3 plant with white funnel-shaped flowers was the parent of six plants of a fourth generation which were all similar to their F_3 parent in respect to shape of corollas. In these occasional green streaks of chlorophyll appeared in the otherwise white corollas just as in the typical *Radowitzii*.

This sort of white streaked with green is not mentioned any-

where among the variations of *Phlox Drummondii* so far as the writer has been able to discover. It is new in the sense that it embodies in one flower characteristics that did not previously occur together. The funnel-shape occurred at the start associated with a rose color streaked with white and occasionally green; the entirely white condition existed only in the salver-shaped flower; the new variation exhibits in one flower the funnel-shape combined with the pure white condition, showing an occasional green streak. It remains to be determined whether this form will breed sufficiently true to be established as a variety.

Undoubtedly many of the varieties of *Phlox Drummondii* were produced by just such hybridization methods followed by selection.

JAMES P. KELLY

DEPARTMENT OF BOTANY,
PENNSYLVANIA STATE COLLEGE

HARDY WOODY PLANTS IN THE NEW YORK BOTANICAL GARDEN

(Continued)

Pinus rigida. PITCH OR TORCH PINE.

Location: Pinetum, north slope of knoll northeast of Conservatory Range I; also west slope of same knoll.

Natural distribution: Eastern North America.

Pinus Sabiniana. DIGGER PINE.

Location: Pinetum, north and east slopes of knoll northeast of Conservatory Range I.

Natural distribution: California.

Pinus Strobus. WHITE PINE.

Location: Pinetum, west side of ridge west of Economic Garden and Herbaceous Grounds; east side of knoll east of Conservatory Range I. East end of approach to elevated railroad. West end of Long Bridge. A small grove in the northeast corner of the Fruticetum. A fine specimen near south end of Lake Bridge. Demonstration White Pine Plantation on ridge near Iris Garden.

Natural distribution: Eastern North America.

Pinus Strobus var: **brevifolia.** DWARF WHITE PINE.

Location: Pinetum, along west side of ridge west of Morphologic Garden.

Pinus Strobus var: **fastigiata.** COLUMNAR WHITE PINE.

Location: Pinetum, along west side of ridge west of Herbaceous Grounds; also between road and path to west of this.

Pinus sylvestris. SCOTCH PINE.

Location: Pinetum, knoll northeast of Conservatory Range 1. South of Mansion.

Natural distribution: Europe and Asia.

Pinus sylvestris var: **argentea.** SILVERY SCOTCH PINE.

Location: Pinetum, knoll northeast of Conservatory Range 1; east side of knoll east of same range.

Pinus sylvestris var: **fastigiata.** PYRAMIDAL SCOTCH PINE.

Location: Pinetum, knoll northeast of Conservatory Range 1.

Pinus Thunbergii. JAPANESE BLACK PINE.

Location: Pinetum, northeast foot of knoll northeast of Conservatory Range 1; also north foot of knoll east of same range.

Natural distribution: Japan.

Pinus virginiana. JERSEY PINE.

Location: Pinetum, knoll northeast of Conservatory Range 1.

Natural distribution: Southeastern United States.

Cedrus. TRUE CEDARS.

Cedrus atlantica. MOUNT ATLAS CEDAR.

Location: Pinetum, ridge west of Economic Garden.

Natural distribution: Northern Africa.

Cedrus atlantica var: **aurea.** GOLDEN MOUNT ATLAS CEDAR.

Location: Pinetum, with the above.

Cedrus atlantica var: **glauca.** BLUE MOUNT ATLAS CEDAR.

Location: Pinetum, with the above.

Cedrus Deodara. DEODAR or INDIAN CEDAR.

Location: Pinetum, east slope of ridge south of Economic Garden.

Natural distribution: Himalayan Region.

Cedrus Libani. CEDAR OF LEBANON.

Location: Pinetum, with *Cedrus atlantica.*

Natural distribution: Syria to Asia Minor.

Larix. LARCHES

Larix Larix (*L. decidua*). EUROPEAN LARCH.
Location: Pinetum, ridge west of Morphologic Garden.
Natural distribution: Mountains of central Europe.

Larix laricina. AMERICAN LARCH or TAMARACK.
Location: In low land near river, east of Fruticetum. North border.
Natural distribution: Northern North America.

Larix leptolepis. JAPANESE LARCH.
Location: Pinetum, ridge west of Morphologic Garden.
Natural distribution: Japan.

Pseudolarix. CHINESE LARCH

Pseudolarix Kaempferi. GOLDEN or CHINESE LARCH.
Location: Pinetum, on ridge west of Morphologic Garden.
Natural distribution: Northern China.

Picea. SPRUCES

Picea Abies (*P excelsa*). NORWAY SPRUCE.
Location: Pinetum, south of Forsythia group near Station Plaza.
Natural distribution: Europe.

Picea Abies var: **aurea.** GOLDEN NORWAY SPRUCE.
Location: Pinetum, with the above.

Picea Abies var: **Barryi.** BARRY'S NORWAY SPRUCE.
Location: Pinetum, with the above.

Picea Abies var: **compacta.** COMPACT NORWAY SPRUCE.
Location: Pinetum, with the above.

Picea Abies var: **conica.** CONIC NORWAY SPRUCE.
Location: Pinetum, with the above.

Picea Abies var: **conica densa.** DENSE CONIC NORWAY SPRUCE.
Location: Pinetum, with the above.

Picea Abies var: **Finedonensis.** PALE YELLOW NORWAY SPRUCE.
Location: Pinetum, with the above.

Picea Abies var: **Gregoryana.** GREGORY'S NORWAY SPRUCE.
Location: Pinetum, with the above.

Picea Abies var: **inversa.** DROOPING NORWAY SPRUCE.
Location: Pinetum, with the above.
Picea Abies var: **Maxwellii.** MAXWELL'S NORWAY SPRUCE.
Location: Pinetum, with the above.
Picea Abies var: **pendula.** WEEPING NORWAY SPRUCE.
Location: Pinetum, with the above.
Picea Abies var: **pyramidalis.** PYRAMIDAL NORWAY SPRUCE.
Location: Pinetum, with the above.
Picea bicolor. ALCOCK'S SPRUCE.
Location: Pinetum, along west border south of Station Plaza near Hydrangea group.
Natural distribution: Japan.
Picea canadensis. WHITE SPRUCE.
Location: Pinetum, along west border, south of Station Plaza. West end of Long Bridge.
Natural distribution: Northern North America.
Picea canadensis var: **coerulea.** BLUE WHITE SPRUCE.
Location: Pinetum, south of Forsythia group at Station Plaza.
Picea canadensis var: **nana.** DWARF WHITE SPRUCE.
Location: Pinetum, with the above.
Picea Engelmannii. ENGELMANN'S SPRUCE.
Location: Pinetum, knoll northwest of Conservatory Range I.
Natural distribution: Western North America.
Picea Engelmannii var: **glauca.** BLUE ENGELMANN'S SPRUCE.
Location: Pinetum, with the above.
Picea Mariana var: **Doumetii.** DOUMET'S BLACK SPRUCE.
Location: Pinetum, along west border south of Station Plaza; near Hydrangea group.
Picea Maximowiczii. MAXIMOWICZ'S SPRUCE.
Location: Pinetum, with the above.
Natural distribution: Japan.
Picea obovata. SIBERIAN SPRUCE.
Location: Pinetum south of Forsythia group near Station Plaza.
Natural distribution: Northeastern Europe and western Asia.
Picea Omorika. SERVIAN SPRUCE.
Location: Pinetum, along west border south of Station Plaza; near Fountain Enclosure.

Natural distribution: Southeastern Europe.

Picea orientalis. ORIENTAL SPRUCE.

Location: Pinetum, near path crossing, northwest of Conservatory Range I; along west border south of Station Plaza; near Hydrangea group.

Natural distribution: Western Asia and Caucasus.

Picea polita. TIGER-TAIL SPRUCE.

Location: Pinetum, north slope of knoll northeast of Conservatory Range I.

Natural distribution: Japan.

THE NEW GARDEN SCHOOL

(WITH PLATE 194)

The commencement of instruction in gardening in cooperation with the International Children's School Garden League, outlined in the March issue of the JOURNAL, was auspiciously inaugurated on the afternoon of March 29 in the new lecture room at the Mansion. Members of the Women's Auxiliary received Trustees and other members of the School Farm League, and Mr. Henry G. Parsons, the newly-appointed Supervisor of Gardening Instruction, described the plan and scope of teaching and the installation of home and school gardens. Remarks were also made by President Thompson and by the Director-in-Chief.

On the afternoon of April 2, two courses were begun, (1) a home garden course for those desiring to conduct their own gardens, to be given on the five afternoons of April, and (2) a special course of six weeks, five afternoons a week, based on the announced course for teachers of school gardens, somewhat modified.

The following students were registered:

1. *For the Home Garden Course*

Mrs. E. H. Anderson, Scarsdale, New York.
Miss H. C. Blake, 128 Central Park South, City.
Mrs. Jennie V. Combs, Scarsdale, New York.
Miss May Corbett, Montclair, New Jersey.
Mrs. Albert Fries, 9 West 82d Street, City.

Courtesy of Underwo[illegible]

Garden school. The first spading lesson of the first class.

Mrs. Sybil T. Hirsch, White Plains, New York.
Mrs. William Naumberg, 21 West 83rd Street, City.
Miss Gertrude Parsons, 110 East 36th Street, City.
Miss T. E. Phillips, 850 West End Avenue, City.
Miss Clara A. Stenns, 500 West 122d Street, City.
Mrs. A. G. Son, White Plains, New York.
Mrs. W. H. Vialle, 419 West 119th Street, City.
Mrs. Josephine V. Winslow, Scarsdale, New York.

2. *For the Special Course*

Mrs. William H. Andrews, 130 East 67th Street, City.
Mrs. Helen Biddle Griscom Bettle, 101 East 72d Street, City.
Miss Ethel Burnet, 937 Madison Avenue, City.
Miss Gail Gardner, 14 West 65th Street, City.
Miss Anne Hoyt, Bronxville, New York.
Mrs. Marion Kinney, Essex Hotel, City.
Miss Harriet McKee, 830 Park Avenue, City.
Mrs. Butler Williamson, 944 Park Avenue, City.

CONFERENCE NOTES

At the monthly conference of students, investigators and staff held on March 7th, Dr. Benjamin Horowitz presented a preliminary report, with demonstrations, of results of various researches in the study of plant pigments. For several years Dr. Horowitz and Professor W. J. Gies have been studying the pigments of flowers and of variegated leaves, using especially material obtained at the Garden. It is planned to present the results of this research in a future number of the JOURNAL OF THE NEW YORK BOTANICAL GARDEN.

A. B. STOUT,
Secretary of the Conference.

NOTES, NEWS AND COMMENT

The following visiting botanists have registered in the library during March: Chester J. Hunn, Ithaca, N. Y.; Professor Francis E. Lloyd, Montreal, Canada; Professor Mel T. Cook, New Brunswick, N. J.

Professor F. E. Lloyd, of McGill University, visited the Garden on March 24 for consultation with Professor Hus in regard to investigations pertaining to production of rubber from *Hevea*.

Mr. C. G. Lloyd, of Cincinnati, has presented to the Garden a complete set of all known species of puffballs, based on his extensive and long-continued studies of this group. The value of this contribution can hardly be estimated.

Sorauer has recently made observations on house plants and finds that injury from burning gas in rooms is negligible and is easily avoided entirely by ventilation. The chief injuries are probably due to the elevation of temperature and the drying of the atmosphere by means of fires or heaters.

Farmers' Bulletin 789 of the U. S. Department of Agriculture treats of certain insects that attack mushrooms and the means of controlling them. The chief insects considered are maggots, mites, springtails, and sowbugs, the first class being the most important. The author, C. H. Popenoe, concludes that if the mushroom house is carefully constructed and all outlets closed or screened; if the spawn is purchased from reliable dealers; and if the compost is carefully prepared and kept at as low a temperature as possible, there should be little necessity for the radical measures of fumigation, sterilization, or destruction of the mushroom beds.

Dr. E. A. Burt has recently completed a study of the Thelephoraceae collected by Dr. W. A. Murrill in Mexico, and reports many interesting species, quite a number of which are new. These will be published in Dr. Burt's series of articles now appearing in the *Annals of the Missouri Botanical Garden*.

Professor George Massee, the well-known English mycologist, died on February 17 at the age of sixty-seven. Professor Massee

was long connected with the Royal Botanic Garden at Kew and published many books and papers on mycology. His private collection of fungi and drawings was purchased by the New York Botanical Garden some years ago. He has been one of the associate editors of *Mycologia* since 1911.

Meteorology for March.—The total preciptation for the month was 3.71 inches of which 1 inch (10 inches snow measurement) fell as snow. The maximum temperatures recorded were 40° on the 1st, 48° on the 10th, 52° on the 13th, *58° on the 24th* and 57° on the 31st. The minimum temperatures were 30° on the 2nd, *12.5° on the 7th*, 18° on the 20th, and 33° on the 30th.

ACCESSIONS

MUSEUMS AND HERBARIUM

2,261 specimens of flowering plants from the United States. (By exchange with the Missouri Botanical Garden.)

649 specimens of fungi from Porto Rico. (Collected by Prof. F. L. Stevens.)

21 specimens of flowering plants from California. (Given by Mr. S. B. Parish.)

23 colored lantern slides. (Given by Mrs. N. L. Britton.)

165 specimens of flowering plants from the local herbarium. (Given by Mr. L. H. Lighthipe.)

4 specimens of hepaticae from Texas. (Given by Mr. E. L. Reed.)

32 specimens of flowering plants from the western United States. (Given by Dr. H. H. Rusby.)

8 specimens of roses from Minnesota and South Dakota. (Given by Mr. L. R. Moyer.)

2 specimens of fungi from China. (By exchange with the United States Department of Agriculture.)

1 specimen of woody fungus from Ohio. (By exchange with Mr. C. M. Scherer.)

1 cotype specimen of *Claudopus subnidulans* from Missouri. (By exchange with Dr. L. O. Overholts.)

1 specimen of *Polyporus pini-ponderosae* from New Mexico. (By exchange with Mr. W. H. Long.)

1 specimen of *Fomes arctostaphyli* from Arizona. (By exchange with Mr. W. H. Long.)

1 specimen of *Leptonia euchlora* from New York. (By exchange with Dr. H. D. House.)

2 specimens of fungi from North Dakota. (By exchange with Dr. J. F. Brenckle.)

1 specimen of *Peziza sylvestris* from California. (By exchange with Dr. L. O. Overholts.)

30 specimens "Fungi Columbiana," fascicles 49, 50, and 51. (Distributed by E. Bartholomew.)

8 specimens of crude drugs. (Given by Dr. H. H. Rusby)

25 specimens "North American Musci Pleurocarpi," numbers 450 475. (By exchange with Dr. A. J. Grout.)

56 specimens of flowering plants from Colorado. (By exchange with Mr J. W. Clokey.)

4 specimens of Hepaticae from Florida. (Given by Mr. Severin Rapp.)

PLANTS AND SEEDS

3 plants of *Juglans nigra*, for Arboretum. (Given by Mr. John Finley.)

40 plants, *Ampelopsis humilis* and *Populus Simonii*. (By exchange with U. S. Dept. of Agriculture, Bureau of Plant Industry.)

9 plants, *Populus* sp., for Nursery. (Collected by Dr. N. L Britton.)

1 packet of seeds of *Peganum Harmala*. (By exchange with Botanic Garden of Tiflis, Russia.)

3 packets of seeds. (By exchange with U. S. Dept. of Agr., Bureau of Plant Industry.)

1 packet of seeds from British Columbia. (Given by Prof. F. Boas.)

1 packet of seeds of *Crinum americanum*. (Collected by Dr. J. K. Small.)

50 packets of California seeds. (Purchased.)

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BRONX PARK, NEW YORK CITY

Vol. XVIII May, 1917 No. 209

JOURNAL

OF

The New York Botanical Garden

EDITOR

FRANCIS WHITTIER PENNELL

Associate Curator

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JOURNAL

OF

The New York Botanical Garden

VOL. XVIII May, 1917 No. 209

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How, by proper planning, a teacher may take a full class into the garden and do effective work in the ordinary class period.

How the garden will furnish material of educational value, alive with interest, which will aid and inspire the regular classroom studies of reading, writing, arithmetic, language, drawing, geography, and history.

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GARDEN PRACTICE.

Harvesting of seeds, of plants and of root crops. Fall fertilizing and spading. Compost pits and their contents. Fall planting. Plant protection for the winter.

LABORATORY.

Experiments and shop work.

V. *Greenhouse Courses* will be organized for November and December, 1917, and for January and February, 1918, to include lectures, greenhouse bench work, propagating, potting, seed testing, hot-bed and cold-frame practice. These courses will be described in detail later in the year.

All correspondence relative to these courses should be addressed to

HENRY GRISCOM PARSONS,
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Access to the School Garden and to the Mansion is most convenient from the new Pelham Parkway Station of the White Plains Road extension of the Subway, walking west on the Bronx and Pelham Parkway and north on either the Bronx Boulevard or on paths which lead to the Mansion. Access can also be had by a somewhat longer walk from the terminal (Botanical Garden or Bronx Park) station of the Third Avenue Elevated Railway, walking east through the Flower Gardens and Hemlock Forest to the Mansion. The Southern Boulevard trolley line reaches the southwestern corner of the Botanical Garden at the junction of Southern Boulevard and Pelham Avenue, from which point access to the Mansion and School Garden can be had by walking east on Pelham Avenue and north to the Mansion.

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

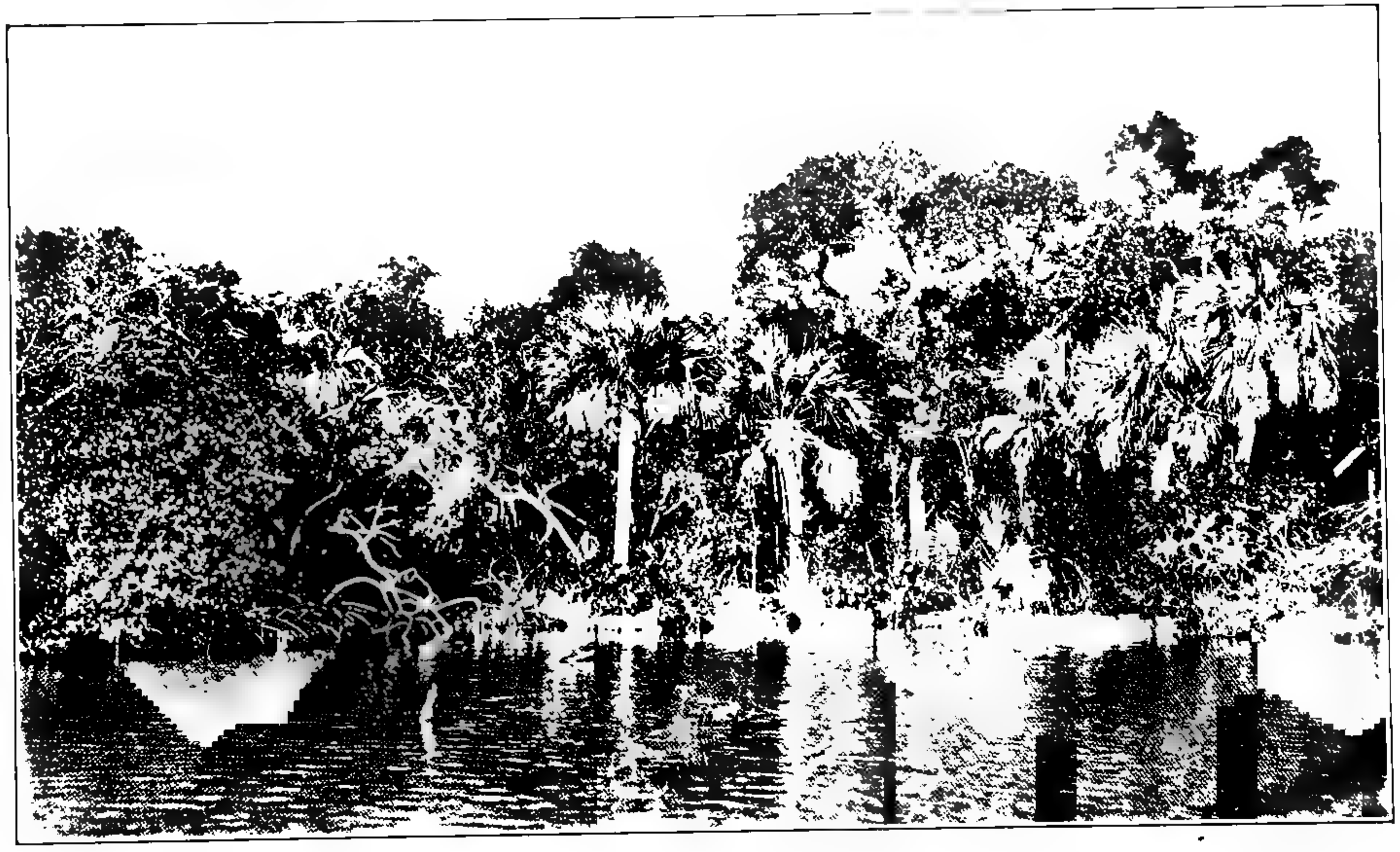
BOTANICAL EXPLORATION IN SOUTHERN FLORIDA IN 1916

WITH PLATES 195-199

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF.

Sir: With your permission I spent January of last year in southern Florida in continuation of general botanical exploration and in photographing the vegetation of the region. During the first two days devoted to field-work, I had the company of Professor R. A. Harper, Professor Tracy Hazen, and Dr. Cecil Yampolski, all of Columbia University.

The initial trip was to Sands' Key. We went there in search of a slender-stemmed cactus that had been reported to occur on that island. Our search was successful, but instead of finding an addition to our cactus flora, we discovered that the seedling plants of the large, and viciously armed dildoe, *Acanthocereus pentagonus*, are little plants with elongate slender stems about



Madeira Bay region, Fla. Shore of Madeira Bay in foreground. Edge of Madeira Hammock in background This is the southernmost hammock on the Florida peninsula, except those of the Cape Sable region. It received its name from the Madeira-redwood or Mahogany tree which grows mostly everywhere in the hammock.

as thick as an ordinary lead-pencil and armed with quite soft spines; altogether so different from the mature state of the plant, that one would not suspect that the two extremes represented the same species, if he had not seen the seedling plants further developed and with the new growths by successive steps taking on the form of the adult. In addition to this discovery, we settled the question about the eligibility of *Maytenus* to our tree-flora list. Its right to inclusion among the trees has always been questioned or disputed except by the writer. On Sands' Key we found tree trunks over a foot in diameter, a fact that should remove all doubts as to whether this plant is a tree or not, and in addition to this evidence, last year Mr. George A. Orrok reported to me the occurrence of trees equal in size to those on Sands' Key growing on Captiva Island on the western coast of Florida near the mouth of the Caloosahatchee River. Another interesting discovery was the Bahamian nightshade, *Solanum bahamense*, growing as a vine, and climbing high in the trees.

The following day was devoted to an excursion to Royal Palm Hammock.* Four subsequent visits were made to this hammock during the month, and much of its area was then explored. The royal palms were in the height of their flowering during January. The massive plumes of white flowers in contrast to the crown of bright green leaves above them presented an impressive sight. Many interesting observations were made and several may be recorded here. The myrtle-of-the-river, *Calyptranthes Zyzugium*, mentioned in my report of last year's work, was found to be one of the most abundant of the shrubs and trees of the island. It grows nearly everywhere, except in the low places. The foliage is peculiarly conspicuous on account of the striking shade of green in its leaves. Another vine was added to our list of climbing plants, namely, the French-mulberry, *Callicarpa americana*. This common shrub was found in the jungle clambering quite high over other shrubs and up into the branches of the trees. It is one of the few shrubs that range all the way from

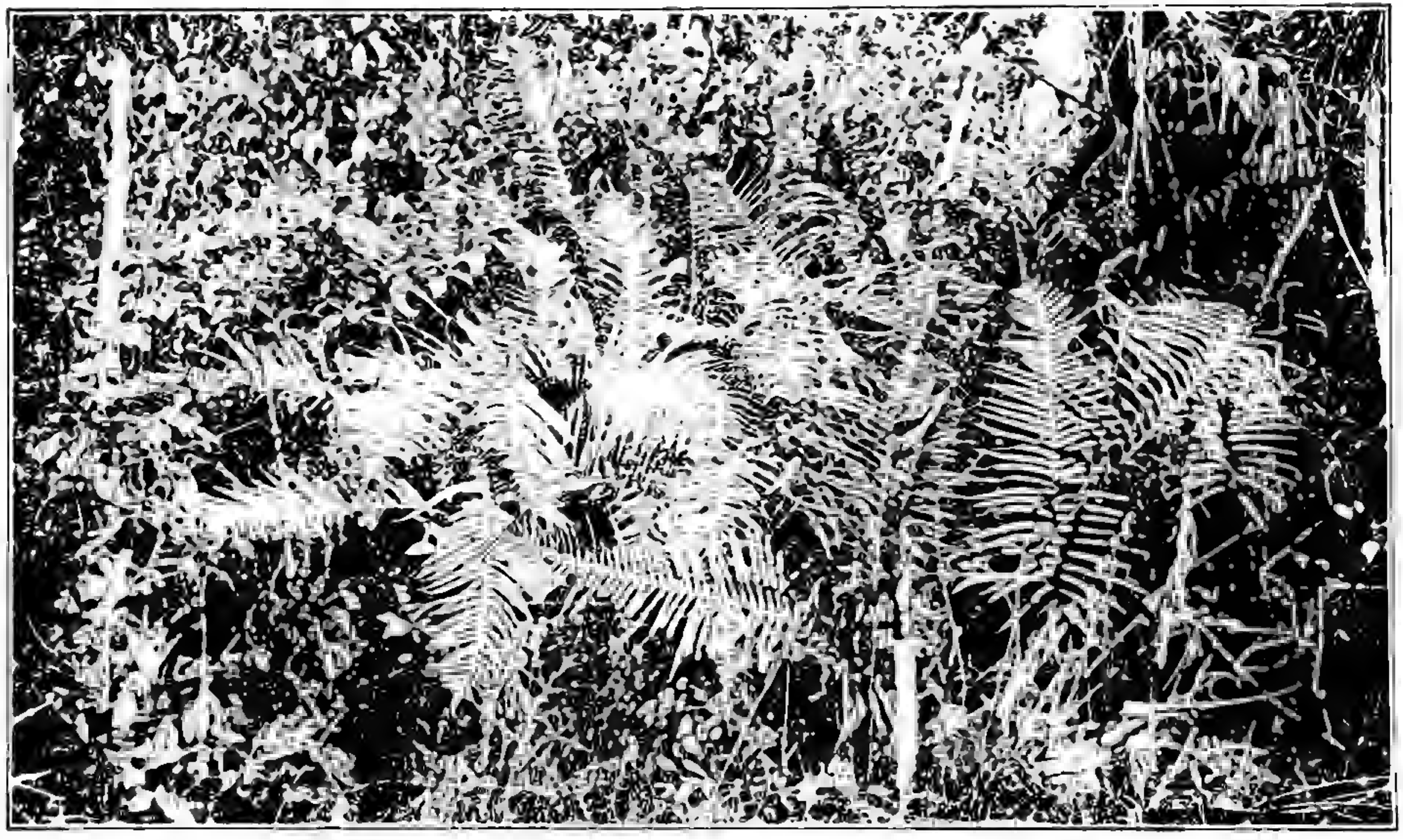
* A separate paper has been devoted to Royal Palm Hammock which has recently become a public reservation. Journal of the New York Botanical Garden **17**: 165–170. 1916.

the Appalachian mountains of Virginia and North Carolina to the southern end of the Everglades. It flourishes about equally well at both extremes of its range.

Royal Palm Hammock furnishes an interesting reversal of the normal phytogeographic conditions of the region. On the Everglade Keys we have extensive pinelands. These surround, here and there, small areas with hammock growth. Royal Palm Hammock is, as the word hammock means, a dense growth of broad-leaved shrubs and trees; but the wind, during hurricanes, or perhaps in less violent storms, has carried seeds from the pine trees growing in distant pinelands and dropped them in the more open places on this everglade hammock. Thus in open and otherwise favorable spots pine trees have sprung up, singly or in groups, and here and there we find small areas of pineland in a hammock. These areas of pine-woods are small, but they are characteristic and even have the saw-palmetto which is nearly always present in the pine-woods on the Everglade Keys. The seeds of this plant were not, however, carried there by the wind, but by animals, most likely by the bear, which up to a few years ago was very abundant throughout this region. Perhaps, if the rock surface of Royal Palm Hammock and the surrounding Everglades were slightly more elevated and the natural protection from fire thus removed, Royal Palm Hammock would long ago have been transformed into a pine island, nearly or quite devoid of hammock.

About ten of the more interesting hammocks mentioned in my report on exploration in 1915 were visited for the purpose of collecting certain plants and making photographs of especially interesting objects.

Two short periods, between visits to the hammocks of the Everglade Keys, were spent in further exploration of the Florida Keys. On one of these cruises the northern end of Key Largo, Angelfish Key, and Palo Alto Key were visited. Key Largo and Palo Alto Key both have some beautiful original forest in which many interesting plants grow. There we found an orchid not before collected on the Florida Keys, and a tree not before found on the Upper Florida Keys. On Angelfish Key we were



In a hammock on the Long Key pineland, Fla. Bed of a very rare wood fern, *Dryopteris augescens*, in foreground. Some of the fern-leaves measured over nine feet in length, and some of the blades were almost three feet wide.

surprised to meet with a copious growth of perhaps our hitherto rarest shrub, *Vallesia*, a member of the dogbane family. Previously it was known in our flora only on Key West. Outside of Florida it is known in the West Indies, in Lower California, and in Chile. On a subsequent cruise the flora of other parts of Key Largo was investigated, and the hammocks of Meig's Key and of Elliott's Key were also visited.

Of the several new hammocks explored, the two more interesting ones are located at the extremities of our field of activities on the mainland during the period under consideration. The one is located in the Long Key pineland, the other in the Everglades west of Little River. At each of these hammocks I was accompanied by Mr. Charles A. Mosier, who discovered the former hammock accidentally several months previous to my visit and who had visited the Everglade hammock several years previously.

The exact location of this Long Key hammock is not determined, but if, after crossing the Everglades from a point where the Ingraham Highway emerges from the western side of Royal Palm Hammock, to the nearest point on Long Key, a northwestern course is followed through the pine forest and across two prairies, one cannot fail to encounter the hammock. This hammock conforms to the invariable rule of the hammocks of the Everglade Keys, in that its flora has individual characteristics and its vegetation, to some extent, is distinctive. Its lime-sinks yielded one kind of West Indian maiden-hair, not known elsewhere on the North American continent. This fern is of interest otherwise in that it has the fragrance of the northern sweet vernal grass in drying. This hammock is rich in orchids. Many of the widely distributed species are present, and in addition to these the *Brassia*, heretofore known in the United States only from the Nixon-Lewis Hammock in the Biscayne pineland, and the *Macradenia* known hitherto only on Royal Palm Hammock, are both quite plentiful.

The incursion to Roberts Island, as the Everglade Key above referred to is locally known, after plans for going there had miscarried many times, took place on January 23. We went by

automobile through the pinewoods to the edge of the Everglades. There afoot we took to the water and mud, and waded for a distance of three miles in a westerly direction in water mostly knee-deep and mud at the same time half as deep or of equal depth, until we reached the hammock. The trip requires strenuous wading, which must of necessity be made at a pace compared with which a funeral march would seem quite rapid; but the objective is worth the effort. This island is several miles long, standing north and south in the Everglades, and about a quarter of a mile wide. It is densely forested throughout. Much of its surface is so low that it is submerged during the rainy season. The soil of the low parts is mud and humus. This supports an almost impenetrable jungle made up mainly of pond-apple trees, cocoa-plum trees, and red-bay trees, and ferns. There are ferns by the square rod and ferns by the acre. The Boston fern and the sword-fern constitute the largest and most beautiful beds. Several kinds of epiphytic ferns and a few species of air-plants often cover the limbs of the trees. The higher ground of the island is sandy. There the live-oak is the dominating tree of the forest, and each tree constitutes a hanging garden. Orchids, air-plants, and ferns completely clothe the limbs of the larger trees. However, plants do not have a monopoly of the trees. There are also epiphytic lizards and epiphytic snakes! There is everywhere present a beautiful green snake. It inhabits the hammocks and it is especially abundant in those of the Everglades. It lies outstretched on the branches of shrubs and trees and glides along the branches from one tree to another with surprising ease. One has usually to be careful to look before laying hold of the limb of a tree for support, or he may grasp something of quite different consistency from that of wood!

The shrubs and herbs here represent more northern kinds than are met with in the hammocks of the nearby Everglade Keys. Among the more interesting discoveries on this island was a gigantic plant of the comptie, *Zamia pumila*, a cycad related to the Florida arrowroot, *Zamia floridana*, which is very common in the pinewoods of the Everglade Keys. The former cycad grows in the hammocks of peninsular Florida mostly north of

the New River, and it had not previously been found south of Fort Lauderdale. The specimen mentioned had a very large branched underground stem, and an unusually fine cluster of leaves each one over four feet tall. So striking was the plant, that we dug it up, photographed it, and replanted it.

Aftér a profitable day on this island, we retraced our steps through the Everglades and found our automobile without special incident, except that one member of the party got his legs tangled in the coils of a large water-moccasin, and in the excitement and confusion of trying to get away in a hurry he fell prone in the mixture of mud and water. Both snake and man were equally surprised at the sudden meeting and neither had time to harm the other.

About the spot where this incident happened we discovered the beefwood or Australian-pine growing in the wet Everglades. The seeds had evidently been blown in during a storm or hurricane from trees growing near the coast.

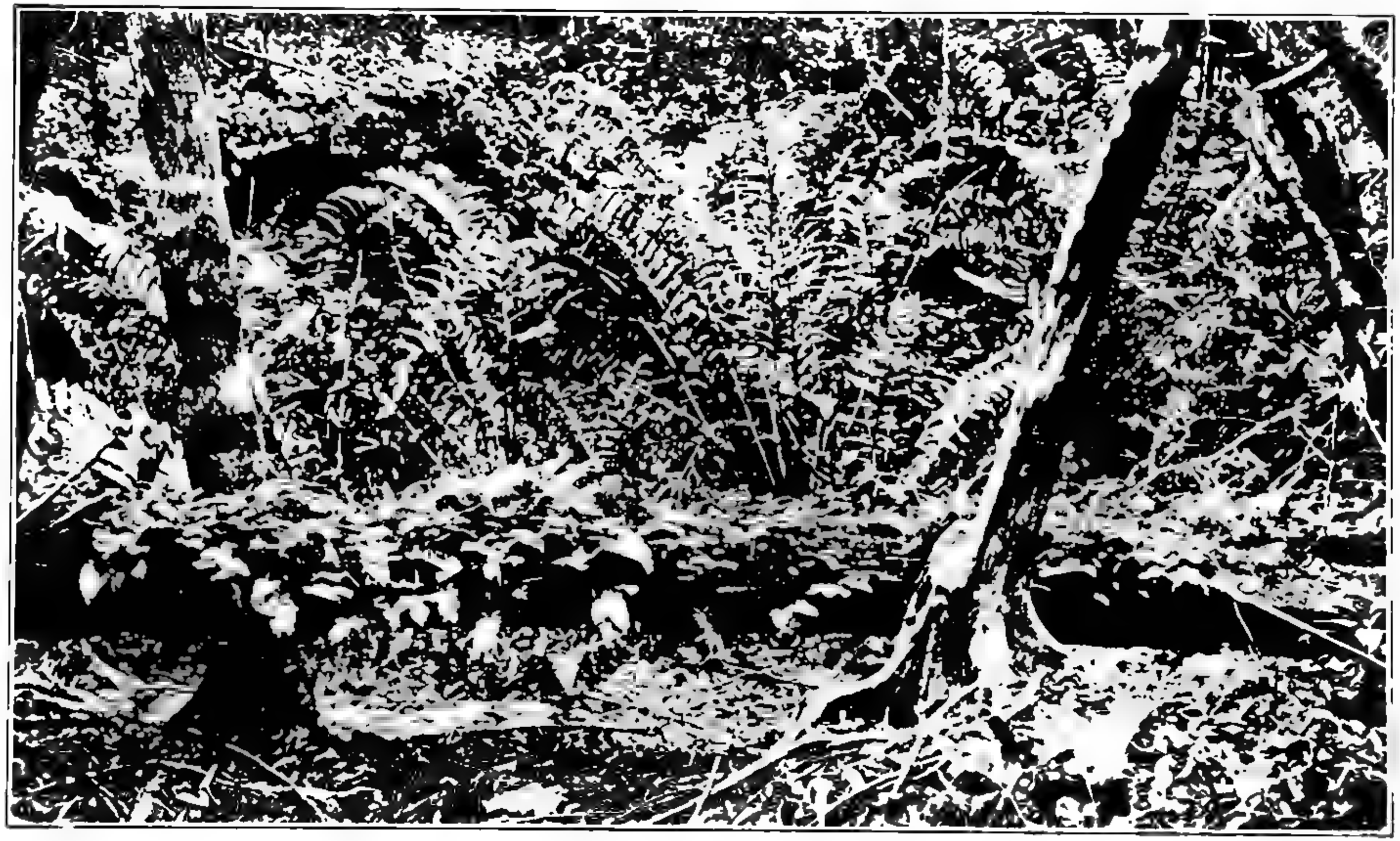
The last week of field-work was devoted to a cruise to the lower Florida Keys. We sailed from Miami one forenoon and late in the evening of the same day we cast anchor for the night in the Bay of Florida just off the mouth of Tavernier Creek at the southern end of Key Largo. The night was warm and calm and the sky was cloudless; but simultaneous with daybreak we were suddenly awakened by the breaking of a "norther" which was ushered in by several flashes of lightning and a wind-squall that nearly swept loose objects from our decks. The gale caused our anchor to drag, thus blowing us rapidly toward the neighboring shore. The storm was accompanied as usual by an uncomfortable chillness caused by the sudden fall in temperature and by the continued strong wind from the north. We got under way at once to avoid being blown on shore, and as the engine was working well we continued southwestward on our proposed course without further delay. The sea became very rough as we went on and on emerging into the open part of the Bay of Florida we were forced to seek the shelter of Lignum-vitae Key for a short respite, both in order to get the salt out of our eyes and to avoid taking too much water aboard.

There we made collections on that island, which somewhat resembles Pumpkin Key in Card Sound, but with a less interesting hammock.

After several hours delay, during which time the wind abated slightly, we again started toward our destination, and made a harbor near the western end of Vaca Key just after dark. An early start next morning brought us to Big Pine Key in the forenoon. Before crossing over to No Name Key, our objective, we called on the oldest resident, the leading citizen, the postmaster, the express agent, the station agent, the merchant, and the banker, and also a good friend of all visitors to Big Pine. This formality and pleasure did not consume much of our time, as these distinctions, offices, and vocations are invested in one man, namely, Mr. Thomas Knowles, who has helped our exploration there by his personal company, by information, and by putting his house at our service. After casting anchor in a harbor on the western side of No Name Key, we at once went ashore to investigate the island. No Name Key, like a half dozen of the neighboring islands, has extensive areas of both pineland and hammock.

These islands, and the other keys west of the region of Bahia Honda channel, are of limestone similar to that of the Everglade Keys, and not of coral rock of which the Upper Florida Keys are built up. The naturalists of a generation back considered the Florida Keys to be a uniform chain of islands. However, our studies in the plants of the region in connection with our exploration of the Everglade Keys, and Mr. W. J. Krome's investigations during the construction of the Key West Extension on the Florida East Coast Railway, disclosed the fact that the groups of Keys we have designated elsewhere* as the Upper Florida Keys and the Lower Florida Keys are of different rock, of different geological ages, and thus quite naturally support different floras. Although of the same kind of limestone, the exposed surfaces of the Lower Florida Keys and the Everglade Keys are different in appearance. However, this difference is superficial, and it is easily explained. The superficial erosion

* Flora of the Florida Keys, iii iv. 1913.



Lime-sink in hammock on Key Largo, Fla. Fallen tree-trunk clothed with resurrection-fern in foreground. Leather fern in bottom of sink in background.

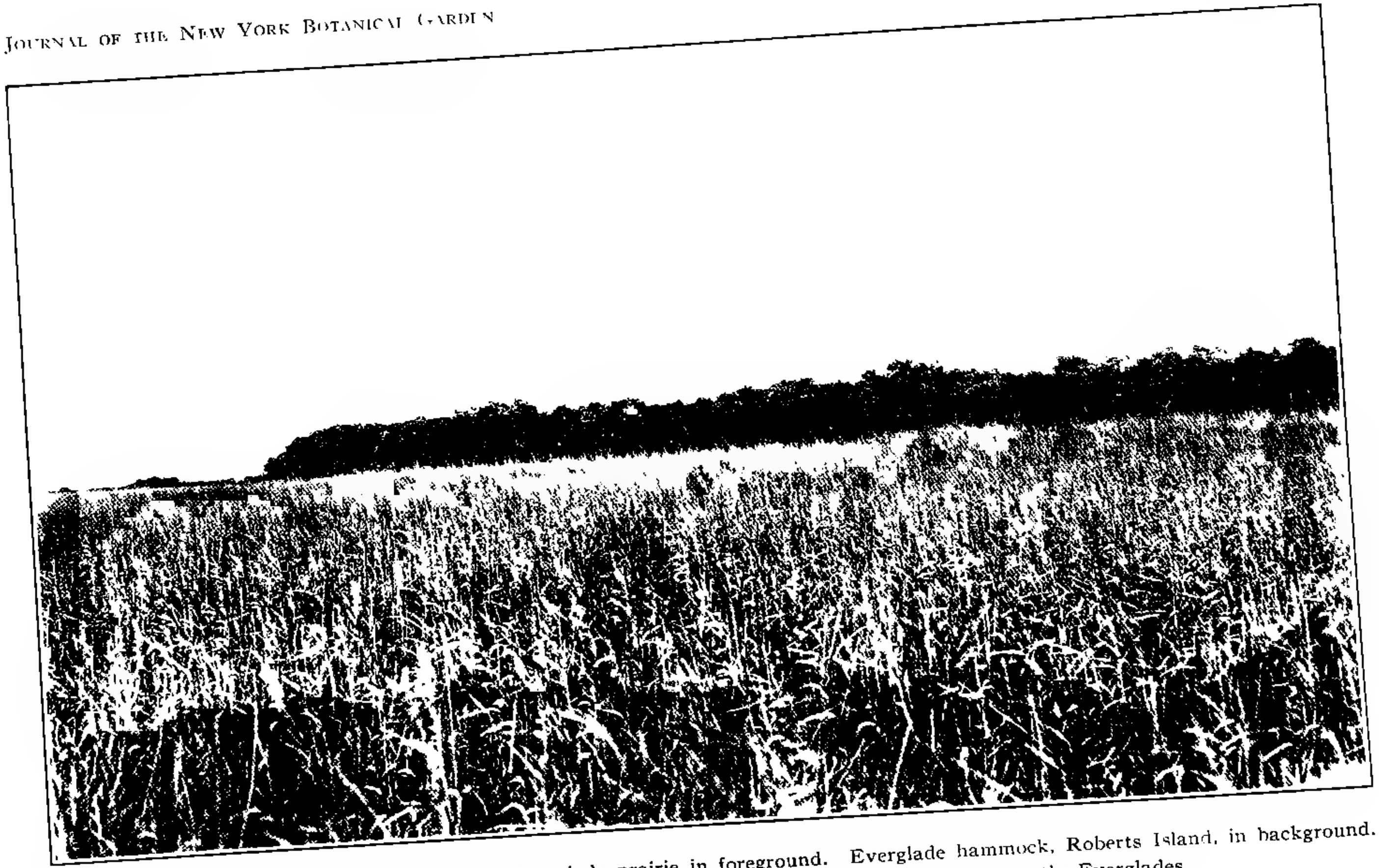
of the rock of the Florida Keys has resulted in a plate-like surface. It has the appearance of having been swept and polished. The storms and hurricanes of ages have brought this condition about. The exposed position of the islands and their slight elevation above tide has permitted the sea to sweep over them from all directions and thus wear down uneven places on the surface, as well as to carry away the decaying vegetable matter and the humus. Thus important factors in the superficial erosion, the acids of the decaying leaves and other vegetable matter and those of the resulting humus, have been largely eliminated. The natural accumulation of humus would produce the opposite condition from that which there obtains. In other words, the leaching-out process is mostly wanting on the Lower Florida Keys, except along the shore lines where the continual action of the tide and the waves leaches out the softer parts of the rock mechanically rather than chemically. The results of chemical leaching are clearly shown on the neighboring mainland of the peninsula.

In the case of the Everglade Keys, all of which are sheltered from the sweeping effect of the sea, we have a quite different rock surface resulting from a quite different mode of erosion. Here the action of rain-water is not counteracted, and the more or less extensive accumulation of humus with its dissolving acids has leached out the softer spots and thus instead of a pavement-like surface we find a surface honeycombed with all sizes of cavities. Further, in the pinelands whose humus has been burned up for ages by forest fires, first as a result of lightning, later by the carelessness or wantonness of man, we find a surface honeycombed with apparently small and shallow cavities; in the hammocks, which have been fire-proof, so to speak, and consequently with copious humus and a perpetual humid atmosphere, we find a surface honeycombed with large and deep cavities. There the surface is so different from that of the pinelands that the cavities are called "pot-holes," "lime-sinks," or "erosion-holes." It is the hammocks that have made the lime-sinks. The lime-sinks are not responsible for the hammocks as is commonly believed.

No Name Key is the type locality or the place where several kinds of flowering plants new to science were first found during the last century. We rediscovered some of these species and, in addition, found the Bahamian *Savia*, a shrub or tree of the spurge family, heretofore known in the United States only from Big Pine Key. Many interesting plants, herbs, shrubs, and trees, clothe the plate-rock surface of this island. The rocks seem too smooth and dry to support vegetation at all, particularly in the pinelands where the humus is scant, and where rays of the tropical sun have direct access to most of the pavement-like surface. Palms thrive exceedingly well. In the pinelands of the Everglade Keys we have a copious growth of stunted saw-palmetto, and occasional stunted silver-palms, or half-starved cabbage-palms. On No Name Key the pine trees are accompanied by a growth of wonderfully developed thatch-palm and silver-palm which sometimes rivals the pines themselves. The young trees of both these palms are very thrifty, with stout trunks and heavy crowns; but as the trees get older the trunks increase greatly in length but not so much in diameter, and the crown of leaves is much diminished in size. The older trees often suggest slender fish-poles with a small brush-like tuft of leaves on the top.

The second day on this island was devoted to crossing to the eastern shore through pineland and hammock towards the southern end and then recrossing to the western side further north. The western side of the Key is mostly pineland, while the eastern side is mostly hammock. The hammock is rather stunted, but dense, and it has formed considerable humus on the floor. This condition leads the inhabitant there, as elsewhere, to clear the land for the cultivation of crops.

As we have already said, natural agencies are slowly destroying the Florida Keys and consequently, in all probability, many kinds of plants that once grew on them have disappeared. Man is destroying hammock and pineland, both wantonly and of necessity, much more rapidly than nature. Before long much of the natural vegetation of the region will be known only in places to which it may have been transplanted, or in the herbarium specimens we secure and preserve in our museum collec-



[illegible] west of Little River, Fla. Everglade prairie in foreground. Everglade hammock, Roberts Island, in background. [illegible] are scattered over the eastern edge of the Everglades.

tions. On the return trip we stopped to make collections on several keys.

We first visited Johnson's Keys, which lie eastward of No Name Key. The next landing was on Bahia Honda Key, where several plants grow that are not known elsewhere in the flora of the United States. After this we visited, successively, Ohio Key, Rachel Key, Bamboo Key, and Key Largo. Rachel Key may be recognized by its lone cocoa-nut tree. Its rocky surface is clothed with dense hammock, except where it has been cleared for cultivation. There we found the aloes growing naturally. This discovery adds an African plant to our naturalized flora. Bamboo Key may be recognized by the absence of bamboo, or any plant like it, and also by the absence of shrubs and trees, except scattered plants of the wild-cotton. Its surface, unlike that of Rachel Key, is composed of loose small fragments of sea-shells. There, also, we found quantities of aloes growing naturally; but its most interesting plant is the common asparagus! Asparagus plants were evidently introduced there in some way, and now they have taken possession of large areas. This plant of temperate regions seems to thrive just as well on this tropical island; there it has no winter resting period, but grows from one end of the year to the other, and, like the wild-cotton plants with which it grows, it both flowers and fruits without cessation.

Card Point, a small cape projecting eastward from the mainland, was visited and its hammock explored. Here, as along most of the coast-line of the Florida peninsula south of Cutler, the mangrove lines the shore. Several projections also support hammock. Growing with the native plants in this hammock we found the beefwood or Australian pine. This tree is becoming more and more common as a naturalized plant in southern Florida. It will grow well in almost any situation; from a distance we noticed it along the uninhabited shore of the peninsula at several points where seeds had evidently been blown by storms or had been washed ashore during high tides. After a short stop on Key Largo for the purpose of making some photographs of ferns, we weighed anchor and proceeded back to Miami and Buena Vista.

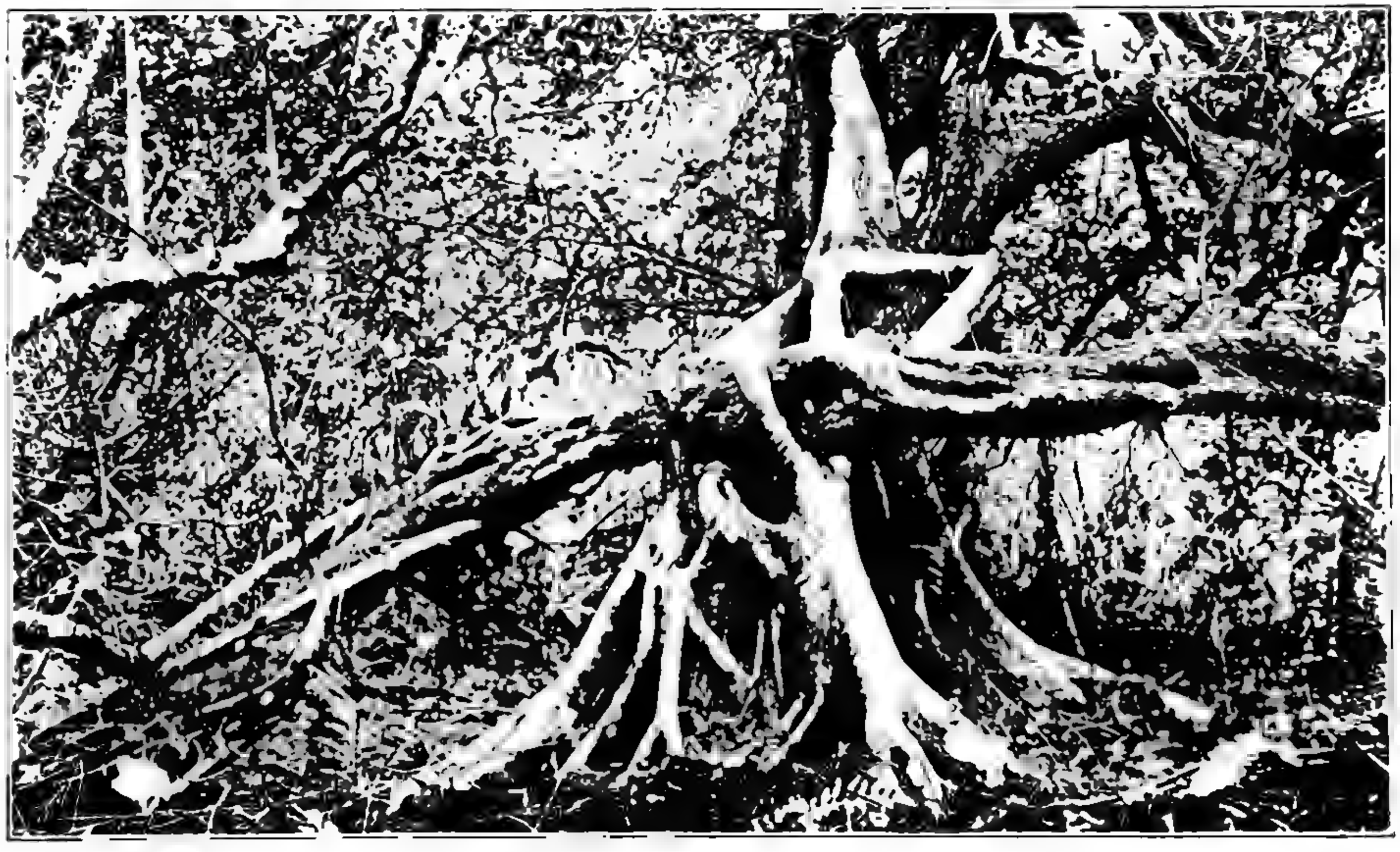
An unexpected call to southern Florida during the latter part of November and the first part of December gave opportunity for further exploration. The time was devoted largely to hitherto unvisited territory. A dozen points in the Everglades not previously visited were investigated, and each one disclosed plants of interest. Several new hammocks were found and portions of the Biscayne pineland not previously traversed by the writer were examined.

A week was devoted to further exploration in the Cape Sable region. Only new localities were visited. We had planned to revisit the Cuthbert Lake and the Coot Bay regions, but a strong easterly wind had blown most of the water out of the Bay of Florida east of Flamingo and recent rains had filled the sloughs on the mainland north of Flamingo and had made them impassable. Consequently, our plans were frustrated by too little water in the sea and too much water on the land.

Although a continued strong easterly wind had perceptibly lowered the water in the bay, we sailed without difficulty as far east as Joe Kemp's Key, where we anchored. There leaving the " Barbee " we went ashore on the key. This was the first time botanists had set foot on the island, and I might say in passing that there are over a hundred Florida Keys upon which collectors have not yet set foot, and what strange plants may be hidden in their hammocks we do not know!

We spent the forenoon collecting on the sand-dunes of the key and in its hammocks, as well as in the hammocks of the adjacent mainland. The wind increased in velocity and we noticed that the water in the bay was rapidly getting lower. We then made haste to go to the "Barbee," which we managed to reach with difficulty, for when we approached her she was resting high and dry on the soft mud bottom of the bay.

This condition of low water afforded an unusual opportunity for collecting the kinds of aquatic flowering plants that grow only on the bottom of the bay. Three kinds were present there, the turtle-grass, the manatee-grass, and a third kind quite similar to the manatee-grass in habit, but with flat leaves. Previously, this plant was apparently one of the very rare plants in our



In hammock on Roberts Island in Everglades west of Little River, Fla. A strangling-fig, pale-barked tree, grappling a cocoa-plum, horizontal tree-trunk in front, and a swamp-bay, erect trunk behind. Note strongly buttressed trunk of strangling fig.

flora and no definite locality for it was known. Our observations prove it to be exceedingly common. Its botanical name is *Halodule*. It has no common name, but it would ordinarily pass for manatee-grass, which it very closely resembles.

As the tide came in the wind abated slightly, and as soon as the "Barbee" floated we moved westward a few miles and sought shelter for the night behind a small cape. The velocity of the wind increased again, and at dusk we were compelled to drive a long stake through the anchor ring to keep from being blown out into the Gulf of Mexico.

After sunrise the next morning we went ashore at Flamingo and started westward across the prairie in the direction of Cape Sable. Between the Cape and the Flamingo region are extensive prairies almost as level as a floor, except for occasional "gator" holes. Hammocks are scattered here and there on the prairies. These, however, are more numerous toward the shore of the bay on the south and along the evidently lower parts of the prairie several miles toward the north. Strong winds sweep the prairies almost unceasingly.

We walked westward nearly to the East Cape, and along the course discovered a number of plants not before known in our flora except on the Florida Keys. The prairie region and adjacent parts are full of bird-life. There is much evidence of it in the hammocks, which often are large rookeries. Reptiles, too, are plentiful. Poisonous snakes are represented by moccasins in the low parts of the prairies and diamond-back rattlers about the hammocks. In a hammock midway between the Cape and Flamingo one member of our party serenely stepped over two "bell-cows," as the rattlesnakes are locally known in parts of Florida; but he was not aware of his daring feat until his attention was directed to the snakes by a companion walking behind him. The reptiles were each over six feet in length.

By sunset we had retraced our steps to Flamingo. During the day we had gathered a wagon load of living plants and herbarium specimens, all of which we transferred to the "Barbee." The following morning we began our homeward journey. We proceeded directly to Cape Sable and made a landing on each

of the three capes, where we examined new localities. At each cape we were rewarded by discovering plants new to our flora. After going northward to the boundary line separating Cape Sable and the Ten Thousand Islands, we boarded the "Barbee" and headed her toward Lower Matecumbe Key. We made a harbor on the inner side of this key after sunset and the following morning went ashore to hunt for plants in parts of the hammock which had not before been visited. The most interesting plant encountered was a rare cactus with simple or nearly simple stems often growing between twenty and thirty feet tall.

After starting on another tangent of our homeward journey late in the afternoon, we decided to visit Madeira Bay. Night fell before we reached Pigeon Key, at which point one must turn north in order to reach Madeira Bay. As a matter of saving time for field-work we determined to attempt to cover the course in the dark. We dodged islands by keeping a sharp look-out and missed running aground on sand-bars by mere luck. All went well and before midnight we anchored at what we unanimously decided was the entrance to Madeira Bay. The next morning at sunrise the outlook seemed quite different and we sighted the entrance to the bay about a half a mile eastward from where we lay. Our collections in and about Madeira Hammock added more plants to our flora. The same afternoon we started on the final portion of our homeward journey, and reached our destination late in the evening of the same day.

All the field-work described and accomplished, which made possible the many interesting discoveries, was due to the interest of Mr. Charles Deering.

The results of the exploration may be stated as follows: first, a number of plants, representing chiefly liverworts, mosses, ferns, and flowering plants, either new to science or new to the flora of the United States; second, additions to our list of plants growing naturally in the Everglades, a descriptive flora of which is contemplated; third, further information on the geographical distribution of the plants of southern, particularly tropical, Florida; fourth, much information on the physiography of south-

ern Florida which will be recorded in a subsequent paper; fifth the collection and preservation of the rarer native plants from localities that are rapidly changing or disappearing, for our herbarium, and for distribution to other herbaria, and the transplanting of living specimens to reservations, where they will be preserved from destruction.

Respectfully submitted,

JOHN K. SMALL.

HARDY WOODY PLANTS IN THE NEW YORK BOTANICAL GARDEN

(Continued)

Picea pungens. COLORADO SPRUCE.

Location: Pinetum, knoll northwest of Conservatory Range I.

Natural distribution: Wyoming to New Mexico.

Picea pungens var: **glauca.** BLUE COLORADO SPRUCE.

Location: Pinetum, with the above; also at Fountain Enclosure. West end of Long Bridge. Woodlawn Road Bridge.

Picea pungens var: **glauca pendula.** WEEPING COLORADO BLUE SPRUCE.

Location: Pinetum, near Fountain Enclosure.

Picea pungens var: **Kosteri.** KOSTER'S BLUE SPRUCE.

Location: Pinetum, knoll northwest of Conservatory Range I; also at Fountain Enclosure. Woodlawn Road Bridge.

Picea pungens var: **Kosteri compacta.** KOSTER'S DENSE-LEAVED SPRUCE.

Location: Pinetum, northwest of Conservatory Range I.

Picea Schrenkiana. SCHRENK'S SPRUCE.

Location: Pinetum, along west border south of Station Plaza near Hydrangea group.

Natural distribution: Siberia to northern China.

Picea Smithiana. SMITH'S SPRUCE.

Location: Pinetum, with the above.

Natural distribution: Himalayan Region.

Picea jezoensis (*P. ajanensis*). YESSO SPRUCE.
Location: Pinetum, with the above. West end of Long Bridge in low land.
Natural distribution: Japan.

Tsuga. HEMLOCKS

Tsuga canadensis. HEMLOCK.
Location: Pinetum, along West Border, south of Power House I. Hemlock Forest, along Bronx River.
Natural distribution: Eastern North America.

Tsuga canadensis var: **albo-spica.** SILVERY-SPOTTED HEMLOCK.
Location: Pinetum, with the above.

Tsuga canadensis var: **compacta.** DENSE HEMLOCK.
Location: Pinetum, with the above.

Tsuga canadensis var: **gracilis.** SLENDER HEMLOCK.
Location: Pinetum, with the above.

Tsuga canadensis var: **parvifolia.** SMALL-LEAVED HEMLOCK.
Location: Pinetum, with the above.

Tsuga canadensis var: **pendula.** WEEPING HEMLOCK.
Location: Pinetum, with the above. West end of Long Bridge. Iris Garden. Flower beds at Conservatory Range I.

Tsuga caroliniana. CAROLINA or CRAG HEMLOCK.
Location: Pinetum, with the above.
Natural distribution: Virginia to Georgia.

Tsuga diversifolia. HAIRY-TWIGGED JAPANESE HEMLOCK.
Location: Pinetum, with the above.
Natural distribution: Japan.

Tsuga Tsuga (*T. Sieboldii*). SIEBOLD'S HEMLOCK.
Location: Pinetum, with the above. Flower beds at Conservatory Range I.
Natural distribution: Japan.

Pseudotsuga. DOUGLAS SPRUCE

Pseudotsuga mucronata (*P. Douglasii*). DOUGLAS SPRUCE.
Location: Pinetum, west side, between path and driveway and also between the driveways, near approach to elevated

railroad. West end of Long Bridge. Group at foot of Museum Approach.

Natural distribution: Western North America.

Pseudotsuga mucronata var: **glauca.** BLUE DOUGLAS SPRUCE.

Location: Pinetum, with the above between driveways.

Abies. FIRS

Abies amabilis. RED SILVER FIR.

Location: Pinetum, near flower border at approach to elevated railway.

Natural distribution: Northwestern North America.

Abies balsamea. BALSAM FIR.

Location: Pinetum, northwest of Conservatory Range I; in depression north of Power House I.

Natural distribution: Northern North America.

Abies cephalonica. MT. ENOS FIR.

Location: Pinetum, northwest of Conservatory Range I.

Natural distribution: Greece.

Abies cilicica. CILICIAN FIR.

Location: Pinetum, northwest of Conservatory Range I.

Natural distribution: Asia Minor.

Abies concolor. WHITE FIR.

Location: Pinetum, northwest of Conservatory Range I. Woodlawn Bridge. West end of Long Bridge.

Natural distribution: Western North America.

Abies concolor var: **falcata.** CURVED-LEAVED WHITE FIR.

Location: Pinetum, with the above.

Abies Fraseri. FRASER'S FIR.

Location: Pinetum, in depression north of Power House I.

Natural distribution: Alleghany Mountains.

Abies grandis. GREAT SILVER FIR.

Location: Pinetum, near flower border at approach to elevated railway.

Abies homolepis. NIKKO SILVER FIR.

Location: Pinetum, northwest of Conservatory Range I.

Natural distribution: Japan.

Abies homolepis var: **umbellata.** MAYR'S FIR.
Location: Pinetum, with the above.
Distribution: Japan.

Abies lasiocarpa. WESTERN BALSAM FIR.
Location: Pinetum, northwest of Conservatory Range 1; in depression north of Power House 1.
Natural distribution: Western North America.

Abies Momi (*A. firma*). JAPANESE SILVER FIR.
Location: Pinetum, west of Conservatory Range 1.
Natural distribution: Japan.

Abies nobilis. RED FIR.
Location: Pinetum, northwest of Conservatory Range 1.
Natural distribution: Washington and Oregon.

Abies Nordmanniana. NORDMANN'S SILVER FIR.
Location: Pinetum, northwest of Conservatory Range 1. West end of Long Bridge. Woodlawn Bridge.
Natural distribution: Caucasus.

Abies numidica. ALGERIAN SILVER FIR.
Location: Pinetum, northwest of Conservatory Range 1.
Natural distribution: Northern Africa.

Abies Picea (*A. pectinata*). SILVER FIR.
Location: Pinetum, northwest of Conservatory Range 1; in depression north of Power House 1.

Abies Pinsapo. SPANISH FIR.
Location: Pinetum, in depression north of Power House 1.
Natural distribution: Spain.

Abies sibirica. SIBERIAN FIR.
Location: Pinetum, in depression north of Power House 1.
Natural distribution: Northern Europe and Asia.

Abies Tomomi. TOMOMI FIR.
Location: Pinetum, northwest of Conservatory Range 1; near flower bed at approach to elevated railway.
Natural distribution: Japan.

Abies Veitchii. VEITCH'S SILVER FIR.
Location: Pinetum, northwest of Conservatory Range 1; also between path and driveway.
Natural distribution: Japan and Manchuria.

TAXODIINAE. Taxodium Tribe

Sciadopitys. UMBRELLA PINE

Sciadopitys verticillata. UMBRELLA PINE.

Location: Pinetum, north end of Herbaceous Grounds valley.
Natural distribution: Japan.

Sequoia. SEQUOIAS

Sequoia Washingtoniana. BIG TREE.

Location: Pinetum, north end of Herbaceous Grounds valley.
Natural distribution: Sierra Nevada Mountains, California.

PLANTING THE NEW ROSE GARDEN

The plans for the Rose Garden, designed by Mrs. Beatrix Farrand in cooperation with Mr. John R. Brinley, Landscape Engineer of the New York Botanical Garden, were described and illustrated in the issue of the *Journal* for August, 1916, where a record of the commencement of work was made by the breaking of ground on May 4, 1916. The construction of the garden has since been continuously prosecuted by the aid of a special fund subscribed by 107 members of the Garden.* To this fund the sum of $100 has since been added by Mrs. Marin Le Brun Cooper.

During the season of 1916, most of the grading, drainage, and path building was accomplished, including the hauling of top-soil to an average thickness of 2½ feet over the whole area of about an acre and a quarter, except the portions occupied by paths; this top-soil was obtained by stripping path locations elsewhere on the grounds, thus accomplishing two purposes at once. During the winter and early spring, a considerable amount of rock was excavated at the northwestern corner of the Garden, and all used in the construction of paths. Some work has also been done in grading the immediate surroundings of the garden and the system of path approaches, and this is still in progress.

* See Bulletin, N. Y. Bot. Garden 9: 371–373.

About 5,000 rose plants have been contributed to the Garden through the Horticultural Society of New York, and planting was commenced on April 23, 1917. On Thursday, April 26, 1917, a conference was held at the Mansion by members of the Garden Board of Managers and Women's Auxiliary and members of the Council of the Horticultural Society, relative to the further development of the Garden, on which occasion Mrs. Farrand lectured on "Roses and the New Rose Garden" and Mr. John Woodcock, of Ossining, New York, made supplementary remarks relative to the care and cultivation of roses. Mrs. Farrand's designs for the central arbor and trellis enclosure of the garden were exhibited and described at this time. It is hoped that some friend or friends of the Garden will contribute the sums necessary for the construction of these architectural features.

CONFERENCE NOTES

The April conference of the Scientific Staff and Registered Students of the Garden was held in the general laboratory of the museum building on the afternoon of April 4.

At this conference two reports of investigations were presented as follows:

"Studies of North American species of *Phyllachora*," by Professor C. R. Orton.

The genus *Phyllachora* was described in Symb. Myc. 216. 1869, and based on *Sphaeria graminis* Pers. Obs. Myc. 18. 1796, where this fungus was not only described but illustrated as well.

The present study has been undertaken for the purpose of presenting descriptions of the species of this genus which occur in North America. About 25 species have been described in the past from North American material, but only a part of these are now referable to this genus. Several South American species are found in tropical North America and some European species have been established.

Morphological studies are being carried along with the taxonomic work as well as cytological investigations. Cultural work is also being pursued in order to definitely work out the life history of these forms, regarding which so little is known.

Cytological preparations showing various stages of the development of the ascus in this species were exhibited at the conference.

"The cultivation of *Hevea* with respect to the production of rubber," was presented by Professor Henri Hus.

During the past two years Dr. Hus has spent all of his time in the investigation of *Hevea*. Much of this time has been spent in the rubber-tree plantations of Java, Sumatra and the Federated Malay states. For several months Dr. Hus has been at the New York Botanical Garden working over data and material.

Dr. Hus presented to the conference on account of the introduction of *Hevea* into the East and the development of the rubber industry that followed. Methods of cultivation and tapping were described and a general report was made of the variability in the yield of dry rubber.

Numerous specimens and photographs were exhibited to illustrate and demonstrate various points.

A. B. STOUT,
Secretary of the Conference

NOTES, NEWS AND COMMENT

The following persons enrolled in the library during April as investigators at the Garden: Hermann W. Merkel, New York, N. Y.; Professor Francis E. Lloyd, Montreal, Canada; Professor L. H. Pennington, Syracuse, N. Y.; Professor H. S. Jackson, Lafayette, Ind.; Professor H. H. Whetzel, Ithaca, N. Y.; Dr. C. L. Shear, Washington, D. C.; Mrs. Frank E. Lowe, Worcester, Mass.; Felix G. Quero, and Dr. J. Lopez-Suarez, Madrid, Spain.

About seventy-five members of the Department of Botany of the Brooklyn Institute of Arts and Sciences held a spring field meeting at the New York Botanical Garden on the afternoon of Saturday, April 28, when they were conducted through the public conservatories and portions of the grounds by Dr. W. A. Murrill, Dr. F. J. Seaver, Mr. Percy Wilson, and Miss Helene Boas. At four o'clock, they assembled in the lecture hall to hear Dr. N. L. Britton speak on "Early Spring Flowers."

Volume 10, part 2, of *North American Flora*, by Dr. W. A. Murrill, appeared April 26. This part contains descriptions of 282 species of rosy-spored gill fungi, 107 of which are new.

Dr. Walter Mendelson has recently given an interesting collection of herbarium specimens to the Garden. These were collected mostly in the vicinity of Germantown, Pennsylvania, and will be added to the local flora herbarium.

A number of specimens of the rarer plants of the vicinity of New York, collected during last season by members of the Garden staff, have been mounted and incorporated in the local flora herbarium.

The Garden has recently received a collection of one hundred and fifty specimens of cup fungi from Professor C. G. Lloyd for determination and study. The collection represents the accumulation of several years and is of considerable value in connection with the study of this group for *North American Flora*.

Professor H. S. Jackson of the Indiana Experiment Station recently spent several days at the Garden in continuation of his work on certain groups of plant rusts.

Professor C. G. Lloyd recently spent several days at the Garden studying the collections of woody fungi.

Professor H. H. Whetzel of Cornell University spent several days in the library looking over phytopathological literature.

The last few days of April brought out some of the magnolias in the new collections of these plants in the Arboretum. The first to bloom was *Magnolia denudata*, the Yulan. This large-flowered kind is a native of China, and its white flowers are very fragrant.

At Conservatory Range 2, a fine plant of *Posoqueria longiflora* is in bloom. Its clusters of tubular waxy flowers are pure white in color, fragrant, and decidedly attractive.

Meteorology for April.—The total precipitation for the month was 1.68 inches. Maximum temperatures recorded for each week were as follows: *84° on the 1st*, 64° on the 11th, 75° on the 22d, and 78° on the 23d. The minimum temperatures were *27° on the 9th*, 31° on the 15th and 17th, and 35° on the 25th.

ACCESSIONS

PLANTS AND SEEDS

2 plants for Conservatories. (By exchange with U. S. National Museum, through Dr. J. N. Rose.)

234 plants for Nurseries and Conservatories. (By exchange with U. S. Dept. of Agriculture, Bureau of Plant Industry.)

24 plants for Nurseries. (Collected by K. R. Boynton.)

118 plants for Fruticetum and Arboretum. (Purchased.)

799 South American cacti for Conservatories. (Collected by Dr. J. A. Shafer.)

35 plants for Conservatories. (Collected by Dr. A. Lofgren.)

118 plants derived from seed from various sources.

6 packets of seeds. (Given by Mr. E. B. Williamson.)

LIBRARY ACCESSIONS FROM MARCH 1 TO APRIL 30, 1917.

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BRONX PARK, NEW YORK CITY

Vol. XVIII June, 1917 No. 210

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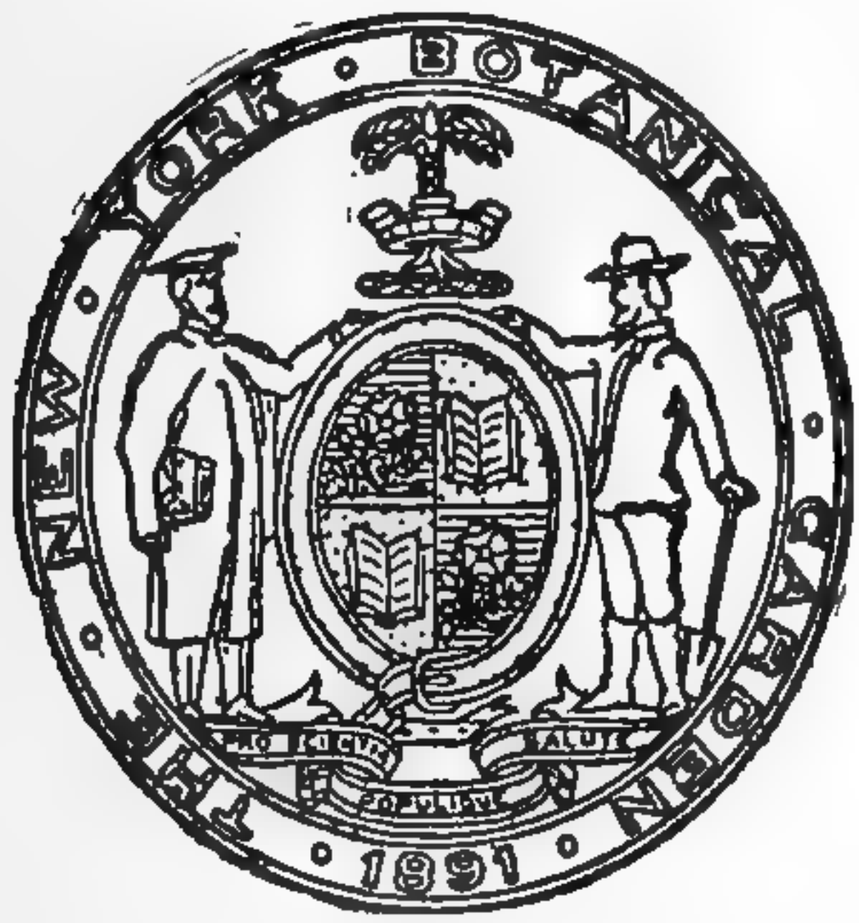
EDITOR

FRANCIS WHITTIER PENNELL

Associate Curator



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JOURNAL

OF

The New York Botanical Garden

VOL. XVIII June, 1917 No. 210

FURTHER DEVELOPMENT OF THE NEW YORK BOTANICAL GARDEN.

REPORT OF THE ENDOWMENT COMMITTEE TO THE BOARD OF MANAGERS, APRIL 19, 1917.

TO THE BOARD OF MANAGERS OF THE
NEW YORK BOTANICAL GARDEN—

Gentlemen: The Endowment Committee, to which was referred with power the report of the Executive Committee of the Board of Managers relative to the further development of the Garden at the meeting of January 8, 1917, would respectfully report as follows:

The Committee has held meetings on January 17, January 31 and March 19, at the office of Mr. Daniel Guggenheim, 120 Broadway.

The Committee organized by the election of Mr. Guggenheim as chairman and with Dr. Britton as secretary.

After consideration of the report of the Executive Committee, the Endowment Committee decided, on the suggestion of its chairman, to have all structures needed to complete the physical construction of the institution designed in uniform style and to obtain estimates of the cost of each item. The committee summoned our landscape engineer, Mr. Brinley, for advice, and fortunately, he has been able, through the high artistic ability of Mr. Bird of his office, to produce the series of beautiful designs

[Journal for May, 1917 (18: 95–120) was issued June 11, 1917.]

which are herewith submitted. The work of designing is not yet complete, Mr. Bird being still occupied with rendering other studies.

CONSTRUCTION ITEMS

Museum laboratory wing	$100,000
East Museum wing	100,000
Central display greenhouse (Given by Daniel Guggenheim and Murry Guggenheim)	75,000
Orchid greenhouse (Given by Daniel Guggenheim and Murry Guggenheim)	24,000
Economic plant greenhouse (A)	24,000
Economic plant greenhouse (B)	22,000
Tropical plant greenhouse (A)	24,000
Tropical plant greenhouse (B)	22,000
Aroid greenhouse	40,000
Garden school greenhouse	8,000
Experimental greenhouse	8,000
Investigation greenhouse	9,000
North Meadows bridge	8,000
Rose Garden arbor and pylons	4,000
Rose Garden west entrance and fencing	2,000
Rose Garden north entrance and fencing	2,000
Rose Garden south entrance and fencing	2,000
Garden School shelter (given by Mrs. Frederick F. Thompson)	4,000
Cherry Garden shelter	2,000
Arboretum shelter	2,500
Fruticetum shelter	2,500
Economic Garden shelter	2,000
Garden school entrance and fencing	2,500
Long Lake entrance and fencing	2,000
Mansion approach entrance and fencing	5,000
Linnean Bridge entrance and fencing	4,000
Iris Garden entrance and fencing	5,000
Horticultural Garden entrance and fencing	3,000
Southern Boulevard entrance	8,000
Wall and fence, Southern Boulevard	6,000
Wall and fence, Pelham Parkway	16,000
Wall and fence, Bronx Boulevard	7,000
Arboretum entrance and fencing	4,000
Paths, grading and drainage	10,000
Rose Garden Stairway (given by Mrs. Robert E. Westcott)	2,000

For the services of Mr. Brinley and Mr. Bird in these studies, the committee will need about $2,000, which sum it is suggested be appropriated from General Fund Income and added to the budget appropriation for plans, surveys and construction.

At the first meeting of the committee, Mr. Daniel Guggenheim expressed his willingness to contribute $50,000, for such of the purposes as may hereafter be determined. Subsequently, his brother, Mr. Murry Guggenheim, contributed an additional $50,000, and at the meeting of March 19, it was determined, with the approval of the Messrs. Guggenheim, to devote their joint contribution of $100,000 to the construction of the Central Display Greenhouse and the Orchid Greenhouse at Conservatory Range No. 2.

Copies of the letters of Mr. Daniel Guggenheim and Mr. Murry Guggenheim conveying these gifts are as follows:

AMERICAN SMELTING AND REFINING CO.

120 Broadway

Daniel Guggenheim,
President.

NEW YORK,
January 19, 1917.

DR. N. L. BRITTON,
Director-in-Chief,
New York Botanical Garden,
Bronx Park, New York City.

My dear Dr. Britton: In confirmation of the offer made by me orally at the meeting of the Endowment Committee of the New York Botanical Garden held at my office on January 17th, I desire hereby to formally advise you that I have agreed to contribute the sum of $50,000.00 in aid of the work of further development of the Garden along lines outlined in the report of the Executive Committee as approved by the Board of Managers at its meeting held November 16th, 1916, and discussed at the recent meeting of the Endowment Committee; and to say further that you are authorized to call on me for the amount of my contribution, in whole or in part, at any time it may be required.

Sincerely yours,
(Signed)
DANIEL GUGGENHEIM

AMERICAN SMELTING & REFINING CO.
120 Broadway
Murry Guggenheim, NEW YORK,
Chairman Finance Committee. March 22, 1917.

DR. N. L. BRITTON,
Director-in-Chief,
New York Botanical Garden,
Bronx Park, New York City.

My dear Dr. Britton: Your valued favor of 20th inst. on behalf of the Board of Managers of the New York Botanical Garden thanking me for the subscription of $50,000.00 for the further development of the New York Botanical Garden which was discussed at the meeting of the Endowment Committee yesterday, and a decision reached to apply this contribution with that of my brother, Mr. Daniel Guggenheim, of the same amount, to the construction of greenhouses, including the central display greenhouse and the orchid greenhouse, as planned, has reached me and I take pleasure in expressing to you my thanks for the opportunity presented to me for using funds to such advantage.

When the occasion requires, kindly call on me for the amount of my subscription, and I will immediately forward you my check.

With kind regards I am

Sincerely yours,
(Signed) MURRY GUGGENHEIM

After a study of the site for these greenhouses with Mr. Brinley, it was decided that some preliminary work in earth and rock excavation would be desirable in order to remove all possible obstacles from the way of contractors, and at the same time obtain all stone necessary for foundations and for the driveway approach to the Central Display Greenhouse from the Bronx Boulevard. This decision was communicated to Mr. Daniel Guggenheim, who immediately sent his check for $1,000 to enable this preliminary work to proceed. Mr. Brinley is obtaining careful estimates of the actual cost by contract of these two greenhouses at the present time, and will also give us a memorandum of what the cost would be under more normal process for iron and glass. Our present estimate of about

$99,000 for the two structures may be modified more or less. The committee will determine, on receipt of Mr. Brinley's report, whether to proceed at once with construction or to wait for possible lower prices of materials.

A contribution of $2,000 has been made by Mrs. Robert E. Westcott, at the suggestion of President Thompson, for the construction of the new Rose Garden stone stairway. We have recently awarded the contract for this work to Joseph Havender of Woodlawn, expert in granite construction, for $1,950, and work was commenced by him on April 16, it is expected to be complete by June 1, and will supply an elegant and much-needed approach to the new plantations of roses.

A contribution of $4,000 has been made by Mrs. Frederic F. Thompson for the construction of the School Garden Shelter, to be located on the eastern bank of the Long Lake at the southern end of the new School Garden; the structure will be beautifully situated, affording a fine view of this wooded body of water; its basement will provide a tool-house for garden students. This gift was also made at the suggestion of Dr. Thompson.

As opportunity offers, the committee proposes to exhibit these studies to friends of the Garden and to enlist their aid in carrying out its program.

The committee has also considered, but not in detail, funds required for permanent endowment of the institution, with reference to the presentation of this subject to the Board of Managers by the Director-in-Chief, which was published in July, 1915. It is proposed to describe further these desired endowment items and to thus bring together the information which would enable patrons to determine to which of them they would be willing to contribute. Twelve different permanent funds are now held by the Corporation.

Respectfully submitted,

DANIEL GUGGENHEIM,
W. GILMAN THOMPSON,
JAMES A. SCRYMSER,
FREDERIC S. LEE,
N. L. BRITTON,
Endowment Committee.

[The Committee subsequently determined to construct the two greenhouses presented by the Messrs. Guggenheim as soon as plans and specifications can be prepared and contracts awarded. The Rose Garden stairway given by Mrs. Westcott was built in May, and a contract will soon be let for the School Garden shelter given by Mrs. Thompson. The gifts have all been paid in full, and plans have been approved by the Municipal Art Commission.]

GARDEN SOILS AND THEIR TREATMENT*

In garden making the labor is so much the most important item of expense that it is necessary to maintain garden soils at a much higher level of fertility than ordinary farm soils. The elements of success and failure in garden soils may be considered under the following heads:

1. Physical, which includes the amount of available water held for the plant, the amount of air space in the soil, size of the soil particles, and the temperature.

2. The chemical properties of the soil, which include the amount of available nitrogen, phosphorus, potassium, calcium, and a few other elements.

3. Bacteriological factors, which include the presence of injurious animal life and the proper relations of microörganisms.

The best garden soils are usually rather sandy in texture, because they can be more easily worked. Sandy soils are more responsive to fertilizers than heavier or clay soils, which, however, contain a larger store of natural fertility than garden soils. A good garden soil is usually rather porous, and contains in the neighborhood of fifty per cent. of pore space, which allows of rapid movement of water and air. Soils of this nature do not hold as much available water as clay soils and for that reason every effort must be made to increase the water-holding capacity, as it is only the water which is held on the surface of the ground in the form of a film which is available to plant roots. It is necessary to remove by drainage any surplus or free water which may occur. On most Long Island soils nature has provided

* Abstract of a lecture delivered at the New York Botanical Garden on May 19, 1917.

such excellent drainage that this is not important, but in other sections the first requisite to success is a series of tile drains, two and a half rods apart and forty inches deep. Proper drainage admits air to the lower levels of the soil and increases the depths of the roots, and insures the crop against drouth. In addition to this it enables the gardener to work his land immediately after a heavy rain and thus keep up with a growth of weeds, which thrive as well as cultivated plants under such favorable conditions.

Next to drainage, the most important factor in the control of soil moisture is the presence of large amounts of organic matter. Just as a sponge holds more water than a handful of gravel, so a soil well stored with humus holds more than any texture of soil which contains a less amount.

The intensive cultivation which a garden receives permits rapid decay of this organic matter, and for this reason a garden soil does not long remain in the best condition of fertility unless large applications are made of stable manure, or some such cover crop as crimson clover or winter vetch. As the garden is often is use from earliest spring until late in the fall, it is impractical to raise any large amount of green manure, and for this reason gardeners always depend upon very heavy applications of stable manure to maintain the proper amount of organic matter in the soil. The presence of this organic matter in the soil increases the absorption of heat, by making it dark in color, and raises the temperature several degrees. The oxidation of this organic matter also produces a considerable amount of heat, which has been estimated as the equivalent of burning a ton of coal per acre a season.

As the soil is a poor conductor of heat, this also raises the temperature of fertile soil above that of a less fertile one. The increase of even a very few degrees of the temperature on the soil is highly desirable in an early spring, when it is difficult to get seeds to sprout, or transplanted vegetables to grow properly. A thorough cultivation of garden soil, combined with a large amount of organic matter, is important in maintaining a large supply of air in the soil. This air is necessary for the proper

development of beneficial microörganisms, and in preventing the accumulations of organic acids in the soil, which is often the result of imperfect decay of vegetation.

The chemical factors of soil fertility are more readily controlled by the gardener than are the physical. If the plants are to make the largest and most economical growth this next year they should have more available plant food present than is used.

Since more than ninety-five per cent. of the plant is derived from the air and water, it would be a small-minded and stingy gardener who would deny the plants the very small amount of material which is derived from the soil.

The greatest factor in the rapid growth of leafy parts is an abundant supply of nitrogen in the form of nitrates. Nitrates may be purchased in the form of nitrate of soda, which is at the present worth nearly $100 per ton, because of the lack of transportation and the demands of the munition factories. It is, however, the most available form of plant food which we can use, and because it is so soluble must be applied in very small amounts at times when growth is going on.

Stable manure contains about twelve pounds per ton of nitrogen in a rather slowly available form. When manure is applied at the rate of twenty to thirty tons per acre each year, it will supply as much nitrogen as can possibly be used by the crops of vegetables. However, nitrate of soda may be used in small amounts to speed up the vegetables in a cold season, or to secure increased yields of those plants, of which, like cabbage and lettuce, the leaves or stems are the desired parts. When the seeds or fruits are used, it is necessary to have a considerable amount of phosphoric acid, and as this is deficient in stable manure, and is usually in small quantities in sandy garden soils, the stable manure should be reinforced by the addition of enough acid phosphate to make the annual application at least eight hundred pounds per acre. The presence of plenty of phosphoric acid in the soil insures the production of well-formed seeds and perfect fruits.

Ground bone is one of the most valuable sources of phosphoric acid, but is somewhat slowly available, and should be used only for those plants like asparagus or rhubarb, which remain several years in one piece of ground.

If the stable manure used has straw for bedding, it usually contains sufficient amount of potash for all garden purposes, but if it seems to contain shavings, it is always best to reinforce manure with at least two hundred pounds per acre of sulphate of potash, or four times that amount of kainit.

There is no question more disputed than the need of lime on garden soils. Except for the fact of increasing the scab disease of potatoes, and reducing the yield of watermelons and okra, it is generally conceded that lime is beneficial to nearly all of the ordinary garden crops. Beets, beans, and lettuce are all particularly affected in yield and quality by moderate applications of lime. Since heavy fertilization and thorough tillage always result in a heavy loss of lime by leaching away in the drainage water, and the decay of organic matter leaves a residue of organic acids, which are increased by the mineral acids of the fertilizers, at least half a ton per acre should be applied every second year. The effect of lime is as largely biological as it is chemical, and a fertile garden soil is an exceedingly lively place, swarming with untold millions of bacteria and other forms of microörganisms, some of which are injurious, others beneficial, and others of no importance to us. We do know, however, that the most fertile soils contain the largest numbers of bacteria, and we know enough of their facts to be sure that the production of nitrates, which are necessary to feed the plants, is entirely due to the activity of three separate groups of bacteria, which only thrive in soil neutral in its reaction. It is, moreover, certain that the bacteria which enable the leguminous plants to use the nitrogen of the air thrive best in the presence of lime. It is known that there are found in many soils, organic products which inhibit plant growth, even when present in minute amounts, and that these products are not found in soils which contain a proper proportion of lime.

With these primary factors of fertility in mind, it is easy to understand why the usual rotation of garden cultivation is followed, and the thorough tillage of the soil affects its physical properties by controlling the escape of water by evaporation, admits air into the soil to supply the plant roots, acts directly

upon the fertilizer ingredients, and permits the growth of the beneficial bacteria, which require air for their best development.

H. F. BUTTON.

CULTIVATING WILD FLOWERS

Most of our early spring wild flowers grow in the woods and prefer shady places, although some kinds will thrive and even grow larger in an open border if the soil is fairly moist and cool.

It should be kept in mind that wood plants require an acid soil of leaf mold or peat, and should be mulched with leaves. They do not like barnyard manure, lime, or fertilizer. Get leaf mold from the woods, mix it with earth shaken out of sods or from old fence corners. Wherever you want to set your plants dig out a hollow a foot or more in depth according to the size of the plant, and fill it with leaf mold; or a larger bed may be dug out to a depth of two or three feet and filled in with a mixture of leaf mold, peat, and some sand. At the same time start a compost heap for future use of sods and leaves—oak leaves are best—and muck from a swamp. In a year or two this will be in a good condition to use.

Instead of attempting to transplant flowers from the woods, it is safer and easier to buy them from a dealer, especially if you intend planting in masses. The nurserymen who specialize in native plants can furnish most of the kinds mentioned in this paper.

Our earliest spring flower is Liver-leaf, a hardy little friend which will thrive in an ordinary garden bed as well as in the shade, and if taken into the house in a flower pot in winter, can be forced for early blooming. It makes fine clumps, and after the delicate violet blossoms are gone the red-brown leaves are handsome all summer. At about the same time comes the bloodroot, with a single pure white flower and attractive leaves. This will grow in rich soil in either sun or shade. Dutchman's-breeches, a small relative of the bleeding-heart, is especially charming, with quaint white flowers and feathery foliage that soon disappears. It requires shade like the anemone, the most fragile of wild things.

Adder's-tongue lily has yellow bells and pretty spotted leaves, and spreads readily. This would do well in a lily bed. The bulbs must be planted deep, as every one who has tried to dig them up knows. Spring-beauty is a white flower, veined with pink, that makes a solid mat and is excellent to fill in with. The delicate sprays of mitrewort and the bellworts belong in the same woodland places along with foam-flower and the little smilacina. Wild ginger should be planted in some shady nook for the pleasure of finding its brown blossoms close to the ground in early spring. Rock saxifrage will grow anywhere, even in the crevices of rocks, and is one of the earliest of the spring flowers.

For trailing arbutus or mayflower, Mr. Edward Gillett's directions are: "Select a shady spot where there is perfect drainage, a dry sandy soil is preferable, cover the plants with about an inch of leaves or enough to keep the ground cool and moist, and let them remain for a whole season, as it takes that time to get the arbutus well established." One difficulty with arbutus is that it depends upon mycorrhiza or fungous growth on its roots requiring special soil conditions. This accounts for many failures. However, in the Department of Agriculture in Washington, Mr. Coville has succeeded in raising both arbutus and blueberries, which belong to the same family, in pots by adding phosphoric and other acid ingredients to the soil. They seem to like sour food, so keep barnyard manure away from your arbutus bed, and mulch with leaves.

Partridge-berry is a creeping evergreen vine with white blossoms and red berries that last all winter. Shin-leaf is often called wild lily-of-the-valley on account of its fragrance; princess'-pine has evergreen leaves and interesting white flowers, and rattlesnake plantain is a familiar orchid with mottled leaves.

In damp, rich soil under trees or shrubs there is a beautiful group of plants of medium height to use. Jack-in-the-pulpit, beloved of all children, wake robins, both our common kind with red-brown flowers and the white one called wood lily; ginseng, Solomon's seal and false Solomon's seal go in this company. The blue-berried cohosh loves the same kind of a place, though it will grow in the open too; also the baneberry and the snake-

root, called sheeptail from its spikes of white flowers. This last is seen at its best against a background of green on the edge of woods or shrubberies.

Those who are fortunate enough to have near their gardens a brook or grassy-edged pool might plant marsh marigold, commonly known as cowslip, though it isn't a cowslip at all. Its glistening yellow flowers make wet places gay in early spring. The pale pink cuckoo-flower will love the edge of the pool, and white hellebore, one of the most decorative of plants with its clasping leaves that look as though they had been ironed in plaits, also likes the wet places. It grows three or four feet tall and has a panicle of greenish flowers. In shallow water the pickerel-weed, with spikes of blue, may be grown, arrowhead with white flowers and arrow-shaped leaves, and golden-club. Near the edge, where the ground is wet, put grass-of-Parnassus, which lifts its white flowers well above the leaves in August. Plant jewel-weed under an overhanging bush, cardinal-flower where it can see its reflection in the stream, and with cat-tails and rushes in the background, honey-balls to bring butterflies, and the stately royal-fern dipping its fronds in the water your pool will be a joy all summer.

Our native orchids are a beautiful group of plants, some of them difficult to cultivate, but all worth trying. Of the woodland species requiring leaf mold and shade, the handsomest is the pink ladies' slipper, which grows wild under pine trees. Wherever you see it standing up and nodding its pink head, it gives you a thrill of delight. The yellow ladies' slipper or moccasin-flower is not less beautiful. A rhododendron bed would be an ideal situation for any of this group of orchids, as it is for lilies and for plants of the heath family. The lavender and white showy-orchis is found early in wet woods, and there are a number of others, all interesting though less conspicuous. In meadows and in sphagnum bogs we find calopogon with lovely mauve flowers on a slender stalk, and rose pogonia, shell pink, with the fragrance of violets. Other meadow orchids are the purple-fringed orchis, the green-fringed orchis, and the common white ladies-tresses. It is not worth while to transplant the

wild ground orchids, since many will die if you do, and all can be had from the dealers.

Quite different from running brook or wet meadow is a sphagnum bog, where the water stands and the Sphagnum is like a wet sponge under your feet. For those who have the right place and time for an experiment, a miniature bog garden is full of interest. Choose a low spot which you can conveniently flood when necessary, dig it out until you come to hard-pan, or if there is no hard-pan put in blue clay and pound it down. Make a cement edge to hold the water, but do not let it show. Put in some muck from a swamp to start with. Then go to a sphagnum bog and dig up the moss, digging deep to get earth below the roots, and bring the chunks home carefully and plant them. You will find all sorts of lovely things among the moss—wild cranberry, pitcher plants and ladies' slippers—and you can add others. The real bog should have sheep-laurel growing around it, and little tamarack trees and tall blue-berries. I do not know why such a bog should not favor mosquitoes, but as a matter of experience I have not found them troublesome in the wild sphagnum bogs that I know.

In midsummer the tall meadow-rue should be in our gardens. Its delicate sprays of white flowers sway in the winds with the meadow grasses, and I know of nothing else with quite its exquisite grace. Another splendid garden plant is the cow-parsnip. It is six feet high, has large flat clusters of white flowers and handsome great leaves, and is one of the most architectural of plants. It grows usually along the margins of streams, but takes kindly to any deep rich soil, as the swamp-mallow does. Along with meadow-rue, we find wild lilies, both the erect meadow-lily and the nodding one. These are easily grown and can be had of all dealers.

The cardinal-flower is deservedly a favorite and will grow in a garden border. Like many perennials it needs occasional transplanting to fresh soil, or starting afresh from seed. In handling this and other meadow flowers, remember that they probably increase by suckering from the roots. There is still a great deal to be learned about the needs of the wild flowers and

a certain flavor of adventure in attempting to cultivate them. Each species is likely to develop peculiarities of its own which are nowhere recorded.

For sun or shade, open ground or rocks, the wild columbine is always good. I saw it once where it had grown three or four feet tall, showing what favorable conditions would do for it.

Another attractive red and yellow flower, but difficult to transplant because it is parasitic on the roots of grasses, is the painted-cup. It should be cherished where it occurs. Blue flag also should be encouraged in the meadows for the lovely sheet of color it makes, though in gardens the cultivated kinds are better. Blue lobelia is a valuable garden plant. Mulleins have their uses and the little moth-mullein is charming. The large, fragrant thistle, and the beard-tongue cannot be passed by. Yellow meadow-parsnip, wild geranium or cranesbill, and alum-root are easily grown in the garden, and so is the little innocence or Quaker-lady.

The despised roadside weeds, bouncing-bet and butter-and-eggs are really garden outlaws, banished because they grow too rankly and crowd out better things, but they might well be used to fill in waste corners. A good group of summer plants for the edges of shrubberies includes the celandine poppy, pearly-everlasting, flowering-spurge, and live-forever. For covering banks there are two little creeping vines, money-penny or creeping Jenny with yellow flowers, and gill-over-the-ground, with purplish-blue ones. The latter planted under lilac bushes will grow in a thick mat and blossom at the same time as the lilacs.

In June and July our gardens are full of bloom, but with August comes a slack season in the perennial border, and it is just here that the wild flowers would be a help, for August is one of their most gorgeous months. In untouched swamps Joe-Pye weed makes wonderful masses of deep old rose, boneset supplies the white, iron-weed a dull purple, and the slender spikes of blue vervain the blue color, while the graceful wild sunflower furnishes the yellow. This sumptuous contrast of color lasts for a month and might well be transferred to deep moist soil in or near the garden. Along with the Joe-Pye weed and of the

same color is the swamp milkweed with its flat-topped cluster of flowers. It is easily grown and is a lovely bit of color. The butterfly-weed is also easily grown and is fine wherever its flaming orange does not clash with the milder things.

Purple asters are among the most valuable of our native plants for naturalizing. Coming as they do late in the season, in every shade from the dark purple of the New England aster to pale lilacs and whites, nothing could be better than masses of them wherever a space can be found. They grow with astonishing luxuriance in a good garden. I have seen them six feet tall and covered with blossoms. There are many varieties and all are beautiful.

Fringed gentian, the latest of the wild flowers, is an annual and can be raised from seed. The field and roadside plants, unlike the woodland flowers, thrive in an ordinary well-manured garden soil and improve with cultivation.

Of our wild vines, the best are, the wild grape, which has beautiful leaves and deliciously fragrant flowers. Clematis, or virgins'-bower is like *C. paniculata*, but comes earlier. Woodbine is always delightful for color in the autumn. Bittersweet has good foliage and orange and scarlet berries. Cat-brier is valuable for its green stems in winter but do not plant it where you expect to walk, its claws are long and sharp. The groundnut has chocolate colored blossoms with the fragrance of violets. Nightshade is a pretty slender vine with purple blossoms and red berries.

A different and delightful way of using wild flowers is to keep and improve the wild gardens that nature has made, and here I want to make a plea for preserving flowers in their native places. They have two foes, the children and their elders who ruthlessly pick and pull up all the flowers in sight, and the farmer who calls them all weeds without discrimination.

When I was a child our roadsides were blue with fringed gentian. Now you may travel miles without seeing one. People say "I left the roots!" But gentians are annuals and the roots are no more use than the roots of China asters after the flowers are gone. Even perennials like columbine need to be renewed

by seed. Our hillsides used to be pink with azaleas. Now there are hardly any in sight from the main roads. People break off the whole top each year until the poor plant is discouraged. There is still plenty of laurel, though you have to go to out-of-the-way or protected places to find full-sized bushes; but with the cutting of it summer and winter for decoration I fear the end is in sight. This is not an idle fear; already laurel is reft from the Pocono and Delaware Water Gap where once it covered mountain sides, trailing arbutus has almost disappeared from Lakewood and everywhere is the same reckless destruction of natural beauty. This has been a wonderful year for dogwood; consequently one meets motors so filled with the lovely white branches that the occupants are hardly visible. Not reasonable quantities which might be picked without harming the trees, but branches of five years' growth broken off, only to wilt in a few days.

Few gardens are more lovely than certain meadows; one in June is pink with calopogon and pogonia; others are full of lilies asking only to be let alone and mowed late—while we are toiling over lily beds somewhere else! The swamps, brilliant with late summer flowers, would be a triumph for any gardener.

I would suggest that where money is being spent on beautifying one part of an estate, a little might be diverted to preserve the beauty which already exists. Why not fence in any special attractive spot, and have a gate and seats? then it would be a part of the garden plan, no longer careless farming but well considered landscape gardening. Such little reservations would be a source of quite unexpected pleasure to your friends.

There are still wonderful thickets near the roads and many beautiful banks of ferns. I wish that more property owners would consider and protect such places. They add more than we perhaps quite realize to the charm of the country.

Delia W. Marble

HARDY WOODY PLANTS IN THE NEW YORK BOTANICAL GARDEN

(Continued)

Cryptomeria. JAPANESE CEDAR

Cryptomeria japonica. JAPANESE CEDAR.
Location: Pinetum, north end of Herbaceous Grounds Valley.
Natural distribution: Japan.

Cryptomeria japonica var. **Lobbi.** LOBB'S JAPANESE CEDAR.
Location: Pinetum, with the above.

Taxodium. BALD CYPRESS

Taxodium ascendens. POND CYPRESS.
Location: Pinetum, at culvert near South Gate.
Natural distribution: Southeastern United States.

Taxodium distichum. BALD CYPRESS.
Location: Pinetum, with the above.
Natural distribution: Southeastern United States.

CUPRESSINEAE. Cypress Tribe

Thuja. ARBOR VITAE

Thuja occidentalis. ARBOR VITAE.
Location: Pinetum, west end of area between driving roads, south of Conservatory Range 1. Beds north side of Conservatory Range 1.

Thuja occidentalis var. **alba.** WHITE ARBOR VITAE.
Location: Pinetum, with the above.

Thuja occidentalis var. **aureo-variegata.** GOLDEN-VARIEGATED ARBOR VITAE.
Location: Pinetum, with the above.

Thuja occidentalis var. **Columbia.** COLUMBIA ARBOR VITAE.
Location: Pinetum, with the above.

Thuja occidentalis var. **Douglasii pyramidalis.** DOUGLAS'S PYRAMIDAL ARBOR VITAE.
Location: Pinetum, with the above.

Thuja occidentalis var. **elegantissima.** CHOICE ARBOR VITAE.
Location: Pinetum, with the above.

Thuja occidentalis var. **Ellwangeriana.** ELLWANGER'S ARBOR VITAE.
Location: Pinetum, with the above.

Thuja occidentalis var. **fastigiata.** PYRAMIDAL ARBOR VITAE.
Location: Pinetum, with the above.

Thuja occidentalis var. **filiformis.** SLENDER ARBOR VITAE.
Location: Pinetum, with the above.

Thuja occidentalis var. **globosa.** ROUND ARBOR VITAE.
Location: Pinetum, with the above.

Thuja occidentalis var. **globosa nova.** NEW ROUND ARBOR VITAE.
Location: Pinetum, with the above.

Thuja occidentalis var. **globosa Spihlmanni.** SPIHLMANN'S ROUND ARBOR VITAE.
Location: Pinetum, with the above.

Thuja occidentalis var. **Little Gem.** LITTLE GEM ARBOR VITAE.
Location: Pinetum, with the above.

Thuja occidentalis var. **lutea.** YELLOW ARBOR VITAE.
Location: Pinetum, with the above.

Thuja occidentalis var. **nana.** DWARF ARBOR VITAE.
Location: Pinetum, with the above.

Thuja occidentalis var. **pendula.** WEEPING ARBOR VITAE.
Location: Pinetum, with the above.

Thuja occidentalis var. **plicata.** FOLDED ARBOR VITAE.
Location: Pinetum, with the above.

Thuja occidentalis var. **pumila.** LOW ARBOR VITAE.
Location: Pinetum, with the above.

Thuja occidentalis var. **Rosenthalii.** ROSENTHAL'S ARBOR VITAE.
Location: Pinetum, with the above.

Thuja occidentalis var. **sempervirens.** EVERGREEN ARBOR VITAE.
Location: Pinetum, with the above.

Thuja occidentalis var. **Spaethii.** SPAETH'S ARBOR VITAE.
Location: Pinetum, with the above.

Thuja occidentalis var. **spiralis.** TWISTED ARBOR VITAE.
Location: Pinetum, with the above.

Thuja occidentalis var. **Wareana** (*Thuja sibirica*). WARE'S ARBOR VITAE.

Location: Pinetum, with the above.

Thuja orientalis (*Biota orientalis*). CHINESE ARBOR VITAE.

Location: Pinetum, with the above.

Natural distribution: China and Japan.

Thuja orientalis var. **aurea.** GOLDEN CHINESE ARBOR VITAE.

Location: Pinetum, with the above.

Thuja orientalis var. **aurea nana.** DWARF GOLDEN CHINESE ARBOR VITAE.

Location: Pinetum, with the above.

Thuja orientalis var. **aurea pyramidalis.** PYRAMIDAL CHINESE ARBOR VITAE.

Location: Pinetum, with the above.

Thuja orientalis var. **filiformis.** WEEPING CHINESE ARBOR VITAE.

Location: Pinetum, with the above.

Thuja plicata var. **atrovirens.** DARK-GREEN CANOE CEDAR.

Location: Pinetum, with the above.

Natural distribution: Northwestern North American.

Thuja Standishii (*Thuja japonica*). JAPANESE ARBOR VITAE.

Location: Pinetum, with the above. Beds at Conservatory Range 1.

Natural distribution: Japan.

Chamaecyparis. WHITE CEDAR

Chamaecyparis Lawsoniana. PORT ORFORD CEDAR.

Location: Pinetum, at culvert near South Gate. Woodlawn Bridge.

Natural distribution: Oregon and California.

Chamaecyparis Lawsoniana var. **Alumii.** BLUE PYRAMIDAL PORT ORFORD CEDAR.

Pinetum, with the above. Beds at Conservatory Range 1.

Chamaecyparis nootkatensis. YELLOW CEDAR.

Location: Pinetum, with the above. Woodlawn Bridge. Beds at Conservatory Range 1. Iris Garden.

Natural distribution: Alaska to Oregon.

Chamaecyparis nootkatensis var. **glauca.** BLUE YELLOW CEDAR.
Location: Pinetum, with the above.

Chamaecyparis nootkatensis var. **pendula.** WEEPING YELLOW CEDAR.
Location: Pinetum, with the above.

Chamaecyparis obtusa. HINOKI CYPRESS.
Location: Pinetum, terrace and vicinity southwest of Conservatory Range I. Beds at Conservatory Range I.

Chamaecyparis obtusa var. **aurea.** GOLDEN HINOKI CYPRESS.
Location: Pinetum, with the above.

Chamaecyparis obtusa var. **aurea nova.** NEW GOLDEN HINOKI CYPRESS.
Location: Pinetum, with the above.

Chamaecyparis obtusa var. **aurea Youngii.** YOUNG'S GOLDEN HINOKI CYPRESS.
Location: Pinetum, with the above.

Chamaecyparis obtusa var. **compacta.** COMPACT HINOKI CYPRESS.
Location: Pinetum, with the above.

Chamaecyparis obtusa var. **filicoides.** FERN HINOKI CYPRESS.
Location: Pinetum, with the above.

Chamaecyparis obtusa var. **gracilis.** SLENDER HINOKI CYPRESS.
Location: Pinetum, with the above.

Chamaecyparis obtusa var. **lycopodioides.** LYCOPODIUM HINOKI CYPRESS.
Location: Pinetum, with the above.

Chamaecyparis obtusa var. **nana.** DWARF HINOKI CYPRESS.
Location: Pinetum, with the above.

Chamaecyparis obtusa var. **nana aurea.** GOLDEN DWARF HINOKI CYPRESS.
Location: Pinetum, with the above.

Chamaecyparis obtusa var. **nana filifera.** SLENDER DWARF HINOKI CYPRESS.
Location: Pinetum, with the above.

Chamaecyparis obtusa var. **pygmaea.** PIGMY HINOKI CYPRESS.
Location: Pinetum, with the above.

NOTES FROM THE HERBACEOUS COLLECTIONS. II

In the western side of the Herbaceous Grounds, under the trees, there has been since 1900 a very interesting plant, a member of the Boxwood Family, which is represented in this country only by this plant and the genus *Simmondsia* of California. Our plant is *Pachysandra procumbens*, of the southeastern United States. This is called the Allegheny Mountain spurge. It is perennial by a creeping rootstock and is at its best in late spring. It grows less than a foot high, forming a dull green carpet of ovate, wedge-shaped leaves, under which can be found the inconspicuous but interesting flowers. *Pachysandra* is monoecious. Both staminate and pistillate flowers occur on a slender spike, the latter at the base being few in number and quite unnoticeable. The former, subtended by purplish-green sepals, make up the main portion of the spike. The most striking floral parts are the thick white filaments and the reddish anthers.

The principal value of this plant seems to be as a semi-evergreen ground-cover, although it is less useful in this respect than its Japanese relative, *Pachysandra terminalis*. It is well adapted to the shady bank on which we grow it, and covers a plot of ground nearly five feet square.

With the alum-root and the shield-leaf saxifrage, which attract attention to the saxifrage family, we have the bronze leaf, bronzy five-finger or Yagurumaso of Japan. This is *Rodgersia podophylla*, a tall, robust perennial with feathery panicles of yellowish-white flowers. Here again the leaves are a conspicuous feature of the plant. Each one of these is raised on a strong petiole two or three feet above the ground, and has five wedge-shaped parts which are somewhat lobed. The leaves measure often as much as six inches across, and are colored with a metallic bronze hue, which gives them a striking appearance in a strong light.

Rodgersia podophylla formed the basis of the genus *Rodgersia*, named by Asa Gray in honor of Captain Rodgers of the United States Navy, one of the commanders of the North Pacific Explor-

ing Expedition in 1853–1856. Captain Rodgers was one of the discoverers of this plant, found in the sub-alpine regions of Japan.

The bronze leaf has flourished in the Herbaceous Grounds since 1901, is quite hardy, and is adapted to its open location or to a deep border, where its great leaf spread can be used with good effect.

Among the plants of the potato family, with its poisons and medicines, its foods and narcotics, we also have some of decorative value. One of these is *Nicotiana sylvestris*, from Argentina. Growing four to five feet high, with an abundance of pure white flowers, it is very showy against the summer green of its surroundings, and possesses a pleasing evening fragrance. The tall, strong stems bear large clasping leaves of a pleasing green, and large panicles of flowers at their summits. The corollas are white, tubular, the tubes being nearly four inches long and swollen near the five-lobed limb. This plant behaves here as an annual, blooming in August. It makes a good subject for the back of the herbaceous border.

The Martyniaceae or Unicorn-plant family has been represented in our collections by *Martynia louisiana*, the fruit of which is used for pickling. In the summer of 1916, there bloomed another species, *Martynia fragrans*, native of the southwestern United States and northern Mexico. This is an annual, one to three feet high, with spreading branches, large, rounded, cordate, lobed leaves and red-purple flowers with yellow, brown-spotted throats. All parts are glandular-hairy and viscid. The flowers are about one inch across, have inflated five-lobed calyces, and corollas with short tubes and four-lobed limbs, the upper lobe bifid, the lower rounded, and the other two smaller and rounded. The flowers are borne in profusion, and are delightfully fragrant. The fruits are rough, crested capsules with two long hooks on the end, which we have found very useful in prying open the capsule to get the seeds. These hooks have given the common name, Unicorn Plant.

A perennial "weed" which exceeded expectations in our collections during the past season was the Wall Rocket, *Diplotaxis*

tenuifolia. This is a robust spreading herb with pinnatifid, somewhat glaucous leaves, and terminal racemes of large, sulphur-yellow flowers, these developing into long slender-pedicled pods filled with an abundance of orange-colored seeds. The Wall Rocket is a native of Europe, the *Sisymbrium tenuifolium* of older botanies. It is said to grow on the walls of many of the older English towns. Contrary to the literature written about it, the flowers of our plant seem to have a rather pleasing fragrance. It is found in this country on the Eastern Coast and in California, everywhere as an adventive. It is easily propagated by seed, requires little care, and should be in every old-fashioned garden.

With the usually climbing or twining morning-glories in our herbaceous collections we have two which are of bushy habit. These are *Ipomoea leptophylla* and *Convolvulus tricolor*. The latter, a native of southern Europe, is one of the most attractive annual flowers of the summer. Its leaves are oblong, green, and hairy. The flowers, borne on long slender peduncles, have corollas which are azure-blue on the outer edge, pale yellow to white within, and bright yellow in the center. They do not seem to close up with the slightest provocation, as do many of the family. The spreading bushy habit, the brightness of the many flowers, and the ease of its cultivation each year from seed, make it a very attractive plant. It is the *Convolvulus minor* of gardens and there are several varieties of it.

One of the newer perennials in cultivation is *Anchusa myosotidiflora*, a native of Siberia and The Caucasus. Not so robust as the tall garden alkanets, its flowers are smaller and quite like those of the forget-me-not. The simple, erect stems are ten to twelve inches high, bearing sessile, ovate leaves, and terminal racemes of small, light-blue flowers. This plant bloomed freely in the Herbaceous Grounds during April and May of last year, and appears to be adapted to and useful in the hardy border.

KENNETH R. BOYNTON.

SPRING INSPECTION OF GROUNDS, BUILDINGS AND COLLECTIONS

Members of the Garden and their friends assembled at the Botanical Garden Station Plaza on Thursday, May 3, at three o'clock for the Spring Inspection. About four hundred persons, in one hundred motor-cars, formed the procession, which visited in order the Main Conservatory Range and the Flower Gardens adjoining; Conservatory Range 2; the Collection of Japanese Cherries; the new Rose Garden; the Convention Garden; and the Museum Building.

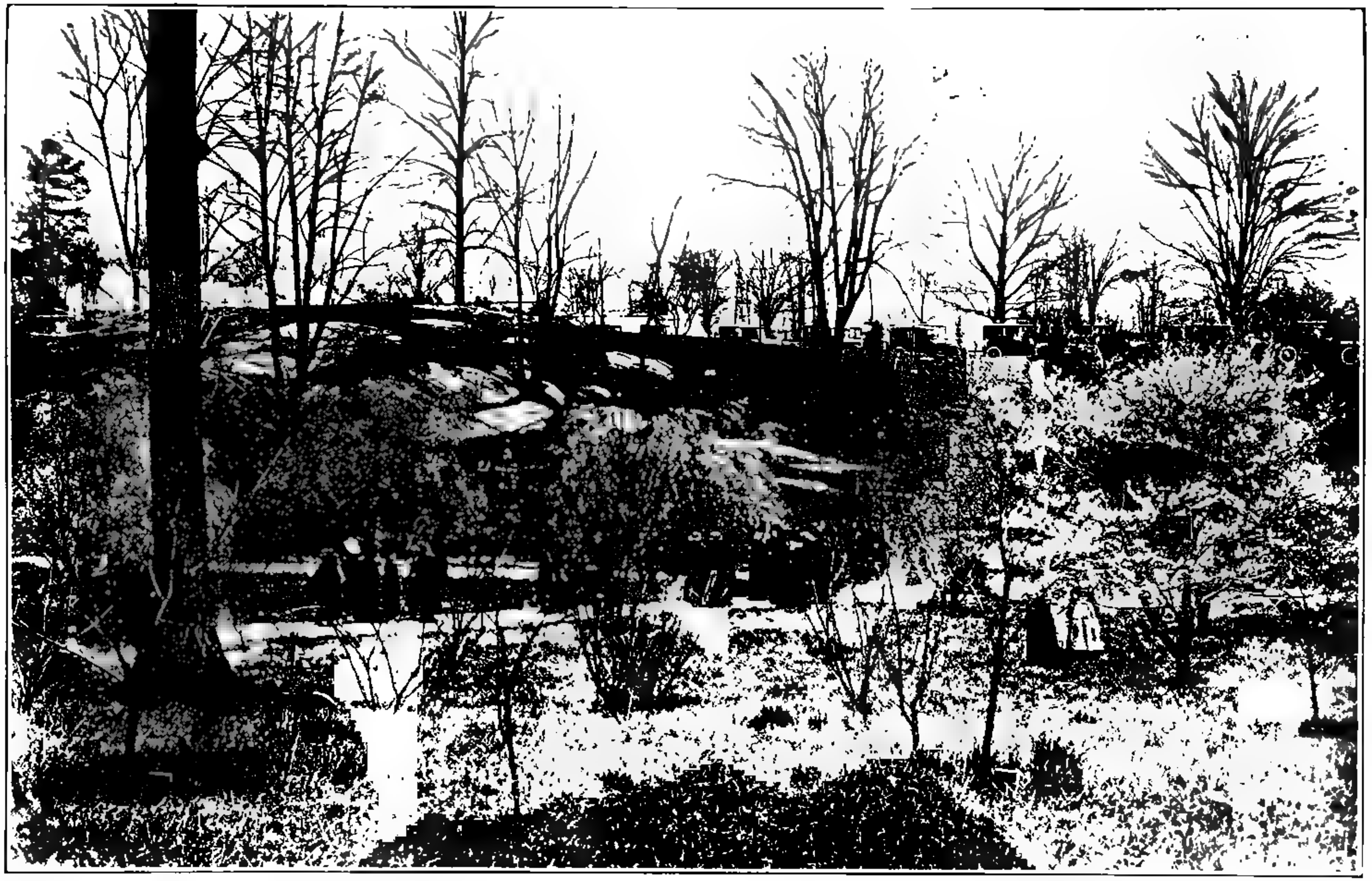
Much interest was shown in the exhibition of paintings of new buildings and other structures planned for the further development of the Garden, including the Central Display Greenhouse and the Orchid Greenhouse given by Messrs. Daniel Guggenheim and Murry Guggenheim, and the Rose Garden Stairway given by Mrs. Robert E. Westcott.

Tea was served on the second floor of the museum building at five o'clock; after which the museums, laboratories, library, and herbarium were inspected.

GARDEN CLUB DAY

Under the auspices of The Garden Club of America, a Field Day for member clubs was held at the New York Botanical Garden on May 10. Through the courtesy of the officials of the Club and of the Botanical Garden, the invitation was made to include members of local garden clubs not yet federated with the national organization. About fifty garden enthusiasts were in attendance and many expressions of interest in the work of the Botanical Garden were heard. Various members of the Garden staff were present to answer questions and to demonstrate objects and operations of special interest.

Motor-cars met the party at the railway station, and the main conservatory and the adjacent flower gardens were first visited. Stops were made near the Long Bridge and at the Japanese



Inspecting the Japanese Cherry Collection

Cherry Collection. After luncheon at the Mansion, Mr. Henry G. Parsons, Supervisor of Gardening Instruction, gave an interesting account of the work of the new Garden School, recently established here in coöperation with the International Children's School Farm League. Visits were then made to the new Rose Garden and to the Convention Garden for the Society of American Florists and Ornamental Horticulturists.

Officials of the Garden Club of America who were present included Mrs. J. Willis Martin, of Philadelphia, President; Mrs. Archibald D. Russell, of Princeton, Vice-President; and Mrs. Bayard Henry, of Philadelphia, Secretary. Among the clubs represented were the North Country Garden Club of Long Island, the East Hampton Garden Club, the Shedowa (Garden City) Garden Club, the Garden Club of Flushing, the Staten Island Garden Club, the Garden Club of Pleasantville, the Bedford Garden Club, the Ulster Garden Club, the Garden Club of Lenox, the Garden Club of Princeton, the Rumson Garden Club, the Philadelphia Garden Club, and the Warrenton Garden Club (Virginia).

SUMMER LECTURES, 1917

July 7. "Wild Flowers of Summer," by Dr. N. L. Britton.

July 14. "Plants Grown by the American Indians," by Dr. A. B. Stout. (Exhibition of Flowers, July 14 and 15.)

July 21. "Flowers for the Summer Garden," by Mr. G. V. Nash.

July 28. "How the Introduction of Foreign Plant Diseases is Prevented," by Mr. H. B. Shaw.

August 4. "Floral and Scenic Features of Cuba," by Dr. M. A. Howe.

August 11. "Books on Gardening," by Dr. J. H. Barnhart.

August 18. "Trees and Flowers of the Yellowstone National Park," by Dr. P. A. Rydberg.

August 25. "Insect Enemies of Plants," by Dr. F. J. Seaver. (Exhibition of Gladioli, August 23–26.)

The lectures, which occupy an hour, will be illustrated by lantern slides and otherwise. Doors closed at 4:00; late comers admitted at 4:15.

The Museum Building is reached by the Harlem Division of the New York Central and Hudson River Railroad to Botanical Garden Station, by trolley cars to Bedford Park, or by the Third Avenue Elevated Railway to Botanical Garden, Bronx Park. Visitors coming by the Subway change to the Elevated Railway at 149th Street and Third Avenue. Those coming by the New York, Westchester and Boston Railway change at 180th Street for crosstown trolley, transferring north at Third Avenue.

NOTES, NEWS AND COMMENT

The American Association of Museums held its twelfth annual meeting in New York City during the week beginning Monday, May 21. On Friday, the 25th, twenty-five representatives of the Association visited the Botanical Garden, giving special attention to the Museum and the Conservatories. They were afterwards guests of Dr. Britton, Director-in-chief, at a luncheon served at Sormani's Restaurant on Pelham Parkway. The American Association of Museums held its first meeting in New York City, May 15 and 16, 1906, the meeting of the second day, at which its preliminary constitution was adopted and at which the first group photograph of its members was made, being held at the Museum of the New York Botanical Garden.

The New York Library Club, having a membership of over 800, held its annual meeting at the Garden on May 10. After a short business meeting and a most interesting illustrated lecture on mountaineering by Le Roy Jeffers, refreshments were served and a tour made of the grounds under the guidance of members of the Garden staff.

Edward W. Berry, formerly a student in paleobotany at the Garden, has been recently advanced to the rank of professor of paleontology in the Johns Hopkins University.

Professor W. T. Horne, of the State University of California, is spending several weeks at the Garden carrying on investiga-

tions on the cytology and morphology of *Armillaria*, one of the fleshy fungi.

Dr. Lon A. Hawkins, of the United States Department of Agriculture, was a recent visitor at the Garden.

Beginning with the dwarf irises on May 15, the new Iris Garden has been a mass of bloom, showing the newer intermediate bearded varieties, the May-flowering German sorts, and the mid-season kinds in order, with the Japanese varieties still to come. A dwarf species from Japan, *Iris gracilipes*, makes a flat mass of color, with attractive foliage and delicate blue, lavender and yellowish flowers. A happy combination of the Darwin tulip Erguste and irises in large clumps on the Southern Boulevard side of the garden attracted much attention during the latter part of May and the first two weeks of June.

Meteorology for May.—The total precipitation for the month was 2.73 inches. The maximum temperatures recorded for each week were 62° on the 2d, 66° on the 11th, *87° on the 20th*, and 78° on the 26th. The minimum temperatures were *32.5° on the 4th*, 39° on the 9th, and 41° on the 16th and the 24th. The month was one of unusually low temperature, and many cloudy damp days: there were but seven days during the month that could be called "mostly clear."

ACCESSIONS

MUSEUMS AND HERBARIUM

2 trunks of western Arbor-vitae from Long Island, New York. (Given by Mr. Madison Grant.)

1 specimen of *Northoscordum fragrans* from Charleston, South Carolina. (By exchange with the Herbarium of Harvard University.)

25 specimens of *Tithymalopsis* from the eastern United States. (Distributed by Professor J. B. S. Norton.)

54 specimens of grasses from the herbarium of W. Boott. (By exchange with the Herbarium of Harvard University.)

1 specimen of seeds of *Hevea brasiliensis* from Ceylon. (Given by Mr. Richard Weil.)

213 specimens of fungi from Porto Rico. (Collected by Professor F. L. Stevens.)

100 North American Uredinales, century 17. (Distributed by Mr. Elam Bartholomew.)

3 lantern-slides. (Given by Mrs. N. L. Britton.)

167 specimens of flowering plants from the vicinity of San Diego, California. (By exchange with the Herbarium of Harvard University.)

PLANTS AND SEEDS

11 plants for conservatories. (By exchange with Bureau of Plant Industry, U. S. Department of Agriculture.)

6 plants of calla lily. (Given by Mr. F. R. Newbold.)

1 plant for conservatories. (Given by Miss Rosa Prainams.)

6 plants for nurseries. (By exchange with Bureau of Plant Industry, U. S. Department of Agriculture.)

1 plant of *Mamillaria pusilla*. (By exchange with U. S. National Museum, through Dr. J. N. Rose.)

6 plants for herbaceous grounds. (Collected in vicinity.)

28 plants, all cacti, for conservatories. (By exchange with U. S. National Museum, through Dr. J. N. Rose.)

56 plants derived from seed from various sources.

1 packet of seeds. (By exchange with Mr. H. M. Curran.)

34 packets of seeds. (By exchange with Botanic Garden at Upsala, Sweden.)

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OF

The New York Botanical Garden

EDITOR

KENNETH ROWLAND BOYNTON

Head Gardener's Assistant

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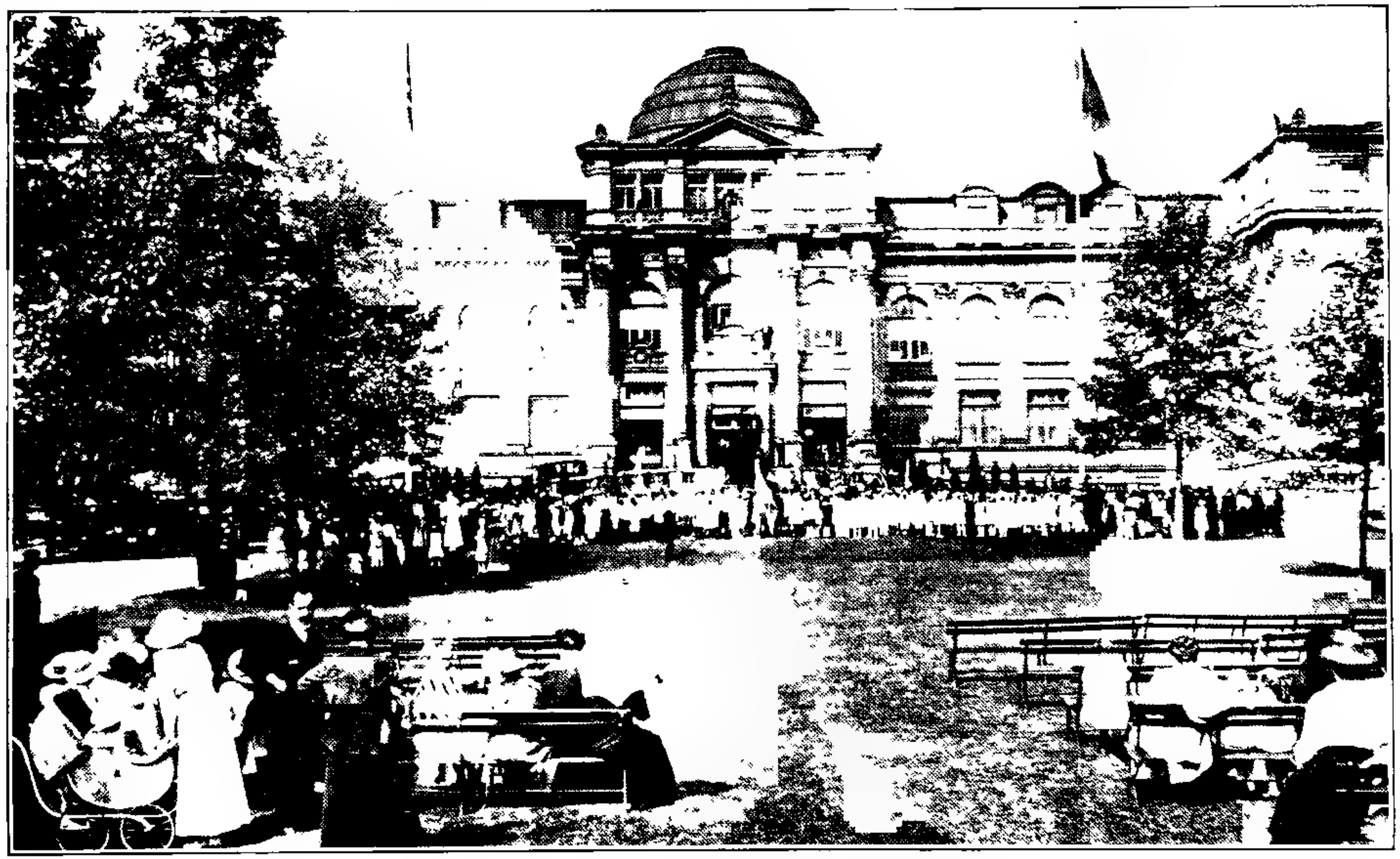

Steel Flag Poles Presented by Mr Edward D Adams

JOURNAL

OF

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VOL. XVIII July, 1917 No. 211

STEEL FLAG POLES PRESENTED BY MR. EDWARD D. ADAMS

WITH PLATE 201

The Garden has recently been favored by the gift of three steel flag poles by Mr. Edward D. Adams, a member of the Board of Managers, two placed in front of the museum building and one on the lawn at the mansion. New flags were raised on these poles on the afternoon of June 16, 1917, in the presence of members of the Garden and other citizens; they were received for the Garden by Hon. George McAneny, a member of the Board of Managers, and for the city by Hon. Douglas Mathewson, President of the Borough of The Bronx.

Several hundred school children from Public School No. 56, in charge of Mr. Robert S. Stantial, Principal, participated in the exercises, together with three troops of Boy Scouts and their band, in charge of Mr. D'Antonio, Scout Executive.

The ceremony commenced at quarter past three o'clock, at the museum building; the Boy Scouts raised the federal flag on the western of the two poles and Mr. McAneny delivered an address, followed by raising the city flag on the eastern pole and the reading by Hon. Victor Hugo Paltsits of Professor John Erskine's poem "The City Flag"; school children then danced upon the front lawn, including a rainbow dance and a sword dance, which were very attractive.

At four o'clock, a procession was formed for a march to the mansion, by way of the hemlock forest, the boulder bridge and

[JOURNAL for June, 1917 (18): 121–148) was issued July 18, 1917.]

south through the river valley, headed by a Garden banner, followed by the Boy Scouts, school children and adults.

Reaching the mansion at 4:15, the scouts raised the federal flag on the pole there, Mr. Paltsits read Joseph Rodman Drake's poem "The American Flag," and Mr. Mathewson delivered an address.

Mr. Mathewson spoke along lines designed to impress the thought of responsibility going with privilege. "My country" he stated was something that grew upon one. When the child was presented by its mother with a flag and was told that that was the flag of his country, the child would not have much appreciation of what "my country" meant; when the boy was taken to his first Fourth of July celebration and enjoyed the day and its pleasures, and was told that it was his country's birthday, and this for the first time, he could not well appreciate what "my country" meant, although undoubtedly he would be glad that his country had a birthday that was so pleasantly situated.

Then the speaker told how as one's learning increased and his vision broadened, "my country" meant more and more. It spelled the history of those who for broader opportunities and greater freedom had endured the discomfort, the suffering, the hardship incident to its settlement. It brought to his mind the statesmanship and the courage of the men who were willing to pledge their lives, their fortunes and their sacred honor, that the American states might be free and independent. It spelled the heroism of the men and women who had traveled out to the frontiers and built up the new empire. It spelled the bravery and the courage of the men who had suffered and died, and of the women who had suffered and borne hardship that this Union might live, and that human freedom within its confines might be broader and broader.

As one's horizon widened, "my country" meant to him the land that had never fought a war of conquest or for the purpose of levying tribute, but whose every effort, whose every exercise of might was for the advancement of the human race and for broader freedom and for broader opportunity.

Then the speaker passed to individual responsibility. Govern-

ment, he said, was something not to be lived on and to be drawn from, but something to be lived under and to be supported. Each must do his share. There was some place everywhere for everyone, big and little, to "do his bit." All could help in making government better and making it more stable in this time of stress, when everyone owed it as an American to do his part to make democracy safe for the world, and to make American institutions more permanent, more fixed and more influential.

Incidentally he reminded his younger hearers that as this was "my country," it was also "my city" and "my parks." He reminded them that they were, as young citizens, part owners; that those in charge depended upon them for help in keeping the place beautiful, and in seeing that there was no destruction of plants and trees and shrubs.

And in closing, he reminded all that the flag and what it stood for and what it was going to mean for future generations, depended in part upon individual effort.

Ice cream in cones for the scouts and school children was the next event, after which Dr. Britton outlined to the scouts, at their request, how they could aid in preserving the beauty of the public parks. The procession was then again formed, marching by way of the gorge bridge and hemlock forest to the Mosholu Parkway entrance. The weather was perfect, and the occasion was enjoyed by all participating.

VACANT LOT GARDENS*

Early this spring when reports from his field agents and statisticians poured in on Secretary Houston he was convinced that a menace threatened the country. All indications pointed to a failure of crops and the consequent failure of a nation to feed its people. For instance, the severe cold in January and February destroyed much of the early vegetable crop in the southern states; the winter wheat crop is expected to be fifty-two million bushels

* Abstract of lecture delivered at the New York Botanical Garden on June 2, 1917.

less than that of 1916, two hundred and forty-three million bushels less than the crop of 1915. Though there had been no war there would have been serious shortages in many crops due to unfavorable climatic conditions.

But these natural shortages have been tremendously increased by the withdrawal from productive work of millions of men for the armies and munition plants of Europe. Thus the entire world is face to face with a very definite crisis. The world's food supply is lower than it has been in decades.

Add that the nation has entered the war and has thereby assumed new responsibilities. It is morally bound to give to its Allies in Europe the help they need, and it begins to be apparent that what they need most now is food.

The situation seems to demand an impossible achievement—the securing of greatly increased crops notwithstanding a steadily decreasing supply of farm labor. Meantime the season advances, and with its advance goes the opportunity for crop production. Nature waits for no man.

In view of these conditions men turned naturally to two great economic factors which have been invested with new importance —unemployed land and unproducing time—that is, they turned to gardening. Just now it is more than a subject to write essays about; it is a thing to toil about. For the unprecedented demand from warring Europe has so accentuated the situation that it bears heavily on every family, in the shape of abnormally high prices for all food products. Unless we have a superabundant food supply the prices will continue soaring.

When these facts were but dimly realized the country was electrified by President Wilson's proclamation of April 16th with its appeal to the soldiers of the commissariat, the "Army of the Furrows."

"We must supply abundant food not only for ourselves, for our armies and our seamen, but also for a large part of the nations with whom we have now made common cause, and in whose support and by whose sides we shall be fighting. "The world's food reserves are low. Not only during the present emergency, but for some time after peace shall have come both our own people

and a large proportion of the people of Europe must rely upon the harvests in America. "Let me suggest, also, that every one who creates or cultivates a garden helps, and helps greatly, to solve the problem of the feeding of the nations."

The leaders turned to home gardens for an augmented food supply. The government stimulated farm production, the Emergency Food Garden Commission directed its attention to city production. As a result home gardens, small, inexpensive, but in the aggregate abundantly productive, are flourishing to-day in every city, town and village in the United States. There never were so many of them. Men and women, old and young, boys and girls, students and workers, are toiling in the army of "Universal Service." Hoes and rakes, spades and sprays, hold equal honor with rifle and sword. Corporate wealth, great industries, eminent statesmen, scholars and scientists make up the army of food producers. States and cities, legislatures and city councils, governors and mayors, have responded to the home garden call. In truth, the soil of the nation is being put to the greatest test in history—the slogan is, "A million or more Food Gardens." If the whole country responds in proportion as Newark has, we will have two and a half million food gardens.

For two months the nation-wide campaign for thus planting back yards and vacant lots has been in full swing. In that period war between the United States and Germany has been declared, the country's resources mobilized, industrial and commercial conditions revolutionized and, through presidential proclamation and gubernatorial plea, the people have been urged to aid this country escape a food crisis such as has afflicted the war-rent nations of Europe. And it gives a thrill to note how the people have responded.

Vacant Lot Gardens were first thought of in times somewhat like those of to-day, when the cost of living was high and the question of food was vitally important. In the great "panic" of 1893–94, the deplorable condition of the unemployed and their families demanded the most thoughtful consideration of philanthropists. Ordinary methods of relief were not adequate to meet this extraordinary crisis.

Many schemes were suggested, the happiest and most fruitful in good results being that of the then Mayor of Detroit, the Hon. Hazen S. Pingree. It became known as "Pingree's Potato Patch Scheme." His plan, in brief, was to lend unemployed land to unemployed men to cultivate, giving all the land they could till and all the vegetables they could produce. The suggestion was novel, many thought it visionary; but being put to the test, it resulted in many pleasant surprises. Land-owners were quick to lend their vacant lots, and the needy were no less quick to enter on their cultivation. Out of a thousand families then receiving aid from the city and from charitable organizations, more than nine hundred availed themselves of this means of self-help. The municipal committee in charge expended $3,600 on seed, implements and other necessities. A conservative estimate placed the value of the first season's produce, which consisted chiefly of potatoes, at $15,000. This unexpected result clearly demonstrated the value of the plan. In his annual message to the City Council, in January, 1895, the Mayor thus referred to it:

"It seems to me that the experiment has demonstrated,—*first*, that at least ninety-five per cent. of the people who are in destitute circumstances as a result of the hard times are ready, willing, and anxious to work; *second*, that a large number of these people can be supported by utilizing vacant lands on the outskirts of the city; *third*, that a very small space of ground is sufficient to raise enough vegetables to support a family through the winter; *fourth*, that a majority of our citizens who own vacant land would much rather allow it to be cultivated by the poor than to pay a large tax for their support; and, *fifth*, that the needy are, therefore, assisted without creating the demoralization in the habits of the people that gratuitous aid always entails."

The following year results were even more gratifying, and other cities took up the plan. The return of general prosperity, however, soon lessened the need and the interest, and also the number of workers; in many places the work ceased to be vigorously prosecuted while in others it was abandoned.

In 1897 Philadelphia took up this work. They have continued

it for twenty years. According to last year's report, the total cost to the association was $5,000; the number of persons affected, 3,581; and the value of the produce, $50,000. Acreage increased from 27 in 1897 to 196 in 1916; the number of gardens from 100 to 756; the total product from $6,000 to $50,000. These results excited interest at home and abroad. In 1899, a director of the association gave a lecture in Paris on this subject. A benevolent French woman became impressed. She procured some vacant land and said, to those who applied to her for aid, "Here is a chance to work; what you produce shall be your own." Many availed themselves of the privilege and prospered beyond their highest expectations. The idea was widely adopted; even the railroad companies of France recognized its value by granting to their employees the use of vacant strips of land here and there. An earnest effort was also made by Mr. Powell (the then Superintendent of the Philadelphia Society) to have the plan adopted by the railroads in this country. He succeeded in having it introduced on a comparatively large scale by the Pennsylvania Railroad.

Many and interesting are the stories told by Mr. Powell of results—of health restored, of independence gained, of heroic struggles to help others, of drunkards redeemed, of a slow but steady movement toward the larger freedom of country life, of a growing discontent with unlovely surroundings, and of a wise impulse to follow that which is truest and best; all of them enforcing the truth that getting a thing is infinitely more gratifying than having it.

A new and interesting extension of the work was its introduction into the public schools, where it has been a prominent success from the start. Already the day of experiment is past,—nature study and gardening are becoming important factors in educational circles. Boys and girls are becoming more and more interested in this attractive work, which takes them out of themselves, out-of-doors, and into closer and more sympathetic relations with one another. The purpose, primarily, is to teach children how to grow flowers and vegetables by having them do the actual work, so that they may have such practical knowledge

of farming as to be able to make a living from it should the need and opportunity come. As D. L. Moody used to say, "You can depend on your elbow if your head gives out." (In addition, the youngsters get instruction and exercise which help them morally, mentally, and physically. Each child is given its own garden—about nine by twelve feet—on condition that the holder must work faithfully and not trespass on others. It is inspiring to see these little ones cultivating the ground that it may bring forth a beautiful flower or a useful vegetable and, above all, to realize that they are privileged to breathe fresh air and spend long hours in the glorious and health-giving sunshine.) The hope is indulged that this cultivation of the soil by the children will instill into their hearts such a love of outdoor life that many will turn their feet countryward and seek a living upon farms rather than remain in the city trying for employment in the already overcrowded offices, shops, and factories.

Vacant lot cultivation in Newark is two years old. The first year one hundred and seventy-five lots were cultivated, last year three hundred and twenty-five lots were used. This year over two thousand lots are already under cultivation.

We have community gardens, where certain neighborhoods of the city may take possession of a tract of two or three acres in the outlying districts and take care of these as a community, giving each cultivator a plot of thirty by sixty, or thereabouts.

We have school gardens and home gardens planted by school children. This has attained astonishing proportions. A boy could procure in the basement of his school building two pounds of lime at two cents, two pounds of fertilizer at four cents, ten packages of seeds at two cents each, total twenty-six cents, which gave him a perfect equipment for a garden of eight by ten feet. If he had the ambition or the strength to start a garden eight by ten, or any other multiple of that original unit, he could procure the material and had everything to go ahead with, including a Garden Primer that was furnished, and supervision by the school authorities. Eighty-four thousand packages of vegetable and flower seeds were disposed of in this manner, twelve tons of fertilizer, eight tons of lime. At present we are unable to report the

exact number of these home gardens thus started, but a conservative estimate would be from six to eight thousand. Thirty-two schools report twenty-seven hundred gardens over two hundred square feet. This is entirely apart from the School gardens, where, of course, an intelligent interest in all growing things is awakening under the excellent supervision of the school authorities.

Then there are the corporate gardens—a tract of one hundred acres in South Orange, cultivated by clerks of the Prudential Insurance Company in the Company's time. The Company finances the plowing and the seed and secures expert supervision for the work. The crop will be sold at cost to the cultivators.

The Weston Electrical Instrument Company plowed fifteen acres and allotted them to its workmen; the Feigenspan Brewery has also put land at the disposal of its employees.

The newest development of this growing movement is shown in New York City and in the New York Botanical Gardens (under whose auspices we are met at this time). I speak of the educational garden at Union Square and the School of Gardening newly established at the New York Botanical Garden and presided over by Mr. H. G. Parsons.

In Newark we proceed in this manner. We have an office in a business building in the center of the city. We have a strong committee appointed by the Mayor. The personnel of this Committee assured the financial support. We have the endorsement and the publicity of the local papers. We have the cooperation of the schools, the Library, the City Plan Commission, the Shade Tree Commission. We advertise in the papers for those who wish to donate the use of land and for those who wish to take up lots.

The lots are inspected and classified roughly into good, fair and bad. The nearest promising plot is assigned to the applicant. As soon as possible it is cleared for plowing. We had six to eight teams plowing for two months. The Association provides seed and fertilizer where necessary. We encourage the applicant to pay for the plowing at $1.00 per lot. Also we instruct beginners.

When the sceptics tried to discourage our efforts this year, we

had our record of the last two years to refute them. On twenty acres planted in Newark last year $10,600 worth of vegetables (values of October, 1916) were raised. At this year's prices those same vegetables would bring $15,000. If the 2000 lots already planted this year are as productive at last year's average, the crop will be worth $100,000. The other gardens will easily double this amount.

Had all the gardeners last year been as successful as the man who won the $50 prize (he raised $60 worth of vegetables on one-seventeenth of an acre) the total would have shown a crop of $1,020 an acre. Note please this was his first year in gardening, and that the time devoted to this work would otherwise have been for the most part wasted.

Take other statistics: The average crop per acre was 8,117 pounds. It takes 100 pounds of vegetables per annum to supply the average person. Therefore, one acre would supply eighty-one persons. Now 81 times 550 (the acreage which could easily be made productive) is 44,550 or one-eighth of Newark's population.

Will you bear with me in one more speculation? There are 8000 acres available in Essex County. Allowing this time 150 pounds of vegetables per average person per annum there is enough vacant land in Essex County to supply the city of Newark, Irvington and East Orange with all their vegetables. This is an astonishing discovery. Enough unused soil in one county—an industrial county—to supply all the vegetables of the metropolis of the State!

The average cramped back yard in a large city, hardly big enough to "hang out" the family washing in, is worth as much to its owner as a $1,000 Liberty Bond, while the larger areas surrounding houses in small communities are worth two or three such bonds. The back yards and vacant lots of the country, if capitalized, ought to yield something like one billion dollars a year—more than the giant wheat crop of 1915 at its high prices brought to the farmers—a pretty addition to the wealth of the people. And don't forget the fun and benefits to health the owners would get out of tilling their own back yards.

Translated into terms of cabbage and potatoes and carrots,

the back yard means the groaning dinner table dear to the hearts of our grandmothers; into terms of domestic economy, lower grocery bills. It means better health, and clearer and in some cases cleaner minds. To the nation's business it means increased production, better satisfied, more stable and more efficient workmen, a nearer approach to national self-sufficiency. Listen to the total raised on twenty acres last year in Newark, a total carefully compiled from the crop reports.

SHOWING AMOUNT OF VEGETABLES RAISED IN 325 LOTS IN 1916.

	Quantity.	Pounds.	Market Value March, 1917.
Potatoes	650 bus.	39,000	$ 3,224 00
Tomatoes	2,353 pks.	32,353	5,394.25
Corn	1,850 doz.	20,720	452.50
Peas	325 pks.	4,875	243.75
Lima beans	650 qts.	1,215	165.00
String beans	3,250 pks.	48,720	4,875.00
Wax beans	650 pks.	9,720	975.00
Onions	541 pks.	7,695	865.00
Lettuce	9,750 heads	2,437	1,462.00
Cabbage	7,500 heads	7,500	1,125.00
Beets	8,125 bunches	8,125	243.75
Radishes	7,500 bunches	1,875	450.00
Carrots	487 pks.	6,074	584.40
Cauliflower	2,275 heads	1,137	523.25
Cucumbers	9,100	3,033	545.95
Celery	6,500 bun.	3,750	1,040.00
Leek	1,625 bun.	408	65.00
Parsley	325 bun.	6,500	26.00
Pumpkins	5,850	5,850	175.00
Turnips	650 qts.	1,300	78.00
Green tomatoes	866 pks.	12,015	346.40
Swiss chard	1713 pks.	8,360	513.90
Peppers	13,000	1,250	650.00
Kohl rabi	6,500	1,083	65.00
Spinach	325 pks.	1,625	97.50
Strawberries	50 qts.	75	17.50
Egg plants	650	650	130.00
Rhubarb	100 bunches	200	12.50
			$24,357.35

Now that we have examined this figure in gross, will you permit me to cite a few of the individual instances that go to make up this total? I have many letters and many crop reports, each of which furnishes a graphic story, full of the joy of accomplishment. Out of these I select a few. The first is from Harold Marriott, a boy twelve years old, who raised vegetables valued at $25.63.

The second is from Hobart E. Williams, who raised a crop worth $184.23. The third is from Charles E. Allen, who raised a crop worth $45.78. The letters by Eggenson and Otto Witte follow and explain themselves:

NEWARK, N. J., October 12, 1916.

VACANT LOT COMMITTEE,
Newark, N. J.

Dear Sirs: I take pleasure in writing a few lines in regard to gardening. My chief feeling is toward the Yard and Lot Improvement Committee.

I have heard and seen many good deeds done, but never has anything been done to help the people and the city to improve. It has helped in many different ways, and I hope it will help others. It has cut down my living expenses and improved my health. It has also helped my family by eating fresh vegetables and lots of them. It has kept me out of doors, as I am working in a shop ten hours a day, and every spare moment I had went into my garden, weeding and hoeing it. And I had a fine outdoor exercise when I dug my garden.

But the best part came a few weeks later when I had everything planted and the seeds came up, then the real life came to me and to my garden. My happiest moments were when I could show strange people the nice things I could raise. And now I still have pleasure when I go into my cellar and see over one hundred jars of different vegetables enough to last me all winter until our good God will send Springtime again and the Committee of the Vacant Lot and Yard Improvement will be so good and give me the use of the same lot.

Thanking you foı your kind deeds, I am

Very truly yours,
(Signed) OTTO WITTE, 160 Shephard Ave.

EGGENSON'S LETTER

"All the moments in my garden are happy moments. I took this up when I lost my wife and it saved me. I get up at five o'clock every morning and get over the fence like a Jack-in-the-box and go to work. I've got two girls and have to be father and mother to them. I did all the housework, cooking, and baking, until one of my girls got old enough to do it.

"I spend all my holidays in my garden. My garden is the talk of the neighbors. It's just as the good old book says, 'As

ye sow so shall ye reap.' Money can't buy better vegetables than we have when we get our knife and fork at work. If I were worth a million dollars I couldn't have better meals. God has been good to me. I give many vegetables to the neighbors."

In selecting a vacant lot for cultivation the question of proximity to the worker's home should be considered first. As the work is usually done in spare time, the location should be as near home as possible. A slope to the south or southeast is usually preferable, because here the soil warms up early in the spring, which permits early planting and stimulates the early growth of crops. Practically any type of soil can be used for the garden, but a sandy loam is to be preferred. The soil is our capital. It is either improving and yielding good interest in crops or it is standing still or even going backward. It gets rich or it gets poor, according to its treatment.

There is no danger of overdoing the matter of enrichment. Where the amateur grudgingly gives his soil a barrowload of nutriment, the professional uses a wagonload, just because he knows it pays to feed the earth. Fifty to a hundred tons of stable manure to the acre are regularly applied by some market gardeners. Such treatment makes any kind of soil productive. No wonder the European gardeners who rent land consider the top soil their personal property and, when they move, take the upper layer of earth with them.

Lime is needed on almost every soil and especially on new ground. Ground oyster shell or ground limestone rock may be used at the rate of two tons to the acre. Half this amount or less of the more powerful, quicker-acting builder's lime is prescribed. Lime should be spread after plowing and should be harrowed in. Between plowings, eternal cultivation is the price of soil fitness. Cultivation kills the weeds and checks the evaporation of water. The gardener using a wheel hoe can keep the soil in better condition with less effort than one who depends on tedious hand cultivation with the hoe. Many good gardeners cultivate every week or ten days; it is not likely that anyone will overdo it.

Good drainage is of prime importance. The land should have sufficient slope to drain off surplus water during heavy rains,

but the slope should not be so great as to wash the soil. If the land near the house is level, artificial drainage should be employed.

Successive Plantings

The first and best half of planting is p-l-a-n. The secret of success in back yard gardening is making all the soil work all the time. This is done by planting a second time as soon as the first crop has been harvested. This is not to be confused, of course, with successive plantings of the same vegetable. The best results are obtained by using some other variety. In this way all the plant food in the soil will be used; also it lessens the danger of transference of insects or plant diseases from crop to crop.

Here are some suggestions on this line:

After strawberries plant cabbages or late potatoes.
After peas plant cabbages, beans, tomatoes or celery.
After radishes or bunch onions plant early cabbages or celery.
After early carrots plant autumn spinach, kale or turnips.
After spring spinach plant beans and tomatoes.
After lettuce plant beans and tomatoes.

These are general rules for successive plantings; they are subject to modification according to the length of the growing season.

Plant little and often. The secret of succulent, tender, well-flavored vegetables is to grow them quickly and eat them just as soon as they are grown. With most garden crops the number of plants should be reduced soon after the plantings appear above ground, so as to give each plant sufficient show for light air, and food from the soil.

Fighting Insects

As surely as you have plants in your garden insects will come to eat them. In a small garden it is often easier, however, to protect the plants than kill the devouring insects. Thus cut-worms may be prevented from destroying newly transplanted cabbage and tomato plants by wrapping a piece of heavy paper around the stems when transplanting. When large insects, like tomato worms or celery caterpillars, attack your plants, it

is probably easier to knock them off and step on them than to resort to sprays. Hand picking is also best for destroying the eggs of squash bugs and potato beetles. The use of sprays or sprinkling in a small garden is usually advisable only in the case of tiny leaf-eating insects.

The real secret of fighting insects is eternal watchfulness. Every plant has its enemy and the wise gardener acquaints himself with the method of procedure before they are upon him. The remedies can be purchased in small and large quantities and for the most part easily applied, and it is a splendid adventure, not unlike a new kind of fishing, as it were, to protect your crops against these silent, voracious insects. In this very "adventuring" lies the great attraction of garden work to thoughtful people. For they feel that to create something beautiful is an adventure; for instance to turn a barren hideous lot into a garden spot of beauty—of beauty and of utility as well. To acquire a working knowledge of a new science is an adventure, and those who in maturity acquaint themselves with the art of gardening, enter on an experience that gives them a larger horizon, a better understanding of their environment, greater sympathy for the toiler, greater respect for the laboratory of Nature. It is such an adventure that the ten thousand gardeners of the City of Newark have entered upon—such an adventure that the millions of gardeners, who sprang to the hoe and the spade at the call of the President are pursuing. It will take more than the initial spurt of enthusiasm; it will require study, patience and plugging to bring the adventure to a successful issue—and that issue is a successful crop.

Gardening and Morality

Most of the boys and girls who are brought before the juvenile courts are victims of idleness and poverty. It is to be noted that some of these young people who have gone wrong are of the brightest and most capable. The children who, from poverty, are tempted to steal are sometimes of the most ambitious. They are not satisfied with the conditions, aspire to better things, and if shown a better way would probably be eager to embrace it.

The mere association of boys and girls with growing plants will

do much toward making better citizens. They acquire a knowledge of the wonderful operations of nature with its convincing manifestations of a Supreme Power at work in the earth as well as in the world of men. And who will calculate the extent of this as an influence for good on these young impressionable hearts. The following paragraph from a report by Miss Annie L. Burke, who has charge of gardening in the schools of Brockton, Massachusetts, will furnish additional testimony on this point:

I could give many illustrations of good results. I shall give but one. A boy of twelve was unruly, unmanageable, and his father conferred with the school principal about sending him to some corrective institution. He became interested in gardening and from that time has been a changed boy. He secured $11.50 in prizes at our September exhibit. A more enthusiastic lad it would be hard to find. His father and mother are very proud of him. Our gardening would have been well worth while had we but saved that one boy.

Gardening and the Joy of Living

The ability to grow plants and to use them in home adornment is a great satisfaction to any one. "Gardening is more than the growing of plants; it is the expression of desire. . . ." "The garden made by one's own hands is always the best garden, because it is a part of oneself. . . ." "A poor garden of one's own is better than a good garden in which one may not dig. . . ." "The child that plants a seed or cares for the life of an animal, is working hand in hand with nature and the Creator. . . ." "A garden is a piece of land where plants and people grow up together and come to love each other."

Gardening and Beauty

Corbett writes: "Every successful attempt to adorn a city lot, a suburban place, or a park has a valuable influence on the community. It is an object-lesson which others will con, and in this way serves the useful purpose of stimulating a love for the beautiful in nature. Fortunately the beauty resulting from ornamental planting can not be hoarded. It is shared in by every

passerby to the full measure of his capacity without in the least detracting from the value of the plantation to its owner."

Gardening and Education

Professor Parsons dilates on the "health, happiness and education" that children's gardens furnish to the little ones. Health, and happiness from exercise "without strain" in the open. Education from the training and information insensibly acquired. According to him the pupils eventually attain "the sense of responsibility"; and by carrying away the stone and trash they come to realize the high place of transportation in our modern civilization.

"We teach in the garden," said Prof. Parsons, "personal belief in the dignity of labor, the love of productive work; the virtues of thrift, honesty, obedience to law, courtesy. To acquire these virtues, and a sense of their values, needs repeated demonstration during the formative years, demonstration with the plainest of object lessons and such object lessons occur almost hourly in the University Gardens."

In the way of prophecy as to what the movement will accomplish he concluded: "There will be better light and more fresh air in all our schools, for the parents will have realized that these make for better study. Our simple, yet clear, method of teaching soil conservation, larger crop production, good roads, and elementary forestry, bring these national questions within the understanding of every intelligence."

And what is said here of child gardeners is true in its measure of adult gardeners for we adults are but children of a larger growth.

Another educator says: "One of our problems in education is how to give information to the young and how to teach methods of acquiring more without destroying creative instinct; how to compensate in the school for some of the damage we have done in taking the child out of real life during the educative process. Now nature study in itself is good for this purpose. . . . It stimulates observation of what is going on, and it gives practice in making accurate records of what is seen; but if nature study can

extend into the realm of the useful, into the region of the productive, into the world where human relations are involved, then so much the better."

The economic benefits of this work to an industrial city such as Newark are incalculable. Many young folks make an honest penny, many poor families, many unemployed, are tided over the year by the garden. The gardeners young and old gain health, rosy cheeks, good appetites, and fresh vegetables with a new flavor. Boys are kept off the streets, out of saloons, and in good company. The quality of thrift is acquired unconsciously by acquaintance with nature's economies. All this reacts on the life of the city. It makes it a little more beautiful, a little more neighborly, more human. It awakes and intensifies the community spirit and this is the beginning of patriotism. By training the citizen to economy and thrift it must in time leaven the whole lump—the city itself—with these virtues. Gardening even in a city lot stirs up that love for the soil which is the birthright of all of us but which lies dormant, perhaps strophied, in so many city folks. If often leads them back to the land. This has been the case in Detroit, in Philadelphia and in other cities, where many families have actually "moved to the country" after one taste of gardening. Perhaps no better result could be obtained than in the breaking of the "city habit" in America.

THE GLORY OF THE GARDEN

There's not a pair of legs so thin, there's not a head so thick,
There's not a hand so weak and white, nor yet a heart so sick,
But it can find some needful job that's crying to be done,
For the Glory of the Garden glorifieth every one.

Then seek your job with thankfulness and work till further orders,
If it's only netting strawberries or killing slugs on borders;
And when your back stops aching and your hands begin to harden,
You will find yourself a partner in the Glory of the Garden.

Oh, Adam was a gardener, and God who made him sees
That half a proper gardener's work is done upon his knees,
So when your work is finished, you can wash your hands and pray
For the Glory of the Garden that it may not pass away!
And the Glory of the Garden it shall never pass away!

CARL BANNWART.

HARDY WOODY PLANTS IN THE NEW YORK BOTANICAL GARDEN

(Continued)

Chamaecyparis obtusa var. **tetragona aurea.** GOLDEN FOUR-SIDED HINOKI CYPRESS.
Location: Pinetum, with the above.

Chamaecyparis pisifera. SAWARA CYPRESS.
Location: Pinetum, with the above.
Natural distribution: Japan.

Chamaecyparis pisifera var. **aurea.** GOLDEN SAWARA CYPRESS.
Location: Pinetum, with the above.

Chamaecyparis pisifera var. **filifera.** SLENDER SAWARA CYPRESS.
Location: Pinetum, with the above. Beds at Conservatory Range I.

Chamaecyparis pisifera var. **filifera aurea.** GOLDEN SLENDER SAWARA CYPRESS.
Location: Pinetum, with the above.

Chamaecyparis pisifera var. **filifera pendula.** WEEPING SAWARA CYPRESS.
Location: Pinetum, with the above.

Chamaecyparis pisifera var. **filifera pendula aurea.** GOLDEN WEEPING SAWARA CYPRESS.
Location: Pinetum, with the above.

Chamaecyparis pisifera var. **filifera pendula aurescens.** GOLDEN-TIPPED WEEPING SAWARA CYPRESS.
Location: Pinetum, with the above.

Chamaecyparis pisifera var. **plumosa.** PLUMED SAWARA CYPRESS.
Location: Pinetum, with the above.

Chamaecyparis pisifera var. **plumosa albo-spica.** WHITE-SPOTTED PLUMOSE SAWARA CYPRESS.
Location: Pinetum, with the above.

Chamaecyparis pisifera var. **plumosa aurea.** GOLDEN PLUMOSE SAWARA CYPRESS.
Location: Pinetum, with the above.

Chamaecyparis pisifera var. **plumosa sulphurea.** SULPHUR-COLORED PLUMOSE SAWARA CYPRESS.
Location: Pinetum, with the above.

Chamaecyparis pisifera var. **pseudo-squarrosa** (*Chamaecyparis pisifera squarrosa Veitchii*). VEITCH'S SAWARA CYPRESS.
Location: Pinetum, with the above. Beds at Conservatory Range I.

Chamaecyparis pisifera var. **pseudo-squarrosa sulphurea.** VEITCH'S SULPHUR SAWARA CYPRESS.
Location: Pinetum, with the above. Beds at Conservatory Range I.

Chamaecyparis pisifera var. **squarrosa.** SPREADING SAWARA CYPRESS.
Location: Pinetum, with the above.

Chamaecyparis pisifera var. **squarrosa compacta.** COMPACT SPREADING CYPRESS.
Location: Pinetum, with the above.

Chamaecyparis pisifera var. **sulphurea.** SULRHUR SAWARA CYPRESS. Location: Pinetum, with the above.

Chamaecyparis thyoides. WHITE CEDAR.
Location: Pinetum, at culvert near South Gate. North side of Aquatic Garden.
Natural distribution: Eastern United States.

Chamaecyparis thyoides var. **andelyensis.** ANDELYAN WHITE CEDAR.
Location: Pinetum, with the above.

Juniperus. CEDARS AND JUNIPERS.

Juniperus chinensis. CHINESE JUNIPER.
Location: Pinetum, south of Conservatory Range I.
Natural distribution: China and Japan.

Juniperus chinensis var. **aurea.** GOLDEN CHINESE JUNIPER.
Location: Pinetum, with the above.

Juniperus chinensis var. **globosa.** GLOBOSE CHINESE JUNIPER.
Location: Pinetum, with the above.

Juniperus chinensis var. **globosa aurea.** GOLDEN GLOBOSE CHINESE JUNIPER.
Location: Pinetum, with the above.

Juniperus chinensis var. **nana.** DWARF CHINESE JUNIPER.
Location: Pinetum, with the above.

Juniperus chinensis var. **nana argenteca-variegata.** SILVER-SPOTTED DWARF.

Juniperus chinensis var. **nana argenteo-variegata.** SILVER-SPOTTED DWARF CHINESE JUNIPER.
Location: Pinetum, with the above.

Juniperus chinensis var. **nana aurea.** GOLDEN DWARF CHINESE JUNIPER.
Location: Pinetum, with the above.

Juniperus chinensis var. **nana aureo-variegata.** GOLDEN-SPOTTED DWARF CHINESE JUNIPER.
Location: Pinetum, with the above.

Juniperus chinensis var. **pendula.** WEEPING CHINESE JUNIPER.
Location: Pinetum, with the above.

Juniperus chinensis var. **Pfitzeriana.** PFITZER'S CHINESE JUNIPER.
Location: Pinetum, with the above.

Juniperus chinensis var. **procumbens.** PROSTRATE CHINESE JUNIPER.
Location: Pinetum, with the above.

Juniperus chinensis var. **albo-variegata.** VARIEGATED PROSTRATE CHINESE JUNIPER.
Location: Pinetum, with the above. Bed at Conservatory Range I.

Juniperus chinensis var. **pyramidalis.** PYRAMIDAL CHINESE JUNIPER.
Location: Pinetum, with the above.

Juniperus chinensis var. **pyramidalis argenteo-variegata.** SILVER-SPOTTED PYRAMIDAL CHINESE JUNIPER.
Location: Pinetum, with the above.

Juniperus communis. COMMON JUNIPER.
Location: Pinetum, with the above.
Natural distribution: North temperate regions.

Juniperus communis var. **hibernica.** IRISH JUNIPER.
Location: Pinetum, with the above.

Juniperus depressa (*Juniperus canadensis*). LOW JUNIPER.

Location: Pinetum, with the above. Beds at Conservatory Range I.

Natural distribution: Northern North America.

Juniperus depressa var. **aurea** (*Juniperus canadensis aurea*). GOLDEN LOW JUNIPER.

Location: Pinetum, with the above. Beds at Conservatory Range I.

Juniperus excelsa. TALL JUNIPER.

Location: Pinetum, with the above.

Natural distribution: Greece, Western Asia and Himalayas.

Juniperus horizontalis (*Juniperus Sabina prostrata*). WAUKEGAN JUNIPER.

Location: Pinetum, with the above.

Natural distribution: Northern North America.

Juniperus pachyphloea. THICK-BARKED JUNIPER.

Location: Pinetum, with the above.

Natural distribution: Southwestern United States and Mexico.

Juniperus Sabina. SAVIN JUNIPER.

Location: Pinetum, with the above.

Natural distribution: Europe and Asia.

Juniperus Sabina var. **fastigiata.** COLUMNAR SAVIN JUNIPER.

Location: Pinetum, with the above.

Juniperus Sabina var. **tamariscifolia.** TAMARIX SAVIN JUNIPER.

Location: Pinetum, with the above.

Natural distribution: Southern Europe.

Juniperus Sabina var. **variegata.** VARIEGATED SAVIN JUNIPER.

Location: Pinetum, with the above.

Juniperus sphaerica. FORTUNE'S JUNIPER.

Location: Pinetum, with the above.

Natural distribution: Northern China.

Juniperus squamata. NEEDLE-LEAVED PROSTRATE JUNIPER.

Location: Pinetum, with the above.

Natural distribution: Himalayas and western China.

Juniperus virginiana. RED CEDAR.

Location: Pinetum, with the above. Wild on open ridges about the grounds.

Natural distribution: North America.

EXHIBITION OF THE AMERICAN GLADIOLUS SOCIETY

The American Gladiolus Society, under the auspices of the New York Botanical Garden, The Horticultural Society of New York, and The New York Florists' Club, will holds its eighth annual exhibition on August 23 to 26, in the museum building, New York Botanical Garden. The exhibition will commence on the afternoon of the 23rd, remaining open until five o'clock, and will be open from ten to five o'clock on the remaining days of the show. The convention of this society will also be held during the continuance of the show. The final schedule is now ready for distribution and may be had on application to the Secretary of the Horticultural Society of New York, New York Botanical Garden, Bronx Park, New York City. The general prizes of this schedule have been offered by the New York Botanical Garden, The Horticultural Society of New York and the New York Florists' Club. In addition to these there are special prizes offered by various individuals and firms.

The gladiolus is one of our most popular garden flowers, giving us a profusion of most attractive bloom during the summer months when showy flowers are not as plentiful as they are early in the season. There are many hundreds of kinds of these flowers which have been produced by selection and hybridization, ranging in color from white through pink, rose, lavender, mauve and purple.

NOTES, NEWS AND COMMENT

The following visiting botanists have registered in the library during June: Professor Alexander W. Evans, New Haven, Conn.; Professor George M. Reed, Columbia, Mo.; Professor F. E. Lloyd, Montreal, Canada.

North American Flora, volume 10, part 3, by W. A. Murrill, appeared June 25, 1917. This part contains descriptions of 11 genera and 324 species of rusty-spored gill-fungi, including 76 species described as new.

Mr. Nathaniel T. Kidder, of Milton, Mass., a member of the Garden, has recently given for the library a valuable collection of 218 standard botanical books, including some rare volumes. A list of the books presented will be found under Library Accessions in this issue of the *Journal*.

Bulletin 31, completing the eighth volume of this publication, appeared July 10, 1917. It contains two scientific papers, one by R. S. Williams on "Philippine Mosses" and the other by Percy Wilson on "The Vegetation of Vieques," together with the table of contents and indexes to the volume.

An interesting sport of wild sarsaparilla (*Aralia nudicaulis*) with sharply incised and curled leaf-segments has been found by Dr. Walter Mendelson at Buck Hill Falls, Pennsylvania, growing with the normal form. This condition of the plant has, apparently, not been previously observed.

Mrs. John R. Delafield, of Riverdale, New York City, has recently given the Garden six finished plates illustrating the species of earth-stars (*Geaster*) in North America, together with the originals of several plates previously published in the *Bulletin of the Torrey Botanical Club*. Accompanying the plates, are two note-books containing references to literature and notes made from specimens.

Over 700 biology pupils from Morris High School and Evander Childs High School came to the Garden June 19 and 21 to study tropical plants, trees, and plant products under the direction of their biology teachers and the Garden staff. They also attended an illustrated lecture on forestry given in the lecture hall of the Museum Building by Mr. George E. Hewitt. The weather was fine both days, and the pupils were very orderly and showed great interest in their work.

Meteorology for June.—The total precipitation for the month was 3.57 inches. The maximum temperatures recorded for each

week were 85° on the 9th, 79° on the 12th, *90° on the 24th*, and 87° on the 27th. The minimum temperatures were *52° on the 5th and the 18th*, 54° on the 22d, and 56° on the 30th.

ACCESSIONS

LIBRARY ACCESSIONS FROM MAY 1 TO JUNE 30, 1917

ALLMAN, WILLIAM. *Analysis . . . generum plantarum phanerostemonum qua, in Britanniis, Gallia et Helvetia, ultraque hos fines sponte suacrescunt.* London, 1828.

American agriculturist. Vol. 37–50. New York, 1878–91.

BABINGTON, CHARLES CARDALE. *Flora bathoniensis.* Bath, 1834. Supplement. [Bath, 1839.]

BAILEY, JOHN M. *The book of ensilage.* Billerica, 1880. (Given by Dr. J. H. Barnhart.)

Baltimore cactus journal. Vol. 1. Baltimore, 1894–95. (By exchange with Mr. Frank Weinberg.)

BROCKLESBY, JOHN. *Views of the microscopic world.* New York, 1851.

CANDOLLE, AUGUSTIN PYRAMUS DE. *Vegetable organography.* Vol. 2. London, 1840. (Given by Rev. H. M. Denslow.)

COOKE, MORDECAI CUBITT. *Illustrations of British fungi* (Hymenomycetes). 8 vols. London, 1881–91.

COOPER, DANIEL. *Flora metropolitana; or, Botanical ramble within thirty miles of London.* London, 1836.

The cottage gardener. Vol. 1–13, 16–21, 23–25. London, 1849–60.

CROSFIELD, GEORGE. *A calendar of Flora, composed during the year 1890, at Warrington.* Warrington, 1810.

The cultivator. Vol. 10, Ser. 2, vol. 1, Ser. 3, vol. 1. Albany, 1843–53.

DEAKIN, RICHARD. *The flowering plants of Tunbridge Wells & neighbourhood.* Tunbridge Wells, 1871.

DILLWYN, LEWIS WESTERN. *Catalogue of the more rare plants found in the environs of Dover.* [London, 1802.]

DUNN, STEPHEN TROYTE. *Flora of southwest Surrey.* London, 1893.

EDMONDSTON, THOMAS. *A flora of Shetland.* Aberdeen, 1845.

The farmers' magazine. Ser. 2, vol. 17–24; Ser. 3, Vol. 1–10, 23–26. London, 1848–64.

FRIES, THEODOR MAGNUS. *Linné: Lefnadsteckning.* 2 vols. Stockholm, 1903.

GALPINE, JOHN. *A synoptical compend of British botany.* Ed. 2. London, 1820.

GISSING, THOMAS WALLER. *Materials for a flora of Wakefield and its vicinity.* London, 1867.

GOOD, PETER P. *The family flora and materia medica botanica.* Vol. 1. New York, 1845. (Given by Mr. E. O. Cockayne.)

HALLE, HUGHES R. P. FRASER. *Letters, historical and botanical relating chiefly to places in the vale of Teign.* London, 1851.

HESLER, LEXEMUEL RAY, & WHETZEL, HERBERT HICE. *Manual of fruit diseases.* New York, 1917. (Given by the MacMillan Company.)

HOARE, CLEMENT. *A practical treatise on the cultivation of the grape vine on open walls.* Boston, 1845. (Given by Dr. J. H. Barnhart.)

HOLDEN, PERRY GREELEY. *El A. B. C. del cultivo del maiz.* Mexico, 1908. (Given by Dr. J. H. Barnhart.)

HOLE, SAMUEL REYNOLDS. *A book about roses.* Ed. 6. Edinburgh, 1877. (Given by Dr. J. H. Barnhart.)

HOWE, W. E. *The ferns of Derbyshire, illustrated from nature.* London, 1861.

HUTCHINSON, PETER ORLANDS. *Ferns of Sidmouth; illustrated with impressions from the ferns themselves.* Sidmouth, 1862.

IBBOTSON, HENRY. *Catalogue of the phaenogamous plants and ferns of Great Britain.* London, 1846–48.

Illustrated botany. 2 vols. New York, 1846–47.

IRVINE, ALEXANDER. *The illustrated handbook of the British plants.* London, 1858.

JANK, JOSEPH K. *Spices, their botanical origin, their chemical composition, their commercial use: Seeds, herbs, leaves, etc.* St. Louis, 1915. (Given by Dr. J. H. Barnhart.)

KIDSTON, ROBERT, & JONGMANS, W. J. *A monograph of the Calamites of western Europe.* Text, part 1. 's-Gravenhage, 1917.

Landwirtschaftliches Centralblatt für Deutschland. Vol. 4–7, 10, 11, 13–16. Berlin, 1856–68.

LEES, EDWIN. *The botany of the Malvern Hills.* Ed. 2. London, [1852]. Ed. 3. London, [1868].

LINTON, EDWARD FRANCIS. *British species of Utricularia.* Dorchester, 1894.

LOBLEY, J. LOGAN. *Hampstead . . . with the flora of Hampstead by Henry T. Wharton.* London, 1889.

LOUBAT, ALPHONSE. *The American vine dresser's guide.* New and revised ed. New York, 1872. (Given by the American Museum of Natural History.)

MACFADYEN, JAMES. *Flora of Jamaica.* 2 vols. London, 1837.

MACGILLIVRAY, PAUL HOWARD. *Catalogue of the flowering plants and ferns growing in the neighbourhood of Aberdeen.* Aberdeen, 1853.

MATON, WILLIAM GEORGE. *The natural history of a part of the county of Wilts.* London, 1843.

MAUGHAM, ROBERT. *A list of the rarer plants observed in the neighbourhood of Edinburgh.* Edinburgh, 1808.

MILLER, MRS. MARIA (MORRIS), & LAWSON, GEORGE. *Wild flowers of North America.* Part 1. [London, 1867.]

MONCKTON, HORACE WOOLLASTON. *The flora of the Bagshot district.* London, 1916.

PRICE, REES, & GRIFFITHS, EVAN. *Y llysieu-lyfr teuluaidd, yu ddwy ran.* Abertawy, 1849.

RAVENSHAW, THOMAS FITZARTHUR TORIN. *Botany of North Devon.* Ilfracombe (1874].

ROPER, FREEMAN CLARKE SAMUEL. *Flora of Eastbourne.* London, 1875.

SALMON, JOHN DREW. *A flora of Surrey.* London, 1852.

SPICER, WILLIAM WEBB. *A handbook of the plants of Tasmania.* Hobart Town, 1878.

[STRACHEY, RICHARD.] *Catalogue of plants found in Kumaon and Garwahl and the adjoining parts of Tibet.* [London, 1854?]

SWETE, EDWARD HORACE. *Flora bristoliensis.* London, 1854.

TASHIRO, SHIRO. *A chemical sign of life.* Chicago, 1917. (Given by Dr. H. H. Rusby.)

THURBER, GEORGE. *Silos and ensilage.* New York, 1881. (Given by Dr. J. H. Barnhart.)

[TYAS, ROBERT.] *Popular flowers: their cultivation, propagation and general treatment.* London, 1843. (Given by Dr. J. H. Barnhart.)

WEBB, ROBERT HOLDEN, & COLEMAN, WILLIAM HIGGINS. *Flora hertfordiensis.* London, 1848–49.

WHITEHEAD, JOHN & OTHERS. *The district flora as compiled by the Ashton-under-Lyne Linnaean botanical society.* Ashton-under-Lyne, 1888.

WILLIAMS, FREDERIC NEWTON. *The high alpine flora of Britain.* Edinburgh, 1908–10.

WINDSOR, JOHN. *Flora cravoniensis.* Manchester, 1873.

WOOD, JOHN BLAND. *Flora mancuinensis.* Halifax, 1840.

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ADAMS, ARTHUR. *Travels of a naturalist in Japan and Manchuria.* London, 1870.

The American Naturalist. Vol. 1–16. Salem, 1867–72.

Annual report of the Forest commission of the state of New York. 1885, 86, 88, 90, 91. Albany, 1886–92.

ANSON, GEORGE. *A voyage round the world, in the years 1740–44 by George Anson, Esq. . . . compiled . . . by Richard Walter.* London, 1748.

AZARA, FELIX DE. *The natural history of the quadrupeds of Paraguay and the River La Plata.* Vol. 1. Edinburgh, 1838.

BALL, JOHN. *Notes of a naturalist in South America.* London, 1887.

BENTHAM, GEORGE, & MUELLER, FERDINAND JACOB HEINRICH VON. *Flora australiensis.* 7 vols. London, 1863–78.

The botanical cabinet, consisting of coloured delineations of plants from all countries. 20 vols. London, 1817–33.

Botanical gazette. Vol. 1–40. Place of publication variable. 1875–1905.

CANDOLLE, AUGUSTIN PYRAMUS DE. *Prodomus systematis naturalis regni vegetabilis.* Vol. 1–17. Parisiis, 1824–83. *Index by H. W. Buek.* Vol. 1–4. Berolini 1840–74.

CATESBY, MARK. *Piscium, serpentum, insectorum . . . nec non plantarum quarundam imagines quas Marcus Catesby in posteriore parte . . . illius operis quo Carolinae, Florideae et Bahamensium insularum tradidit historiam naturalem eiusque appendice descripsit.* Nürnberg, 1750.

CHADRIN, JOHANN. *Journal de voiage du Chevalier Chardin en Perse & aux Indes orientales.* Vol. 1. Amsterdam, 1686.

COLLINGWOOD, CUTHBERT. *Rambles of a naturalist on the shores and waters of the China seas.* London, 1868.

CUNNINGHAM, ROBERT OLIVER. *Notes on the natural history of the Strait of Magellan and west coast of Patagonia made during the voyage of H. M. S. 'Nassau' in the years 1866, 67, 68 & 69.* Edinburgh, 1871.

Erythea. Vol. 1–3. Berkeley, 1893–95.

GESNER, CONRAD. *Opera botanica per duo saecula desiderata.* Vol. 1. Norimbergae, 1751.

GIGLIOLI, ENRICO HILLYER. *Viaggio intorno al globo della R. pirocorvetta italiana Magenta negli anni 1865, 66, 67, 68.* Milano, 1875.

HOOKER, JOSEPH DALTON. *Himalayan journals.* New ed. 2 vols. London, 1855.

HOOKER, JOSEPH DALTON. *The rhododendrons of Sikkim-Himalaya.* London, 1849–[51].

Journal of the proceedings of the Linnean society. Botany. Vol. 1–18. London, 1857 81.

The magazine of botany and register of flowering plants. 16 vols. London, 1841–49.

MARTYN, JOHN. *Historia plantarum rariorum centuriae primae decas I–III.* Londonini, 1728.

Minnesota botanical studies. Vol. 1, 2. Minneapolis, 1894–1902.

Missouri botanical garden. Annual report 1–15. St. Louis, 1890–1904.

NIEREMBERG, JUAN EUSEBIO. *Historia naturae maxime peregrinae libris xvi distincta.* Antverpiae, 1835.

Report on the scientific results of the voyage of H. M. S. Challenger during the years 1873–76. Botany, Vol. 1. London, 1885.

SMITH, WILLIAM. *A new voyage to Guinea.* London, 1744.

STACKHOUSE, JOHN. *Nereis brittanica.* Bathoniae, 1795–1801.

Torrey botanical club. Bulletin. Vol. 1–32. New York, 1870–1905.

Torrey botanical club. Memoirs. Vol. 1–12. New York, 1889–1907.

TOURNEFORT, JOSEPH PITTON DE. *Relation d'un voyage du Levant.* 3 vols. Amsterdam, 1717.

VAHL, MARTIN. *Symbolae botanicae, sive plantarum . . . quas in itinere imprimis orientali collegit Petrus Forskål.* Vol. 1–3. Hauniae, 1790.

The voyages of Captain James Cook round the world, 2 vols. London, 1829. Another ed. 2 vols. London, 1846.

Zoe. Vol. 1–4. San Francisco, 1890–94.

PLANTS AND SEEDS

12 plants of *Eleocharis tuberosa.* (Given by Mr. C. T. Harbeck.)

31 plants collected in Florida. (Collected by Dr. F. W. Pennell.)

9 cactus plants. (Collected by Dr. J. K. Small.)

2 plants of *Cephalocereus Keyensis.* (Collected by Dr. F. W. Pennell.)

1 plant of *Maxillaria* sp. (Given by Mr. Philip Pfoh.)

2 plants for Herbaceous Grounds. (By exchange with I. Hicks & Son.)

9 plants of *Trapa natans.* (By exchange with Mr. Henry Natho.)

3 plants, for Conservatory Tanks. (By exchange with Mr. Chas. L. Tricker.)

11 plants, *Agave* sp. (Collected by Dr. F. W. Pennell.)

2 packets of seeds. (Given by Mr. A. M. Knick.)

1 packet of seeds. (Given by Mr. F. F. Von Vilmorsky.)

136 packets of seeds. (By exchange with Royal Botanic Gardens, Kew.)

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Vol. 3, part 1, 1910. Nectriaceae—Fimetariaceae.

Vol. 7, part 1, 1906; part 2, 1907; part 3, 1912. Ustilaginaceae—Aecidiaceae (pars).

Vol. 9 (now complete), parts 1 and 2, 1907; part 3, 1910; part 4, 1915; parts 5, 6, and 7, 1916. Polyporaceae—Agaricaceae (pars). (Parts 1 and 2 no longer sold separately.)

Vol. 10, part 1, 1914; parts 2 and 3, 1917. Agaricaceae (pars).

Vol. 15, parts 1 and 2, 1913. Sphagnaceae—Leucobryaceae.

Vol. 16, part 1, 1909. Ophioglossaceae—Cyatheaceae (pars).

Vol. 17, part 1, 1909; part 2, 1912; part 3, 1915. Typhaceae—Poaceae (pars).

Vol. 21, part 1, 1916; part 2, 1917. Chenopodiaceae.

Vol. 22, parts 1 and 2, 1905; parts 3 and 4, 1908; part 5, 1913. Podostemonaceae—Rosaceae (pars).

Vol. 25, part 1, 1907; part 2, 1910; part 3, 1911. Geraniaceae—Burseraceae.

Vol. 29, part 1, 1914. Clethraceae—Ericaceae.

Vol. 34, part 1, 1914; part 2, 1915; part 3, 1916. Carduaceae—Anthemideae.

Memoirs of the New York Botanical Garden. Price to members of the Garden, $1.00 per volume. To others, $2.00. [Not offered in exchange.]

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. viii + 138 pp., with 29 plates. 1909.

Vol. IV. Effects of the Rays of Radium on Plants, by Charles Stuart Gager. viii + 278 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 + 592 pp., with 43 plates and many text figures. 1916.

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JOURNAL

OF

The New York Botanical Garden

EDITOR

KENNETH ROWLAND BOYNTON

Head Gardener's Assistant

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JOHN R. BRINLEY, *Landscape Engineer*
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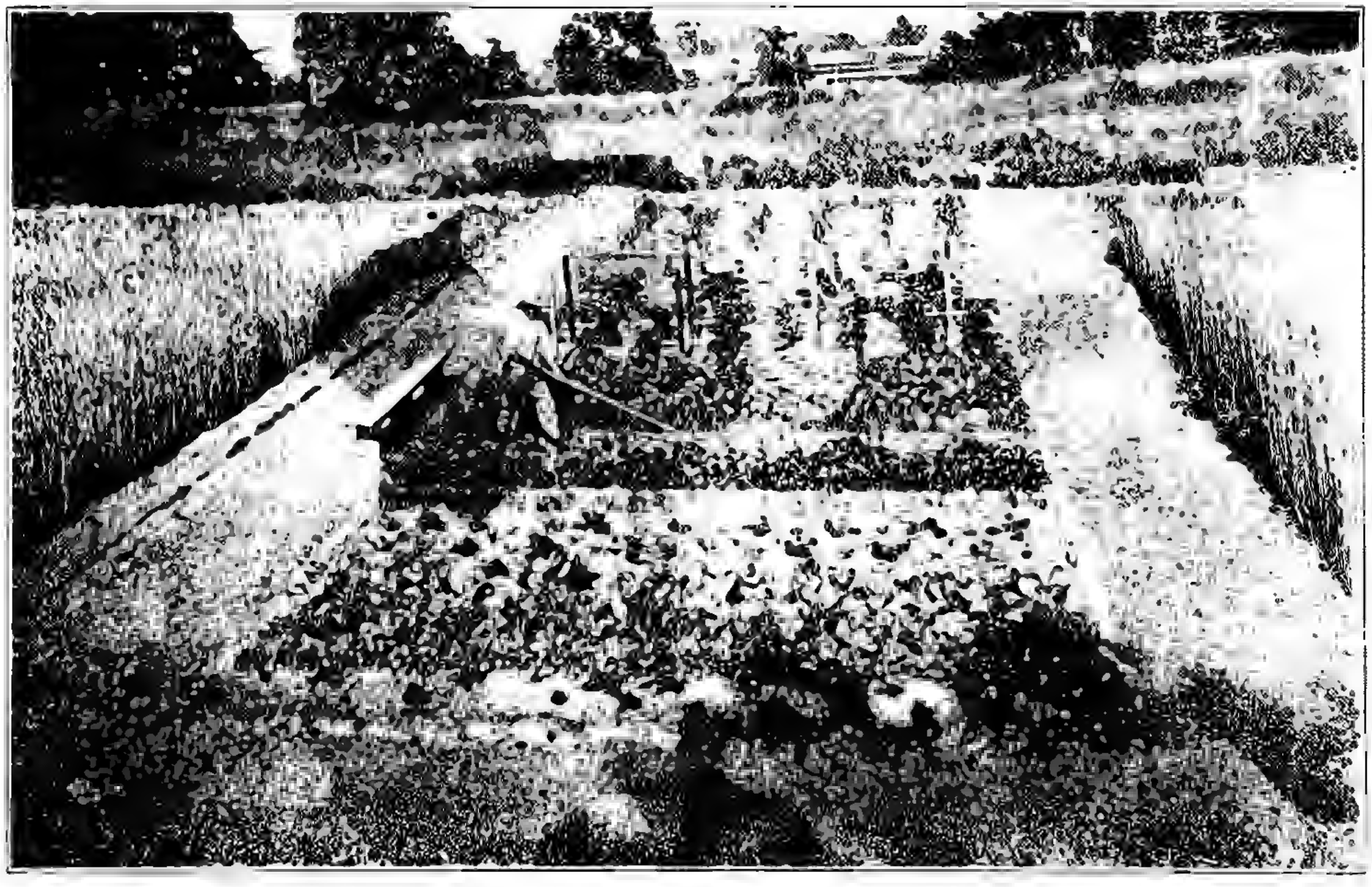

An hour-a-day garden.

JOURNAL

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THE SMALL HOME GARDEN OF THE GARDEN SCHOOL

(WITH PLATE 202)

This garden was planned 20 feet wide by 50 feet long as a suitable section at the back yard of the ordinary 50 by 100 foot suburban lot, and as a good size for a person who must do all the work and with hand tools, before or after their regular day's work. With a knowledge of how to work, with suitable tools, and the ground first put in condition, an hour daily will probably be sufficient, the labor will be well within the strength of the ordinary man or woman, and can be a source of recreation, as well as a close-at-hand food supply of tender and fresh vegetables, for four to six persons.

The garden was divided into zones of 2½ x 20 feet. This amount can be spaded and raked and planted in about two hours. The work must be done as the weather permits, and the gardener must look ahead to rainy days when the soil must not be worked, but when early crops will grow nicely if the soil is in order and the seeds in.

The first list is given in the order of planting.

No. 1 LIST

Parsley—extra curled
Spinach—Viroflay
Spinach—New Zealand
Swiss Chard—Lucullus

[JOURNAL for July, 1917, (18): 149–176) was issued August 16, 1917.]

Lettuce Cabbage, transplanted
" Butter, transplanted
" Black-seeded Simpson, transplanted
Radish Scarlet Globe
Cabbage -York, transplanted
Kohlrabi—White Vienna, transplanted
Strawberries—Superb
Celeriac, transplanted
Romaine—Trianon, transplanted
Onion—Prize Taker
Beet—Crimson Globe
Carrot—Early Horn
Turnip—Purple Top Strap Leaf
Parsnip—Hollow Crown
Salsify—Sandwich Island
Bean—Bountiful
Tomato—Dwarf Champion, transplanted
Bean—Burpee Bush Lima
Squash—Summer Crook neck
Eggplant—N. Y. State, transplanted
Leek, transplanted
Pepper—Dulcima, transplanted
" Cayenne, transplanted
} planted June 1

The second list is for second crop planting to keep the ground occupied during the growing season.

The third list was left out of such a small garden because, for the quantity produced, they would occupy too much room.

No. 2 List

Bean—Bountiful (after early cabbage)
Celery—Golden Self Blanching (after early beets)
Carrot—Danvers Stump rooted (planted after early turnips on June 30, to be transplanted. July 20 after early beans)
Cabbage Late flat Dutch

No. 3 List—Leftouts

Pea Corn Potato Okra Asparagus Cucumber Pole lima bean Hubbard squash	very desirable but need a space equal to 4 times the rest, which means 100 x 50 feet, 5 hours' daily labor, and 5 times the manure

Possible Returns

After June	1.	Lettuce and radish daily
" "	15.	Spinach once a week
		Kohlrabi 3 times
		Turnips 5 times
" July	1.	Swiss Chard twice a week
" "	15.	Snapbeans twice a week
		Cabbage 6 times
" Aug.	1.	Beets once a week
		Carrots once a week
		Squash twice a week for 6 weeks
		Sweet pepper once a week
		Tomatoes daily
" "	15.	Lima beans once a week 4 times
" Sept.	1.	Eggplant twice a week for 5 weeks.

The strawberries planted late in April of an everbearing variety, bore a few in June and should bear well in September.

For winter storage outside or in a cool cellar

Turnips	Onions	Cabbage
Beets	Parsnips	Celery
Carrots	Salsify	Celeriac

General Rules

Buy seeds early and test for viability.

Clean, deep cultivation before, and *frequent* cultivation after planting.

Space the plants generously, that they may have all the sunlight and air they can use.

Transplant carefully into wet holes.
Keep the ground occupied and well fertilized.

The accompanying photograph of the garden was taken July 1, 1917. It shows the home garden bounded by ash-gravel paths flanked by fields of spring rye; Professor Harper's experimental corn-plots are shown beyond.

HENRY GRISCOM PARSONS.

THE JAMAICA WALNUT

(With plates 203 and 204)

Herbarium specimens of both the staminate and the pistillate flowers of the "Jamaica walnut" collected last May by Mr. William Harris near the Ferry, St. Andrews, Jamaica, recently reached the Garden. The specimens of the staminate flowers are particularly interesting as they appear to be the first of this species collected.

The systematic relationship of this tree has been puzzling and uncertain. Geographically it is restricted to the southern arid part of Jamaica. The early writers on the natural history of Jamaica associated the plant with the walnut, whence its common name; it is a small tree with 3-foliolate leaves and a nearly globose fruit.

Several references to this plant printed in books relating to Jamaica in the seventeenth, the eighteenth, and the nineteenth centuries are interesting enough to quote. The first tree mentioned by Hans Sloane in his Catalogue* of Jamaican plants published in 1695 is the subject of this note, and this is, apparently, the first reference to the Jamaica walnut. It reads thus:

"Nux juglans trifolia, fructu magnitudine nucis moschatae. Ad ripas fluvii *Cobre* dicti, et in pratis circa urbem *St. Jago de la Vega* locis sylvosis copiose crescit."†

In 1725, Hans Sloane, in his Natural History of Jamaica,‡

* Catalogus Plantarum Quae in Insula Jamaica Sponte Proveniunt, etc. 128.

† *Translation.* —Trifoliate walnut, with fruit the size of a nutmeg. Grows plentifully on the banks of the Cobre River and in woods in the meadows about Spanish Town.

‡ A Voyage to the Islands, Madera, Barbadoes, Nieves, St. Christophers and Jamaica 2: 1.

after partly repeating the above quotation and citing some subsequent references says:

"This Tree rises to twenty Foot high, having a grey-colour'd Bark, with some Sulci in it, being as thick as ones Thigh, having Branches spread round it, making a comely Top. The Twigs have Leaves which stand on their Ends without any Order, always three together on the same, two Inches long, common redish Footstalk, each of which has a small quarter Inch Footstalk, is about three Inches long and one broad, thin, smooth, and of a dirty or brownish green colour. *Ex alis foliorum* come the *Juli*, two together, each about an Inch long, made up of a great many small greenish yellow Points, *granula herbacea*, or Flowers not open. The Fruit hangs from the Branches by an Inch long Footstalk, is oval, yellowish in Colour, as big as a Nutmeg, having under a very thin mucilaginous Pulp, a large Shell of the same Shape, which I never remember I broke, but think this Fruit may be refer'd hither.

"It grew in the Town *Savanna*, in the woody Part, between it and two Mile Wood, and on the Banks of the *Rio Cobre*, below the Town of *St. Jago de la Vega*.

"'Tis plain that this is differing from the Hickery Nut tree which Dr. *Plukenet*, p. 236 [136] of his *Mantissa* suspects may be it."

In 1755, Patrick Browne* referring to our tree says:

"This shrubby tree is frequent about the *Ferry*, and often rises to a considerable height. The outward part of the fruit is soft and pulpy, when ripe; but the hard lignous shell, and the partitions and lobes of the seeds, as well as the parts of the flower, agree perfectly with the general characters of the genus" [*Juglans*].

A little later, in 1759, Linnaeus† still retains the plant in the genus *Juglans*, *i. e.*, with the walnuts.

After Linnaeus's time the botanical history of this plant is, briefly, as follows:

In 1837, over a century after Hans Sloane illustrated the

* The Civil and Natural History of Jamaica 346.

† Syst. Ed. 10. 1272.

tree, James Macfadyen referred* it to the sumac family, and somewhat doubtfully to the genus *Rhus*. In a note he says:

"It is probable that this may be found to constitute a genus distinct from *Rhus*. I have not, however, been successful in observing the flower, and have met with only two individuals of the species. The fruit has a great resemblance in size and appearance to that of the *Hog-plum*, but the taste is intensely bitter. It is green at Christmas, and ripens towards the end of March, so that it is probable that August may be the period of flowering."

The time of flowering here mentioned, evidently, was not a good guess on the part of Macfadyen. In a note on the herbarium label, Mr. Harris says: "Leaves deciduous with the advent of the flower-buds, but young leaves and expanded flowers appear together." The flowers sent by Mr. Harris were collected on May 25, 1917.

In 1846, J. E. Planchon† described the genus *Picrodendron*, basing it upon the Jamaica walnut. He referred it to the Quassia family (Simaroubaceae).

In 1859, A. H. R. Grisebach‡ accepted the generic disposition of Planchon, but placed the plant back in the walnut family.

In 1862, Bentham and Hooker§ referred it to Simaroubaceae, following the disposition of Planchon, but they also note that Grisebach‖ still refers the plant to the walnut family.

In 1896, Adolf Engler¶ doubtfully retained our plant in the Quassia family, and the writer accepted this disposition of it in North American Flora in 1911. Taking into account the Cuban species which was first referred to the soapberry family as mentioned further on, the genus has been referred by authors to four different plant families, to none of which it really belongs. Curiously enough the first and only plate of this plant published appeared in 1725.** It represents

* Flora of Jamaica 1: 225.

† Lond. Journ. Bot. 5: 580.

‡ Fl. Brit. W. Ind. 177.

§ Genera Plantarum 1: 315. 1862.

‖ Fl. Brit. W. I. 177.

¶ Engler & Prantl. Nat. Pfl. 3^4: 230.

** A Voyage to the Islands, Madera, Barbadoes, Nieves, St. Christophers and Jamaica 2: *pl. 157. f. 3.*

a branch bearing immature staminate flowers. However, it is so poorly executed that it is impossible to make out any details regarding the flowers. As no definite description of the staminate flowers has appeared in the works written at the larger herbaria of the Old World, it seems to be a safe inference that specimens of the staminate flowers do not exist in those collections.

Although Hans Sloane figured the immature staminate inflorescence, he did not describe the flowers. Neither did Patrick Browne refer to the staminate flowers, and subsequent authors either ignored them or referred to them in a single word from observations made evidently on the original plate of Hans Sloane.

From the material at hand the staminate flowers may be described thus: Staminate flowers borne in loosely spreading solitary or clustered finely pubescent aments, remote, or contiguous on the distal part of part of the rachis, the aments often raceme-like or panicle-like on account of the development of short flower-stalks which are sometimes subtended by short scale-like bracts. Each flower is subtended by an involucre of three bracts, the middle bract the larger and overlapping the adjacent edges of the lateral bracts. Calyx and corolla wanting. Stamens mostly 20–54, sometimes fewer, rarely more, just before anthesis compactly disposed in a depressed head, in anthesis loosely clustered, forming a globose head about 5 millimeters in diameter, borne on a hemispheric receptacle which is closely sessile in the bracts and which may possibly be formed by the concretion of the lower parts of the filaments. Filaments (free portion) short-subulate, variable in length, but shorter than the anthers, or rarely as long, glabrous. Anthers oval, nearly 1.5 millimeters long, sparingly pubescent, especially at the tip, the sacs laterally dehiscent, but slightly extrorse, when fully mature notched at the apex and cordate at the base.

The pistillate flowers are solitary in the axils of the leaves of the season on finely pubescent pedicels 2–4 centimeters long which are thickened above and expanded into a receptacle-like apex under the perianth: sepals 4, lanceolate, thickish, ascending-recurved, unequal, the smaller 3–4 millimeters long, the larger

6–7 millimeters long, rather remotely toothed, the teeth softly spine-tipped: ovary and style flask-shaped, the ovary 2-celled, the style as long as the ovary or slightly longer; stigmas sharply differentiated from the style, stout-subulate, the thick edges slightly revolute. There are 2 ovules in each ovary-cavity, suspended from a hemispheric placenta borne in the top of the ovary-cavity. The fruits are nearly globose, usually fully 2.5 centimeters long when ripe, orange, the epicarp rather thin, fleshy, the endocarp often slightly elongate, obscurely 4-angled, 1.5 2 millimeters thick.

The seed is solitary, by the abortion of one of the ovules in one cavity and the two ovules in the other and by the partial suppression of one of the ovary-cavities it occupies most of the fruit-cavity. The partition is pushed over nearly or quite to one side of the endocarp. It is globular, the cotyledons are turned back on the slender funicle, much corrugated, somewhat hemispheric, but inequilateral from the pressure of the large plumule, which is also turned back on the funicle at right angles to the cotyledons.

The specimens at hand show clearly that the Jamaica walnut is not properly included in any of the families to which it has at times been referred. The early writers referred to above, and Grisebach, were the more correct in referring the plant to the walnut family. However, the Jamaica walnut possesses several characters so different from those of the walnut family as ordinarily constituted that the characters of that family would have to be unduly expanded in order to include the subject of this note. Among other characters, the superior 2-celled ovary, the four ovules, two in each ovary-cavity, and the structure of the seed, find no match in the walnut family. In fact, none of the families of the ament-bearing shrubs and trees have the structural characters we find in the Jamaica walnut. This plant seems to represent a line of development somewhere between the walnuts and the oaks. It should, therefore, be considered as representing a distinct and natural plant family, to be known as PICRODENDRACEAE.

A second species of *Picrodendron* grows at low elevations near

the coasts in Cuba and the Bahamas, differing from the Jamaican tree in having blunt leaflets and ovoid or oval and smaller fruit. This was first described by A. Richard* in 1845, and figured at the same time. The specimen studied by Richard was collected in the Vuelta de Abajo (Pinar del Rio), Cuba. He referred the tree to the genus *Schmidelia* of the soapberry family (Sapindaceae), but it is not of that relationship.

In 1893, Krug and Urban† described the Bahamian tree as a variety of the Jamaican species as *Picrodendron baccatum* var. *bahamense;* but erroneously regarded the Cuban species of Richard as the same as the tree of Jamaica. Dr. Britton‡ in 1906 first correlated the Cuban and the Bahamian trees as a species distinct from the Jamaica walnut, under the name *Picrodendron macrocarpum* (A. Richard) Britton. In the Bahamas the negroes call this tree "black-wood;" while in Cuba, according to Dr. Juan T. Roig, the tree is known as "vanilla-prieta."

Within the past few years specimens of a *Picrodendron* were collected in Santo Domingo. The characters examined by those who determined the specimens led them to associate the plant with the Cuban species. An examination of the specimens in hand indicates that this Santo Domingan tree is different from the plants of the neighboring islands, and may be named and described as follows:

Picrodendron medium Small, sp. nov.

A tree with gray branchlets and closely fine-pubescent shoots: leaves mostly 12–16 cm. long; petioles slender, finely pubescent; leaflets 4–9 cm. long, the blades elliptic or elliptic-lanceolate, short-petioluled, 4–8 cm. long, mostly obtuse, finely reticulate, paler-green beneath, obscurely pubescent above, finely pubescent beneath: staminate flowers in aments mostly 3–5 cm. long, the peduncle and rachis finely pubescent: bracts subtending the flower 3, deltoid, nearly 1.5 mm. long, acute, sometimes abruptly pointed, finely pubescent, ciliate: receptacle hemispheric: stamens

* Ramon de la Sagra, Historia Fiscia Politica y Natural de la Isla de Cuba 10: 116. *pl. 30.*

† Botanische Jahrbücher 15: 308.

‡ Bulletin of the N. Y. Botanical Garden 14: 139.

mostly 29 35, the filaments subulate, as long as the anthers or shorter, the anthers oval, nearly 1.5 mm. long, very minutely pubescent: drupes globose-obovoid, nearly or quite 2 cm. long, long, orange.

Southern Santo Domingo.—Northeast of Azua, *J. N. Rose, 4042* (type, in herb. N. Y. Botanical Garden), specimen with fruit: near Barahona, *Miguel Fuertes, 1535*, specimen with staminate flowers.

This tree is interesting in that its leaflets resemble those of the Jamaican plant in outline and venation, whereas the fruits have the thick-walled stone (endocarp) of the Cuban plant. It is known to the natives of Santo Domingo as "Manzanillo," and like its relatives, it inhabits very dry regions.

EXPLANATION OF PLATE 203

A. Branch of *Picrodendron baccatum* with staminate flowers, slightly reduced. *b*, staminate flower from the back, showing the three subtending bracts, enlarged. *c*, staminate flower from the side, showing short pedicel, enlarged. *d*, staminate flower, showy receptacle with some of the stamens removed, also the three subtending bracts, pedicel and a bract which sometimes subtends the pedicel, enlarged. *e*, stamen, enlarged.

EXPLANATION OF PLATE 204

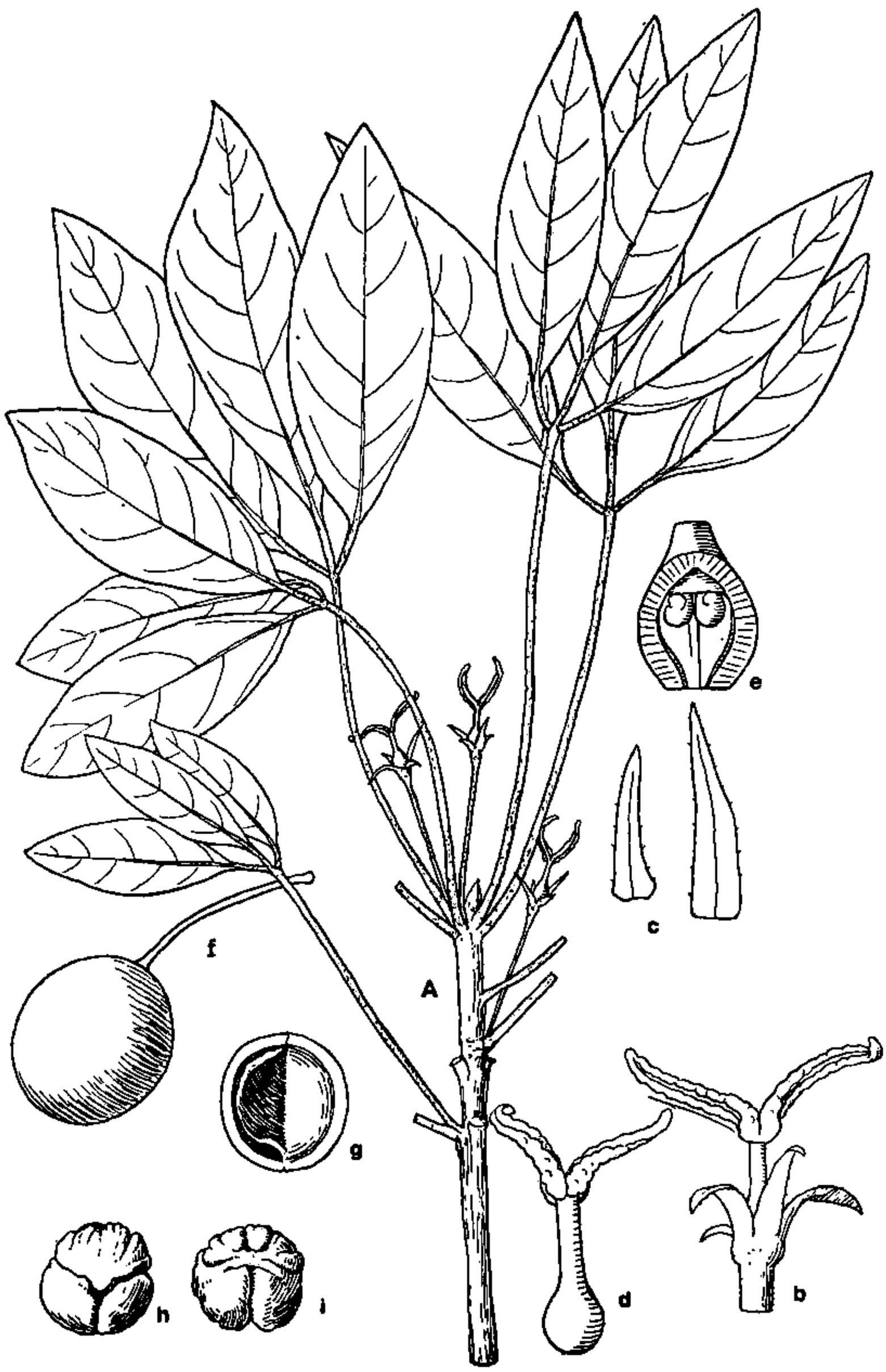
A, Branch of *Picrodendron baccatum* with pistillate flowers, slightly reduced. *b*, pistillate flower, enlarged. *c*, two sepals, two sizes, enlarged. *d*, pistil, enlarged. *e*, section of ovary, showing placenta with two suspended ovules, enlarged. *f*, fruit, about natural size. *g*, section of endocarp, showing partition pushed aside by the single seed, slightly reduced. *h*, seed, looking on the top, the two seed-leaves below, the plumule above, natural size. *i*, seed, looking at the base, the two seed-leaves borne on their petioles below, the plumule above, natural size.

JOHN K. SMALL

DAMAGE FROM SOIL FUNGI

A considerable amount of damage has been noted during the past season among various plants of the Garden, apparently caused by the presence of fungi which normally inhabit the humus of the soil. The fungi constitute a large group of micro-organisms which either live as saprophytes on dead matter or as parasites on living animals or plants. In the past it has been customary to regard a few fungi as being the cause of plant diseases, while a vast majority were considered innocent sapro-

Picrodendron baccatum (L.) Krug & Urban—Staminate.



Picrodendron baccatum (L.) Krug & Urban—Pistillate.

phytes merely living as scavengers on dead and decaying matter. Opinion, however, has gradually changed, until at the present time a vast number of fungi which have formerly been considered harmless are found under favorable conditions to be virulent parasites, causing an immense amount of damage to cultivated plants. In fact, some biologists are inclined to regard the depletion in the fertility of soils under constant cultivation very largely to the presence of this type of microörganisms, and to look for a remedy for this condition to some carefully worked out method of sanitation by which the soil can be rid of these harmful organisms.

The attention of the writer has recently been called to a bed of Funkias in our grounds in which about one third of the foliage had been killed. The examination of the leaves of these plants, while showing slight traces of fungus mycelium and spores, as is usual on dead plant tissues, did not reveal any particular species present in sufficient abundance to account for the death of the plants.

A careful examination of the soil about the bases of these plants, however, showed the presence of a fungus belonging to the genus *Sclerotium*, which had apparently attacked the plants through the medium of the soil, causing the base of the large leaves to rot entirely off in some cases and in this way accounting for their death. While difficult to determine with any degree of certainty, the fungus appeared to be *Sclerotium Semen* Tode, a species which commonly occurs on dead leaves and in the humus of the soil. The species receives its name from the fact that the only fruit produced is a sclerotium resembling in form and color grains of mustard seed, although often very much larger. While usually regarded as a saprophyte, from the above observations, this fungus has shown its ability under favorable conditions to attack living plants, causing their death.

Further search revealed the fact that this fungus was not restricted to the one host on which it was originally detected, but attacked other plants as well, causing a large amount of damage. A strictly parasitic fungus is often very selective in its habits, restricting its attacks to a certain species or to a number

of very closely related species of plants. These semi-saprophytic species, on the other hand, are often less selective and often quite omnivorous in their habits and for this reason more difficult to control. Apparently the only successful means of combating these and other similar types of fungi is to work out some method of soil treatment which will enable us to attack the fungus at its source of infection.

Earlier in the season the attention of the writer had been called to the presence of a fungus on the bulbs of the garden tulip which appeared to be accountable for the failure of the plants produced from such bulbs to bloom. This fungus belonged to the same genus as the preceding, and although the species has, so far as known, not been mentioned in American literature it occurs in Europe, where it has caused great losses among professional tulip growers. While the origin of infection of the latter, *Sclerotium Tulipae* Therry, is not known with certainty, we have reason to suspect that it is the same as that of the preceding species.

Still another fungus which has ordinarily passed as a saprophyte has been found to attack the rootstocks of the wild geranium, causing their decay. Laboratory experiments have been carried on with the latter species in order to determine its life history and habits and the results of these experiments will be published in the near future.

In addition to the few cases which have come under observation during the past season, a large number of the diseases of cultivated plants are now known to be caused by similar fungi which are transmitted through the soil. The soil is no longer regarded as made up entirely of inert matter, but is now known to be teeming with life, and one of the largest problems confronting the biologist today is to determine the nature and effect of these minute organisms on growing vegetation.

F. J. SEAVER

HARDY WOODY PLANTS IN THE NEW YORK BOTANICAL GARDEN

(Continued)

Juniperus virginiana var. **albo-spica.** WHITE-SPOTTED RED CEDAR.
Location: Pinetum, with the above.

Juniperus virginiana var. **Cannartii.** CANNART'S RED CEDAR.
Location: Pinetum, with the above.

Juniperus virginiana var. **elegantissima.** YELLOW RED CEDAR.
Location: Pinetum, with the above.

Juniperus virginiana var. **glauca.** GLAUCOUS RED CEDAR.
Location: Pinetum, with the above. Beds at Conservatory Range I.

Juniperus virginiana var. **glauca pendula.** DROOPING GLAUCOUS RED CEDAR.
Location: Pinetum, with the above.

Juniperus virginiana var. **globosa.** GLOBOSE RED CEDAR.
Location: Pinetum, with the above.

Juniperus virginiana var. **nana pendula.** WEEPING DWARF RED CEDAR.
Location: Pinetum, with the above.

Juniperus virginiana var. **pendula.** DROOPING RED CEDAR.
Location: Pinetum, with the above.

Juniperus virginiana var. **plumosa argentea.** SILVER-SPOTTED RED CEDAR.
Location: Pinetum, with the above.

Juniperus virginiana var. **Schottii.** SCHOTT'S RED CEDAR.
Location: Pinetum, with the above.

Juniperus virginiana var. **tripartita.** NEEDLE-LEAVED DWARF RED CEDAR.
Location: Pinetum, with the above.

GINGKOACEAE. Maiden-hair Tree Family

Gingko. MAIDEN-HAIR TREE

Gingko biloba. MAIDEN-HAIR TREE.
Location: Pinetum, south end of ridge west of Herbaceous

Grounds. Plaza, at railroad depot, N. Y. C. & H. R. R.
Driveway, west of Museum building.
Natural distribution: China and Japan.

Gingko biloba var. **pyramidalis.** COLUMNAR MAIDEN-HAIR TREE
Location: Pinetum, with the above.

TAXACEAE. Yew Family

Cephalotaxus. CLUSTER-FLOWERED YEW

Cephalotaxus drupacea. JAPANESE CLUSTER-FLOWERED YEW
Location: Pinetum, west of Economic Garden.
Natural distribution: China and Japan.

Cephalotaxus Harringtonia var. **fastigiata.** HARRINGTON'S COLUMNAR CLUSTER-FLOWERED YEW.
Location: Pinetum, with the above.
Natural distribution: Japan and China.

Tumion. TORREYA

Tumion nuciferum. JAPANESE TORREYA.
Location: Pinetum, with the above.
Natural distribution: Japan.

Taxus. YEW

Taxus baccata. ENGLISH YEW.
Location: Pinetum, west of Economic Garden.
Natural distribution: Europe to Himalayan Region.

Taxus baccata var. **adpressa.** SHORT-LEAVED ENGLISH YEW.
Location: Pinetum, with the above.

Taxus baccata var. **argentea.** SILVERY ENGLISH YEW.
Location: Pinetum, with the above.

Taxus baccata var. **aurea.** GOLDEN ENGLISH YEW.
Location: Pinetum, with the above.

Taxus baccata var. **Dovastonii.** DOVASTON YEW.
Location: Pinetum, with the above.

Taxus baccata var. **Dovastonii variegata.** VARIEGATED DOVASTON YEW.
Location: Pinetum, with the above.

Taxus baccata var. **fastigiata.** IRISH YEW.
Location: Pinetum, with the above.

Taxus baccata var. **fastigiata aurea.** GOLDEN IRISH YEW.
Location: Pinetum, with the above.

Taxus baccata var. **fastigiata variegata.** SILVERY IRISH YEW.
Location: Pinetum, with the above.

Taxus baccata var. **Jacksonii.** WEEPING ENGLISH YEW.
Location: Pinetum, with the above.

Taxus baccata var. **luteo-baccata.** YELLOW-FRUITED ENGLISH YEW.
Location: Pinetum, with the above.

Taxus baccata var. **procumbens.** PROSTRATE ENGLISH YEW.
Location: Pinetum, with the above.

Taxus baccata var. **repandens.** LOW ENGLISH YEW.
Location: Pinetum, with the above.

Taxus canadensis. AMERICAN YEW.
Location: Pinetum, with the above.
Natural distribution: Northeastern North America.

Taxus cuspidata. JAPANESE YEW.
Location: Pinetum, with the above.
Natural distribution: Japan.

Taxus cuspidata var. **densa.** DENSE JAPANESE YEW.
Location: Pinetum, with the above.

Taxus cuspidata var. **nana.** DWARF JAPANESE YEW.
Location: Pinetum, with the above.

SALICACEAE. Willow Family

Populus. POPLAR

Populus alba. WHITE POPLAR.
Location: Arboretum, south end. Along driveway, west of Conservatory Range I. Ridge west of Herbaceous Grounds valley, north end.
Natural distribution: Europe and Asia.

Populus alba var. **croatica.** BOLLE'S POPLAR.
Location: Arboretum, with the above.
Natural distribution: Turkestan.

Populus balsamifera. BALSAM POPLAR.
Location: Arboretum, with the above.
Natural distribution: Northern North America.

Populus berolinensis. BERLIN POPLAR.
Location: Arboretum.
Hybrid.

Populus candicans. BALM OF GILEAD.
Location: Arboretum. Salicetum.
Natural distribution: Northern North America.

Populus deltoides. CAROLINA POPLAR.
Location: Arboretum.
Natural distribution: Eastern North America.

Populus Eugenei. EUGENE POPLAR.
Location: Arboretum. Salicetum.

Populus grandidentata. LARGE-TOOTHED ASPEN.
Location: Woodland, east of Herbaceous Grounds.
Natural distribution: Northeastern North America.

Populus italica. LOMBARDY POPLAR.
Location: Arboretum. Salicetum. North Bridge. Woodlawn Road Bridge. Entrance to approach of Elevated Railroad.
Natural distribution: Europe.

Populus laurifolia. LAUREL-LEAVED POPLAR.
Location: Arboretum.
Natural distribution: Siberia.

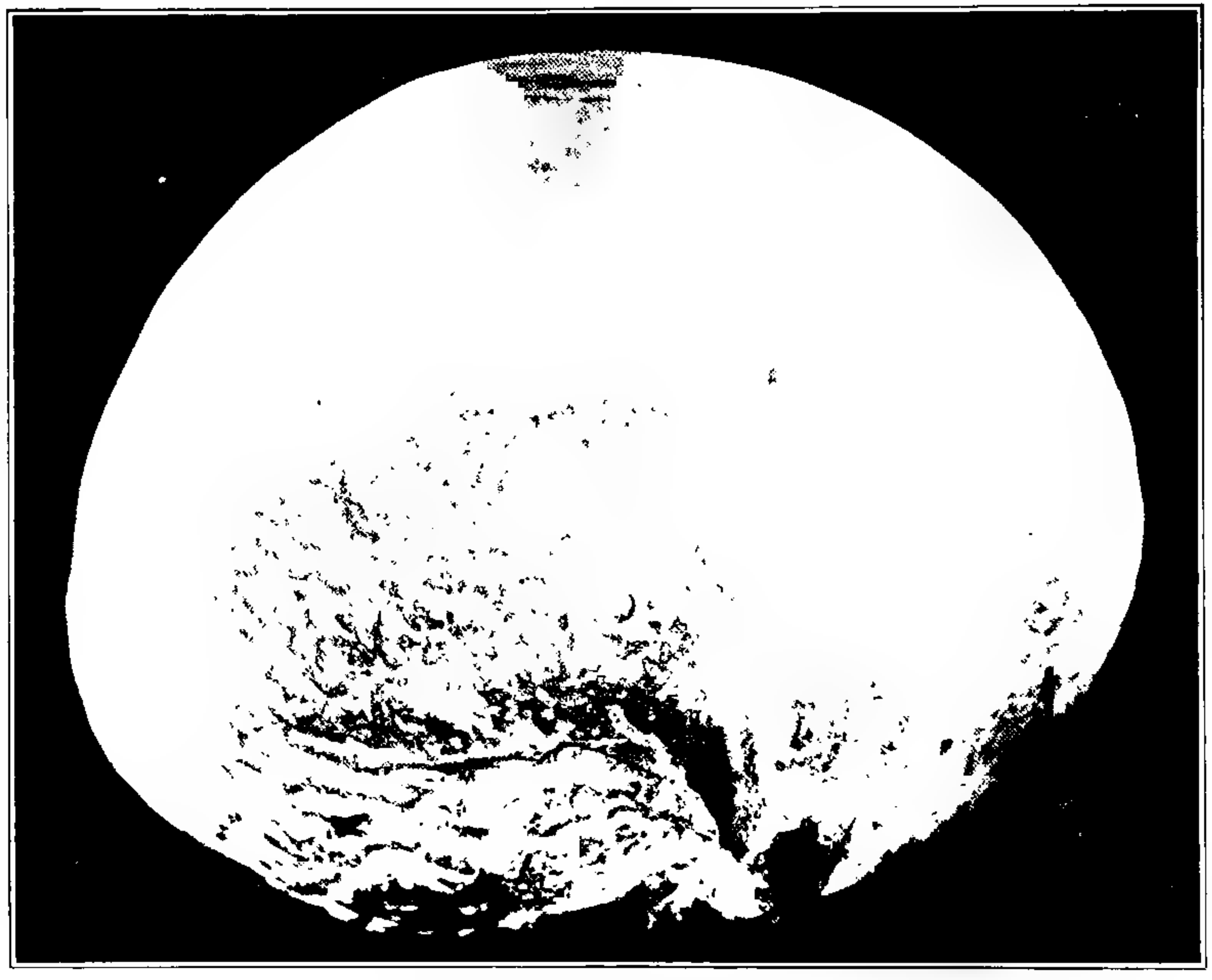
Populus nigra. BLACK POPLAR.
Location: Arboretum.
Natural distribution: Europe and Asia.

Populus Petrowskiana. PETROWSKY'S POPLAR.
Location: Arboretum.
Hybrid.

Populus Sargentii. WESTERN COTTONWOOD.
Location: Arboretum.
Natural distribution: Western North America.

Populus serotina var. **Van Geerti.** VAN GEERT'S LATE POPLAR.
Location: Arboretum.
Hybrid.

Populus Simonii. SIMON'S BALSAM POPLAR.
Location: Arboretum. Along driveway, west of Conservatory Range 1. West end of Long Bridge.
Natural distribution: Amur Valley to China.



GIANT PUFFBALL, LYCOPERDON GIGANTEUM

A GIANT PUFFBALL

(With plate 205)

A splendid specimen of the giant puffball, *Lycoperdon giganteum*, measuring a foot in diameter and weighing three and one half pounds was recently found on the grounds of the New York Botanical Garden by Mr. William Curry, who brought it to me to be photographed and dried for the Garden herbarium.

The species has been collected at least three times before in this vicinity, but none of the specimens approached a foot in diameter. Authentic records have been made of specimens three feet in diameter, although they rarely become much larger than a man's head. During a warm, wet season like the present one, conditions would favor rapid and unusual development.

The giant puffball, easily recognized by its large size and smooth, white appearance, occurs infrequently in fields, pastures, or woods throughout most of the United States, as well as in parts of Europe and Asia. The flavor of this species is particularly good, and little cooking is required. The writer remembers coming suddenly some years ago upon four large giant puffballs grouped picturesquely about an old stump in a beech grove near Ithaca, New York, and the pleasure he had, not only in gazing at them, but in getting them home and distributing them in quarter sections to a number of his friends.

Puffballs are the safest of all fungi for the beginner in mycophagy, none of them being poisonous. They may be cooked alone in various ways, or used in stews and omelets, and for stuffing roast fowls. When used in stews and omelets, they should be stewed first. All kinds except the very small ones should first be peeled and cut into slices or cubes, after which they may be fried quickly in butter, or dipped in beaten egg and fried like egg-plant, or cooked in any of the ways recommended for the ordinary mushroom. The smaller kinds are much inferior in flavor to the larger ones and need a few specimens of some good mushroom to make them attractive.

W. A. MURRILL,
Assistant Director

AUTUMN LECTURES, 1917

September 1. "Collecting Fungi in the Catskills," by Dr. W. A. Murrill.

September 8. "The Origin and History of Soils," by Dr. A. Hollick.

September 15. "Growing Fresh Vegetables in the Back Yard," by Mr. H. G. Parsons.

September 22. "Some Botanical Features of Northern Cape Breton," by Dr. G. E. Nichols.

(Exhibition of dahlias, September 22 and 23.)

September 29. "Growing Nut Trees," by Dr. W. C. Deming.

October 6. "Autumn Coloration," by Dr. A. B. Stout.

October 13. "The Relation of Forests to Water Supply," by Dr. G. C. Fisher.

(Catskill Aqueduct Celebration Lecture.)

October 20. "Fall Planting and Winter Protection," by Mr. G. V. Nash.

The lectures, which occupy an hour, will be illustrated by lantern slides and otherwise. Doors closed at 4:00; late comers admitted at 4:15.

The museum building is reached by the Harlem Division of the New York Central and Hudson River Railroad to Botanical Garden Station, by trolley cars to Bedford Park, or by the Third Avenue Elevated Railway to Botanical Garden, Bronx Park. Visitors coming by the Subway change to the Elevated Railway at 149th Street and Third Avenue. Those coming by the New York, Westchester and Boston Railway change at 180th Street for crosstown trolley, transferring north at Third Avenue.

NOTES, NEWS AND COMMENT

The following visiting botanists have registered in the library during July: Mr. Oakes Ames, North Easton, Mass., Dr. Jean Broadhurst, New York, N. Y., Professor Arthur H. Graves. New Haven, Conn., Professor George M. Reed, Columbia, Mo., and Professor I. M. Lewis, Austin, Tex.

Professor C. R. Orton, of the Pennsylvania State College, has been awarded a scholarship for one month during the summer to enable him to continue his researches on *Phyllachora*, a genus of fungi which occurs parasitically on various plants, especially on grasses.

About fifty students of the summer school of Columbia University, accompanied by Mr. L. W. Crawford and Mr. George Meredith, visited the Garden on the afternoon of July 26 and were conducted through portions of the grounds and buildings by members of the Garden staff.

Dr. Bradley M. Davis, of the University of Pennsylvania, visited the Garden on August 2.

Three plants from the herbaceous collections were tried out as border annuals in the flower beds near conservatory range 1, and proved to be worthy of more general use. The Venice mallow or flower-of-an-hour, *Hibiscus trionum*, a native of southern Europe but adventive to eastern North America, has been showing cream-colored flowers with purplish edges and almost black throats for a month or more. *Anoda hastata*, a purple- or blue-flowered mallow from Mexico and the West Indies, has a weedy branching habit and bears many flowers on long peduncles. *Diplotaxis tenuifolia*, a European weed, adventive to the eastern United States and California, gives a mass of sulphur-yellow blooms nearly all summer.

Meteorology for July.—The total precipitation for the month was 2.30 inches. The maximum temperatures for each week were 91° on the 2d, 84° on the 13th, 92° on the 22d, and *100° on the 30th and the 31st.* The minimum temperatures were *57° on the 5th*, 58° on the 11th, 67° on the 17th, and 62° on the 28th.

ACCESSIONS

PLANTS AND SEEDS

3 plants for conservatory tanks. (By exchange with Mr. Charles L. Tricker.)

7 plants for conservatories and nurseries. (By exchange with U. S. Department of Agriculture, Bureau of Plant Industry.)

2 plants for conservatories. (Given by Mrs. Henry Hubbard.)

1 plant of *Arisaema tryphyllum*. (Given by Miss E. M. Kittredge.)

1 plant of *Pentstemon Smallii*. (Given by Mr. G. Clyde Fisher.)

7 plants, all orchids, for conservatories. (Given by Mr. Godfrey Davidson.)

2 plants, *Opuntia* sp., for conservatories. (Given by Mr. Robert Leslie.)

1 plant, *Opuntia megacantha*. (By exchange with U. S. National Museum, through Dr. J. N. Rose.)

1 plant, *Camptosorus rhizophyllus*. (Given by Miss E. M. Kittredge.)

5 plants of *Citrus medica nanus*. (By exchange with U. S. Department of Agriculture, Bureau of Plant Industry.)

40 cuttings of roses. (Given by Mrs. W. Gilman Thompson.)

MUSEUMS AND HERBARIUM

951 specimens of flowering plants from Newfoundland. (By exchange with Harvard University.)

748 specimens of flowering plants from the northern counties of New York. (By exchange with Harvard University.)

1 specimen of *Ananas macrodonta* from Mexico. (By exchange with the Bureau of Plant Industry.)

64 specimens of flowering plants from New Mexico. (By exchange with the United States National Museum.)

639 specimens of flowering plants from the A. Commons herbarium. (By exchange with the Academy of Natural Sciences, Philadelphia.)

3 specimens of hepaticae from New England. (By exchange with Miss Annie Lorenz)

22 specimens of fungi from Venezuela. (Collected by Dr. J. N. Rose.)

17 specimens of mosses and hepatics from Chili. (By exchange with Mr. Irénée Theriot.)

104 specimens of flowering plants for the local herbarium. (By exchange with Rev. L. H. Lighthipe.)

1 specimen of *Stenochlaena Kunzeana* from Florida. (Given by Miss Olivia Rodham.)

4 specimens of hepatics from Florida. (By exchange with Mr. Severin Rapp.)

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

117 specimens of flowering plants from Arizona. (Collected by Mr. C. T. Vorhies.)

1 specimen of *Phacidium crustaceum* from Massachusetts. (By exchange with Miss Grace B. Nutting.)

2 specimens of fungi from Colorado. (By exchange with Professor Ellsworth Bethel.)

1 specimen of *Urvillea ulmacea* from Guatemala. (By exchange with Professor E. W. D. Holway.)

1 specimen of *Giberella pulicaris* from the Canal Zone. (By exchange with Professor C. R. Orton.)

1 specimen of *Tapesia arachnoidea* from New York. (By exchange with Professor H. M. Fitzpatrick.)

3 specimens of fungi from Porto Rico. (By exchange with Professor John A. Stevenson.)

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

20 specimens "Fungi Wisconsinenses Exsiccati." (Distributed by Dr. J. J. Davis.)

14 specimens of fungi from Colorado. (By exchange with Professor Ellsworth Bethel.)

1 specimen of fungus from North Carolina. (By exchange with Professor W. C. Coker.)

1 specimen of *Merulius lacrymans* from Ontario. (By exchange with Professor John Dearness.)

3 specimens of fungi from Montana. (By exchange with Dr. J. R. Weir.)

1 specimen of fungus from Washington. (By exchange with Professor J. W. Hotson.)

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

23 specimens of discomycetes from various localities. (By exchange with Professor C. G. Lloyd.)

25 specimens of fungi from Cuba. (By exchange with Professor W. T. Horne.)

1 specimen of *Underwoodia columnaris* from New York. (By exchange with Mr. Stewart H. Burnham.)

1 specimen of *Sarcosphaeria coronaria* from New York. (By exchange with Mr. Stewart H. Burnham.)

2 specimens of fungi from Ontario, Canada. (By exchange with Professor John Dearness.)

25 specimens of fungi from Oregon. (By exchange with Mr. Henry C. Gilbert.)

5 specimens of fungi from Canada. (By exchange with Mr. R. J. Blair.)

3 specimens of *Xylaria* from Virginia. (By exchange with Professor F. D. Fromme.)

4 specimens of fungi from London, Canada. (By exchange with Professor John Dearness.)

4 specimens of fungi from Brookline, Massachusetts. (By exchange with Mr. Simon Davis.)

3 specimens of cup fungi from Ontario. (By exchange with Professor John Dearness.)

5 specimens of fungi from New Jersey. (By exchange with Mr. C. A. Schwarze.)

5 specimens of discomycetes from New York. (By exchange with Mr. Stewart H. Burnham.)

225 specimens of flowering plants from Nicaragua. (Collected by Dr. C. F. Baker.)

105 specimens "Chloris Platensis Argentina." (Distributed by Professor C. M. Hicken.)

116 specimens of algae from the Philippine Islands. (By exchange with the Bureau of Science, Manila.)

17 lantern slides. (Given by Mrs. N. L. Britton.)

2 specimens of "balsa wood." (Given by Mr. Robert A. Marr.)

38 specimens of mosses from Florida. (By exchange with Mr. Severin Rapp.)

55 specimens of flowering plants for the local herbarium. (By exchange with the Academy of Natural Sciences, Philadelphia.)

5 photographs of "Pita-Floja." from the Canal Zone and Guatemala. (By exchange with the Bureau of Plant Industry.)

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Vol. XVIII September, 1917 No. 213

JOURNAL

OF

The New York Botanical Garden

EDITOR

KENNETH ROWLAND BOYNTON

Head Gardener's Assistant

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Colony of *Cephalocereus Deeringii* growing on Lower Matecumbe Key, Florida. In 1916 and 1917 several colonies similar to this one and numerous individual plants were found in the southern part of the hammock.

JOURNAL

OF

The New York Botanical Garden

VOL. XVIII September, 1917 No. 213

THE TREE CACTI OF THE FLORIDA KEYS

(WITH PLATE 206)

During the earlier half of the last century, perhaps in the thirties or in the forties, a large cactus with columnar and fluted stems and branches was discovered on Key West.

The existence of this plant was first made known to a few botanists through meager specimens collected and distributed by Mr. Bennett, who at one time was a resident of Key West; but it was not brought to the notice of the botanical public until the publication of the first edition of Chapman's "Flora of the Southern United States," in 1860.

Partly on account of its isolated habitat and limited geographical distribution and partly on account of the difficulty of making good or even determinable herbarium specimens of such very succulent and bulky plants, this, like many other kinds of cacti, was for a long time imperfectly understood and consequently wrongly interpreted. For a long period this interesting plant was either ignored or associated with a then little-known and still imperfectly understood species that was originally described from somewhere in the West Indies.

After an interval of about fifty years the flowers were again collected; but no studies concerning the relationships of the plant were attempted by any one. Again, an interval, this time of about twenty-five years' duration, elapsed without further reference to the plant.

[JOURNAL for August, 1917 (18): 177–198 was issued September 20, 1917.]

In April, 1909, in connection with our studies and exploration in Florida and the West Indies, Dr. Britton and Dr. Howe rediscovered the plant in the remnant of the Key West hammock. This opportunity to study and photograph it was taken advantage of, and in addition to living plants, both flowers and fruits and photographs were secured. Thus nearly three quarters of a century after this plant was discovered and brought to the notice of botanists its true relationships were determined. It was found to belong to a group of cacti, the genus *Cephalocereus*, which comprises between forty and fifty species widely distributed in the American tropics. Naturally enough, its closest relatives have been found to be plants of similar habit growing on the other side of the Gulf Stream in the Bahamas and in Cuba.

The plant was named for the chain of islands, the Florida Keys, at the western extremity of which Key West is situated and where *Cephalocereus keyensis* was for a long time very abundant. In recent years with the destruction of the hammock for securing firewood and for developing building sites, this interesting cactus has become scarce, until at present it is on the verge of extermination in its natural habitat. A dozen years ago many fine and robust trees, some of them over twenty feet high, stood in the hammock east of the city. These have long since disappeared. The writer has counted a score of prostrate skeleton remains scattered over the hammock floor which were either cut down by wood hunters or blown down by storms. Many small plants and a few small trees remained standing as late as 1915. The trees have now been destroyed, and nearly all of the small plants have been exterminated during the past year by the construction of a baseball field and by the clearing of building lots.

Fortunately, a number of specimens of this disappearing species have been secured and planted in certain tropical hammocks in the Miami region by a patron of botany who is mentioned in a subsequent page of this paper. While considering the cacti of Key West, aside from the prickly-pears (*Opuntiae*), it may be interesting to note that in the earlier part of the last century, before the destruction of the hammock had been carried

on to the extent of exterminating various kinds of plants, there were evidently four different kinds of cacti of the *Cereus* group growing wild on the island. This fact is recorded on the pages of a manuscript list, now preserved in the Garden library, of the plants of the southern states, made many years ago by Dr. Chapman and on which he founded his "Flora" already referred to. On the page where the cacti are recorded, we find the statement that there are four kinds of *Cereus* at Key West. These were, without much doubt, the plant already discussed, the "dildoe" of the Keys, *Acanthocereus pentagonus*, which still grows there, a native night-blooming cereus, *Harrisia*, and a naturalized night-blooming cereus, *Hylocereus*. Both of the night-blooming cerei apparently long since were exterminated, as a thorough search by the writer and others has failed to bring them to light.

In recent years an additional plant of this relationship has come to notice in a different group of the Florida Keys. It may be named and described as follows:

Cephalocereus Deeringii Small, sp. nov.

Plant slender, often becoming 10 m. tall, the stem erect, simple or with few erect, short or elongate fastigiate branches which are ascending or erect and appressed to the main stem, the branches deep-green, but sometimes rather light, usually 10-ribbed, sometimes 9-ribbed: areolae very copiously hairy, the hairs rather persistent; spines acicular, 25–31 together, the longer ones 1 cm. long or more: flowers opening in the afternoon, about 6 cm. long, elongate-campanulate, light-green without: sepals obovate, obtuse, rounded, or emarginate: petals 9–11 mm. long, clawless, oval, rounded at the apex, erose, scarcely narrowed at the base: anthers less than 2 mm. long: berries much depressed, 3.5–4 cm. in diameter, dark-red; seeds about 2 mm. long, shining.

Rocky hammocks, Lower Matecumbe Key, Florida, J. K. Small 7790 (type in herb. N. Y. Botanical Garden).

This species was first casually observed on Lower Matecumbe Key, Florida, more than a decade ago by John Soar and Charles T. Simpson. Without further examination it was assumed to be identical with the species of *Cephalocereus* long known to grow on Key West.

Little attention was paid to the plant until less than two years ago, when our botanical exploration of the Florida Keys was revived. Recalling the report of the occurrence of such a plant on Lower Matecumbe Key, an attempt was made to locate specimens in the hammock while sailing along the shore of that island. As no tall cactus was observed, it was assumed that recent hurricanes had blown down all the plants; and even a subsequent search ashore in the northern part of the hammock failed to reveal them. However, a landing near the southern end of the island in March, 1916, gave opportunity for further search, and then an abundance of the cactus was encountered. As had been suspected, all the older and larger plants were prostrate on the hammock floor as a result of hurricanes, and the younger plants had not yet grown up as high as the tree-tops. Considering the slight foothold, the habit of growth, and the weight of the stems and branches, it is difficult to understand how the plant can ordinarily maintain an erect position.

The only relative of this plant in Florida is *Cephalocereus keyensis* which is now known only from the limestone island of Key West, although it was formerly found also on the neighboring Boca Chica Key. The fact that Lower Matecumbe Key is of coral-rock and of a later geological formation than Key West aroused the suspicion that this very local cactus might be different from that growing on limestone only at the western extension of the lower keys. An examination of the stems and the flowers of plants from both localities shows that while *Cephalocereus keyensis* has areoles with usually fewer than 15 (9–15) spines, and acute, either abruptly pointed or acuminate, sepals and petals, *Cephalocereus Deeringii* has areoles supporting usually more than 25 (25 31) spines, and obtuse, rounded, or emarginate sepals and petals. The habit of growth of the two plants is different. The full-grown plants of *Cephalocereus keyensis* are copiously and intricately branched, while those of *Cephalocereus Deeringii* are nearly simple-stemmed or with few straight erect or ascending branches.

The plant is named for Charles Deering, whose deep interest in the botanical exploration of Florida, and in the preservation

of its hammocks from destruction and its rare native plants from extermination, enabled us to rediscover, study, and satisfactorily determine the relationship of this cactus.

Plants similar to those from Lower Matecumbe Key have been collected on Umbrella Key, which is a few miles north of Lower Matecumbe. These plants represent, without much doubt, the same species. Their stems, however, were slightly more robust, and as neither flowers nor fruit were found, its status is yet slightly doubtful.

JOHN K. SMALL

HARDY WOODY PLANTS IN THE NEW YORK BOTANICAL GARDEN

(Continued)

Populus Rasumowskyana. RASUMOWSKY'S POPLAR.
Location: Salicetum.
Hybrid.

Populus suaveolens. FRAGANT POPLAR.
Location: Arboretum.
Natural distribution: Siberia, Mongolia and China.

Populus tremula. EUROPEAN ASPEN.
Location: Arboretum.
Natural distribution: Europe and Asia.

Populus tremuloides. AMERICAN ASPEN.
Location: Arboretum.
Natural distribution: Northern North America.

Populus trichocarpa. BLACK COTTONWOOD.
Location: Arboretum.
Natural distribution: Northwestern North America.

Populus sp. CHOPO POPLAR.
Location: Arboretum.
Introduced by the Bureau of Plant Industry from Grenada, Spain.

Salix. WILLOW

Salix amygdalina var. **angustifolia.** NARROW-LEAVED ALMOND WILLOW.

Location: Fruticetum.
Natural distribution: Europe and Asia.

Salix amygdaloides. PEACH-LEAVED WILLOW.
Location: Salicetum.
Natural distribution: Central and western United States.

Salix argentea. SILKY SAND WILLOW.
Location: Fruticetum.
Natural distribution: Europe.

Salix babylonica. WELPING WILLOW.
Location: Salicetum. Arboretum.

Salix babylonica var. **annularis.** RING WILLOW.
Location: Arboretum.

Salix Basfordiana. BASFORD WILLOW.
Location: Salicetum.
Natural distribution: France.

Salix bicolor var. **Borreriana.** BORRER'S TEA-LEAVED WILLOW.
Location: Fruticetum.
Natural distribution: Europe.

Salix bicolor var. **Weigeliana.** WEIGEL'S WILLOW.
Location: Salicetum.
Natural distribution: Silesian Alps.

Salix calodendron. WIMMER'S WILLOW.
Location: Fruticetum.
Hybrid.

Salix caprea var. **elliptica.** ELLIPTIC-LEAVED GOAT WILLOW.
Location: Salicetum.
Natural distribution: Europe and Asia.

Salix cinerea. ASH WILLOW.
Location: Fruticetum. Salicetum.
Natural distribution: Europe and Asia.

Salix cinerea var. **aquatica.** BROAD-LEAVED ASH WILLOW.
Location: Fruticetum.

Salix cordata. HEART-LEAVED WILLOW.
Location: Salicetum. Fruticetum.
Natural distribution: Northern North America.

Salix cordata var. **angustata.** NARROW HEART-LEAVED WILLOW.
Location: Fruticetum.
Natural distribution: Northern North America.

Salix cordata var. **rigida.** EASTERN HEART-LEAVED WILLOW.
Location: Salicetum.
Natural distribution: New Brunswick to Pennsylvania.

Salix discolor. PUSSY WILLOW.
Location: Fruticetum.
Natural distribution: Northeastern North America.

Salix elegantissima. THURLOW'S WEEPING WILLOW.
Location: Salicetum.
Natural distribution: Japan.

Salix Fendleriana. FENDLER'S WILLOW.
Location: Fruticetum.
Natural distribution: Rocky Mountain region.

Salix Forbiana. FORBY'S WILLOW.
Location: Fruticetum.
Hybrid.

Salix fragilis. BRITTLE WILLOW.
Location: Salicetum.
Natural distribution: Europe and northern Asia.

Salix glaucophylla var. **angustifolia.** NARROW GLAUCOUS-LEAVED WILLOW.
Location: Fruticetum.
Natural distribution: Northern North America.

Salix gracilistyla. THUNBERG'S WILLOW.
Location: Fruticetum. North shore of Aquatic Garden.
Natural distribution: Japan, Korea, and Manchuria.

Salix hexandra. EHRHART'S WILLOW.
Location: Fruticetum.
Natural distribution: Europe.

Salix holosericea. SMITH'S WILLOW.
Location: Salicetum. Fruticetum.
Natural distribution: Northern Europe.

Salix holosericea var. **ferruginea.** SMITH'S BROWN WILLOW.
Location: Fruticetum.

Salix incana. HOARY WILLOW.
Location: Fruticetum.
Natural distribution: Europe and Asia Minor.

Salix interior. SANDBAR WILLOW.
Location: Salicetum. Fruticetum.
Natural distribution: Northern North America.

Salix laurina. LAUREL WILLOW.
Location: Fruticetum.
Natural distribution: Northern Europe.

Salix lucida. SHINING WILLOW.
Location: Fruticetum.
Natural distribution: Northern North America.

Salix missouriensis. MISSOURI WILLOW.
Location: Salicetum.
Natural distribution: Central United States.

Salix missouriensis × cordata. HYBRID MISSOURI WILLOW.
Location: Salicetum.
Hybrid.

Salix mollissima. SOFT WILLOW.
Location: Fruticetum.
Natural distribution: Europe.

Salix nigra. BLACK WILLOW.
Location: Salicetum.
Natural distribution: Eastern North America.

Salix nigricans var. **elliptica.** ELLIPTIC-LEAVED BLACKISH WILLOW.
Location: Fruticetum. Salicetum.
Natural distribution: Europe.

Salix nigricans var. **obovata.** ANDERSON'S WILLOW.
Location: Fruticetum.

Salix nigricans var. **petraea.** ROCK BLACKISH WILLOW.
Location: Fruticetum.

Salix nigricans var. **rotundata.** ROUND-LEAVED BLACKISH WILLOW.
Location: Fruticetum.

Salix pendulina. WISCONSIN WEEPING WILLOW.
Location: Arboretum.
Hybrid.

Salix pentandra. BAY-LEAVED WILLOW.
Location: Salicetum.
Natural distribution: Europe and northern Asia.

Salix petiolaris. SLENDER WILLOW.

Location: Fruticetum.

Natural distribution: Central and northeastern North America.

Salix Pierotii. PIEROT'S WILLOW.

Location: Salicetum.

Natural distribution: Japan.

Salix purpurea. PURPLE WILLOW.

Location: Fruticetum. Salicetum.

Natural distribution: Europe, northern Africa and Asia.

Salix purpurea var. **angustifolia.** NARROW-LEAVED PURPLE WILLOW.

Location: Fruticetum.

COLLECTING FUNGI AT THE DELAWARE WATER GAP

The writer spent a vacation of two weeks, August 1–15, 1917, at "The Glenwood," Delaware Water Gap, Pennsylvania, and found opportunity to secure a fairly representative collection of fungi for that season of the year. The region offers considerable variety in exposure, soil, and host plants, the forests being oak-chestnut intermixed with hemlock and rhododendron. The northern slopes of Mt. Minsi are particularly good for fleshy fungi during rather dry weather, since they are well watered and well shaded.

A list of the fungi obtained will probably appear later in *Mycologia*. The ravages of the chestnut canker were very conspicuous, all of the chestnut trees seen being either dead or dying. Some dead trees in and near the village were measured and a few were found to reach a diameter of 8 feet at breast height. Many of the hotels and private homes depended largely upon the chestnut tree for shade, and the death of these magnificent trees will be severely felt.

Thanks are due the management of the hotel for various courtesies extended me, and many of the guests for assisting me in collecting.

W. A. MURRILL,
Assistant Director

A DISEASE OF THE HEMLOCK TREE

A disease of the hemlock tree due to a woody, poroid fungus, *Fomitiporia tsugina* Murrill, was discovered by Mr. Percy Wilson at East Hebron, New Hampshire, in August, 1905.

In July, 1917, Mr. Wilson revisited the type locality and gathered specimens from the trunk of the same tree, which was found to be dead and prostrate on the ground. These later specimens were over an inch thick and broadly effused over the trunk.

Living hemlocks recently examined by Mr. Wilson near Bristol, New Hampshire, were also found to be attacked by this fungus, which is known to occur in New Hampshire and New York, always confined to the hemlock.

The disease is probably important and should be further investigated both by foresters and mycologists.

W. A. MURRILL,
Assistant Director

GREENHOUSE COURSES IN GARDENING

The first winter course in gardening will be given at the propagating houses on Saturday mornings in November and December, commencing Saturday, November 3rd, at 9 o'clock, and ending December 15th. The same course will be given on other days of the week, mornings or afternoons, if more convenient to persons wishing to attend.

The propagating houses are located on the eastern side of the grounds, a short distance from the Mansion and from the School Garden. The Allerton Avenue station of the White Plains Road extension of the subway is within about five minutes' walk of the propagating houses, and is the nearest railroad station to them.

The instruction will include lectures and conferences, greenhouse bench work in propagating, potting and seed testing, and cold-frame practice.

The fee for this course will be $10, which will include necessary supplies and material.

A second winter course will be organized for January and February, 1918.

All correspondence relative to these courses should be addressed to

HENRY GRISCOM PARSONS,
Supervisor of Gardening Instruction, Mansion,
New York Botanical Garden, Bronx Park.

NOTES, NEWS AND COMMENT

The following visiting botanists enrolled in the library during August: Professor Bradley M. Davis, University of Pennsylvania; Professor George M. Reed, Columbia, Mo.; L. H. Knoche, San Jose, Cal.; Professor H. M. Fitzpatrick and Dr. A. Le Roy Andrews, Ithaca, N. Y.; Professor W. C. Coker, Chapel Hill, N. C.; A. D. Shamel, Riverside, Cal.; Professor W. C. Twiss, University of Utah; Professor C. R. Orton and Dr. L. O. Overholts, State College, Pa.; and Dr. J. N. Rose, Washington, D. C.

Through the kindness of Dr. J. N. Rose the library has recently received a photostat copy of C. A. Lemaire's *Iconographie descriptive des cactées*, Paris, 1841–47.

It is said that rose leaf-blotch, caused by *Actinonema Rosae*, may be prevented by repeated spraying with lime-sulphur solution, beginning before the buds open in the spring and repeating at intervals of ten days throughout the growing season, except when the roses are in bloom.

The gladiolus is subject to a hard-rot disease due to *Septoria Gladioli*, which affects both the leaves and the corms. Crop

rotation and the burning of affected leaves in the autumn are suggested by L. M. Massey as means of partial control.

Prof. H. M. Fitzpatrick of Cornell University was granted a scholarship at the Garden for one month to aid him in his work on certain groups of microscopic fungi.

Mr. L. O. Overholts, of State College, Pennsylvania, was given a research scholarship for August 15 to September 15, to complete his study of *Pholiota*, a large genus of gill-fungi, for *North American Flora*.

Professor W. C. Coker, of the University of North Carolina, continued his studies of the coral-fungi in the herbarium of the Garden during August.

The fall crocus or meadow saffron, began blooming in the latter part of September. The pink *Colchicum autumnale*, and the white *Colchicum speciosum album*, natives of Europe and North Africa, and the Caucasus respectively, form their large strap-like leaves in the spring, then show no signs of life until the autumn, when the flowers appear.

Dr. A. LeRoy Andrews, of Ithaca, N. Y., spent a month after August 15 on a scholarship grant at the Garden, studying the Weisiaceae group of mosses.

Meteorology for August. The total precipitation for the month was 0.81 inches. Maximum temperatures for each week were as follows: *100° on the 1st*, 91° on the 6th, 88° on the 12th, 89° on the 20th, and 82° on the 27th. The minimum temperatures were 58° on the 5th and 11th, 57° on the 18th, *53° on the 25th*, and 55° on the 28th.

ACCESSIONS

MUSEUMS AND HERBARIUM

1,085 specimens of flowering plants from Colombia, Panama, and Central America. (By exchange with the United States National Museum.)

1 specimen of *Bumelia lycioides* from Mississippi. (By exchange with Professor J. M. Beal.)

150 specimens "Phycotheca Boreali-Americana," fascicles 43–45. (Distributed by Messrs. Collins, Holden and Setchell.)

22 colored lantern-slides. (Given by Mrs. N. L. Britton.)

1 specimen of *Albizzia Julibrissin* from New Jersey. (Given by Dr. Carl A. Schwarze.)

450 specimens of flowering plants from the Philippine Islands. (By exchange with the Bureau of Science, Manila.)

340 specimens of flowering plants from British East Africa. (By exchange with the United States National Museum.)

2 specimens of *Capriola Dactylon* from North Carolina. (Given by Mr. Albert N. Hansen.)

4 specimens of Hepaticae from Vermont. (By exchange with Miss Annie Lorenz.)

2 photographs of *Ficus Brittonii* from Curacao. (Given by Mr. H. M. Curran.)

1 specimen of *Woodsia ilvensis* from Quebec. (By exchange with Mr. John Adams.)

710 specimens of flowering plants from North America and the Canary Islands. (By exchange with the United States National Museum.)

201 specimens of flowering plants from Texas (By exchange with Harvard University.)

26 specimens, "Fungi Dakotenses," fascicle 18. (Distributed by Dr. J. F. Brenckle.)

21 specimens of polypores from New Mexico. (By exchange with Mr. W. H. Long.)

2 specimens of woody fungi from New Hampshire. (Collected by Mr. Percy Wilson.)

2 specimens of *Grifola Sumstinei* from New York. (By exchange with Miss A. Kahle.)

32 specimens of parasitic fungi from various localities. (By exchange with Professor C. R. Orton.)

56 miscellaneous specimens of ferns. (By exchange with the United States National Museum.)

8 specimens of marine algae from Washington. (Given by Professor T. C. Frye.)

1 specimen of *Tyromyces Spraguei* from New York. (Collected by Mr. Percy Wilson.)

71 specimens of flowering plants for the local herbarium. (Given by Rev. L. H Lighthipe.)

2 specimens of marine algae from Florida. (Given by Dr. H. H. M. Bowman.)

PLANTS AND SEEDS

1 plant, *Persea persea*, for conservatories. (Given by Mrs. David J. Kelley.)
66 plants for conservatories. (By exchange with Mr. A. J. Manda.)
1 plant, *Maranta* sp., for conservatories. (Given by Mr. W. C. Orchard.)
2 plants of *Araucaria Braziliensis*. (Given by Dr. R. T. Morris.)
19 plants for conservatories. (By exchange with Fairmount Park, Philadelphia.)
3 plants of *Persea persea* for conservatories. (Given by Mr. Donald Roebling.)
3 plants, all cacti, for conservatories. (Given by Mr. H. D. Hall.)
11 plants for conservatories. (Given by Mr. John Sommer.)
2 plants for conservatories. (By exchange with Missouri Botanical Garden.)
77 plants. (Derived from seed from various sources.)
1 packet of seeds of *Lepargyrea argentea*. (Given by Mr. L. J. Hersey.)
2 packets of seeds. (By exchange with Missouri Botanical Garden.)

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Vol. 9 (now complete), parts 1 and 2, 1907; part 3, 1910; part 4, 1915; parts 5, 6, and 7, 1916. Polyporaceae—Agaricaceae (pars). (Parts 1 and 2 no longer sold separately.)

Vol. 10, part 1, 1914; parts 2 and 3, 1917. Agaricaceae (pars).

Vol. 15, parts 1 and 2, 1913. Sphagnaceae—Leucobryaceae.

Vol. 16, part 1, 1909. Ophioglossaceae—Cyatheaceae (pars).

Vol. 17, part 1, 1909; part 2, 1912; part 3, 1915. Typhaceae—Poaceae (pars).

Vol. 21, part 1, 1916; part 2, 1917. Chenopodiaceae.

Vol. 22, parts 1 and 2, 1905; parts 3 and 4, 1908; part 5, 1913. Podostemonaceae—Rosaceae (pars).

Vol. 25, part 1, 1907; part 2, 1910; part 3, 1911. Geraniaceae—Burseraceae.

Vol. 29, part 1, 1914. Clethraceae—Ericaceae.

Vol. 34, part 1, 1914; part 2, 1915; part 3, 1916. Carduaceae—Anthemideae.

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OF

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EDITOR

KENNETH ROWLAND BOYNTON

Head Gardener's Assistant

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WALTER S. GROESBECK, *Clerk and Accountant*
ARTHUR J. CORBETT, *Superintendent of Buildings and Grounds*
HENRY G. PARSONS, *Supervisor of Gardening Instruction*

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HYBRID CHESTNUTS AND OTHER HYBRIDS

The writer recently made an interesting excursion in company with Dr. B. T. Galloway, Dr. David Fairchild, Mr. Peter Bisset, and Mr. Samuel Luttrell, to the experimental grounds of Dr. Van Fleet, located several miles northeast of Washington.

Dr. Van Fleet is one of the most successful rose hybridizers in America. The beautiful pink rose bearing his name has been a great favorite both with him and Mrs. Van Fleet. The name it now bears was given by the dealer who first introduced it to the trade. Several fine roses were seen still in bloom; among them the new Ever-blooming Jersey Beauty; *Rosa omeiensis*, of Chinese origin, which has single flowers and foliage resembling the Mimosa; and an ever-blooming, pink, partly double hybrid of *Rosa rugosa* with a tea rose, which is very fragrant and is really a fine rose.

A row of Cascara bushes was seen, all in fruit. The leaves are green and attractive and the green bark is marked with white, somewhat as in moosewood. This shrub of the Pacific coast is perfectly hardy at Washington and might be so in New York. It grows well from seed and is quite decorative.

A much finer barberry than *B. Thunbergii*, the well-known Japanese species, is *B. Wilsonii*, from China. It grows just as rapidly and the foliage is much finer and better colored. Anyone interested in hedges should have this plant.

[JOURNAL for September, 1917 (18): 199–211, was issued October 23, 1917.]

The ever-bearing strawberry, which grows well on dry banks, was of much interest. Like the tea rose, it flowers and fruits all season. Dr. Van Fleet also showed us red, white, and black raspberries fruiting from August to October, which is much later than the usual season for this fruit.

But by far the most interesting plants shown me by Dr. Van Fleet were his hybrid chestnuts, covering an area of four acres, planted 6 to 8 feet apart in a cultivated strip about a yard wide, the rows being 12 feet apart, with the cowpea and soy bean as a cover crop. Many of the trees were only eighteen months old and bore some fruit; others were two to three years old with abundant fruit. The rabbits are kept away from the young trees by binding them with cardboard or thin wooden strips.

Three main lines of hybrid experiments were attempted by Dr. Van Fleet, using the Japanese chestnut, the American chinquapin, and the immune Chinese chestnut recently discovered by Meyer. The method pursued was to cross two selected parents and take the fruit obtained and plant it in quantities to get the range, then to select according to flavor, size, and immunity. All stages were seen, from a large, sweet chinquapin to a Japanese chestnut having fruits the size of a large marble, but of poor flavor and good only for cooking. The more chinquapin stock, the better flavor. The hybrids of the chinquapin and Japanese chestnut seem to be practically immune from the chestnut canker. I do not remember seeing a single plant of this group attacked by the canker. Many of the intermediate forms produced nuts of excellent flavor.

The advantage of using the Chinese chestnut lies in the fact that the nut is very sweet, with soft skin, and much larger than the chinquapin to begin with, but I found that the product was not so immune to the blight, several trees having been seen attacked by it and some fatally so. It might be best to grow them as shrubs with several trunks so that when one is killed others will take its place. Many chestnuts in the woods nearby were killed by the canker, so that quantities of spores were always present.

It would now seem to be a perfectly practical proposition to grow immune hybrid chestnuts in quantities to add to our supply of nuts. By cutting out the branches attacked by the canker as they appear, it ought to be perfectly possible to maintain good fruitful and productive orchards of hybrid chestnuts, and they bear so quickly that even if killed by the canker it would be possible to replace them almost immediately.

Correspondence on this subject should be addressed to Dr. David Fairchild, Bureau of Plant Industry, Washington, D. C.

W. A. MURRILL

THE CONVENTION GARDEN

In the issue of the *Journal* for October, 1916, an announcement was made of the proposed establishment of this garden. As explained there, its occasion was the meeting and convention of the Society of American Florists and Ornamental Horticulturists, held in this city from August 21 to 24, 1917.

Those interested commercially in plants did not take as active an interest in the success of this garden as might have been desired; there were some excellent displays of cannas, gladioli, and mallows. Most of the planting was accomplished by our own force, and the results in such cases were very satisfactory. Following are the exhibitors with the kinds of plants shown:

American Bulb Co., a new seedling canna.

Bobbink & Atkins, mallows. This collection has been presented to the Garden.

Arthur T. Boddington, cannas.

John Lewis Childs, Inc., gladioli. The collection has been presented to the Garden.

The Conard & Jones Co., cannas "New York" and "Snow Queen."

Arthur Cowee, gladioli.

Henry A. Dreer, cannas "Eureka," "Orange Bedder," "The Gem," "Favorite," "Lahneck," and "Scharfenstein."

Hicks & Son, display of conifers. This collection has been presented to the Garden.

W. A. Manda, miscellaneous collection of plants.

Meehan & Sons, mallows. The collection has been presented to the Garden.

A. L. Miller, collection of miscellaneous plants.

A. N. Pierson, Inc., roses and phloxes.

Raymond W. Swett, display of seedling dahlias. The collection has been presented to the Garden.

B. Hammond Tracy, gladioli.

Wm. Tricker, display of water lilies and other aquatics. This collection has been presented to the Garden.

Vaughan's Seed Store, cannas and gladioli.

The main entrance from the Southern Boulevard was held by a number of palms from the Garden collection. Following these, on both sides of the walk, were the exhibits of gladioli. In a bed in the center of an oval area, to which the main walk was an approach, were cannas. Also in beds on one side of this oval and to the right of the path leading from it to the east, were cannas, and to the left of this same path were also beds of cannas and others of miscellaneous plants. To the north of the oval displays of phloxes and roses were placed.

It is planned to develop the area assigned for the Convention Garden as a permanent exhibition of special collections of horticultural plants. Among these are considered: collections of gladioli, cannas, phloxes, dwarf evergreens, hardy chrysanthemums, berry-bearing shrubs, marsh mallows, hardy variegated shrubs and trees, rock plants, and plants with dissected leaves. This will enable visitors interested in such plants to examine many kinds brought together in one place. Conifer plantations will give backgrounds.

The plants donated by the exhibitors in the Convention Garden will be used in the development of these special collections, and such plants will bear a label giving the name and address of the donor.

GEORGE V. NASH

HARDY WOODY PLANTS IN THE NEW YORK BOTANICAL GARDEN

(continued)

Salix purpurea var. **gracilis.** SLENDER PURPLE WILLOW.
Location: Salicetum.

Salix purpurea var. **Lambertiana.** BOYTON WILLOW.
Location: Salicetum.

Salix purpurea var. **pyramidalis.** PYRAMIDAL PURPLE WILLOW.
Location: Salicetum.

Salix purpurea var. **sericea.** SILKY PURPLE WILLOW.
Location: Fruticetum.

Salix rubra. RED WILLOW.
Location: Fruticetum.
Natural distribution: Europe.

Salix sericea. SILKY WILLOW.
Location: Fruticetum.
Natural distribution: Northeastern United States.

Salix sericea var. **subsericea.** ANDERSON'S SILKY WILLOW.
Location: Fruticetum.
Natural distribution: Northeastern United States.

Salix Trevirani. TREVIRAN WILLOW.
Location: Salicetum.
Hybrid.

Salix tristis. SAGE WILLOW.
Location: Fruticetum.
Natural distribution: Eastern United States.

Salix viminalis. OSIER WILLOW.
Location: Fruticetum.
Natural distribution: Europe and Asia.

Salix viridis. GREEN WILLOW.
Location: Fruticetum.
Hybrid.

Salix vitellina. YELLOW WILLOW.
Location: Salicetum. Arboretum.
Natural distribution: Europe and Asia.

Salix vitellina var. **alba.** WHITE WILLOW.
Location: Salicetum.

Salix vitellina var. **alba splendens.** SILVERY WHITE WILLOW.
Location: Salicetum.

Salix vitellina var. **britzensis.** RED-STEMMED WILLOW.
Location: Salicetum.

Salix vitellina var. **pendula.** WEEPING YELLOW WILLOW.
Location: Salicetum.

Salix sp.
Location: Salicetum.
Introduced by the Bureau of Plant Industry from Pautingfu, China.

Salix sp.
Location: Fruticetum.
Introduced by the Bureau of Plant Industry, from Schahoschon, China.

Salix sp.
Location: Arboretum.
Introduced by the Bureau of Plant Industry from Langar, Chinese Turkestan.

MYRICACEAE. Bayberry Family

Comptonia. SWEET FERN

Comptonia peregrina. SWEET FERN.
Location: Fruticetum.
Natural distribution: Northeastern North America.

Myrica carolinensis. BAYBERRY.
Location: Fruticetum. Wild: sparingly about the grounds on dry knolls and open hillsides.
Natural distribution: Eastern North America.

Myrica Gale. SWEET GALE.
Location: Fruticetum.
Natural distribution: North temperate regions.

LEITNERIACEAE. Corkwood Family

Leitneria. CORKWOOD

Leitneria floridana. CORKWOOD.
Location: Northeast of Aquatic Garden, at foot of bank.
Natural distribution: Florida, southern Missouri and Texas.

JUGLANDACEAE. Walnut Family

Pterocarya. WING-NUT

Pterocarya fraxinifolia var. **dumosa.** CAUCASIAN WING-NUT.
Location: Arboretum.
Natural distribution: Caucasian Region.

Pterocarya stenoptera. NARROW-WINGED WING-NUT.
Location: Arboretum.
Natural distribution: China.

Juglans. WALNUT

Juglans cinerea. BUTTERNUT.
Location: Arboretum.
Natural distribution: Eastern North America.

Juglans hybrid. HYBRID WALNUT.
Location: Arboretum.
Hybrid.

Juglans major. ARIZONA WALNUT.
Location: Arboretum.
Natural distribution: New Mexico, Arizona and Mexico.

Juglans mandschurica. MANCHURIAN WALNUT.
Location: Arboretum.
Natural distribution: Manchuria and Amurland.

Juglans nigra. BLACK WALNUT.
Location: Arboretum. Along path from Museum to Elevated Railroad Approach.
Natural distribution: Eastern United States.

Juglans regia. ENGLISH WALNUT.
Location: Arboretum.
Natural distribution: Southeastern Europe to China.

Juglans Sieboldiana. SIEBOLD'S WALNUT.
Location: Arboretum.
Natural distribution: Japan.

Hicoria. HICKORY

Hicoria alba. MOCKER-NUT.
Location: Wild: occasional.
Natural distribution: Eastern United States.

Hicoria aquatica. WATER HICKORY.
Location: Arboretum.
Natural distribution: Southeastern United States.
Hicoria cordiformis. BITTER-NUT.
Location: Arboretum. Along path, Museum to Elevated Railroad Approach. Wild: scarce.
Natural distribution: Eastern United States.
Hicoria glabra. PIGNUT HICKORY.
Location: Wild: occasional.
Natural distribution: Eastern United States.
Hicoria laciniosa BIG SHELLBARK HICKORY.
Location: Arboretum.
Natural distribution: Eastern United States
Hicoria microcarpa. SMALL-FRUITED HICKORY.
Location: Wild: scarce.
Natural distribution: Northeastern United States.
Hicoria ovata. SHAG-BARK HICKORY.
Location: Near Depot Plaza.
Natural distribution: Eastern North America.
Hicoria Pecan. PECAN NUT.
Location: Arboretum.
Natural distribution: Southeastern United States.

BETULACEAE. Birch Family

Carpinus. HORNBEAM

Carpinus Betulus. EUROPEAN HORNBEAM.
Location: Arboretum.
Natural distribution: Europe to Persia.
Carpinus caroliniana. AMERICAN HORNBEAM.
Location: Arboretum. Wild: near Economic Garden; near lakes; common in the wooded areas of the grounds.
Natural distribution: Eastern North America.

Ostrya. HOP HORNBEAM

Ostrya virginiana. HOP HORNBEAM.
Location: Wild: Arboretum, path northeast of Senna family, and at Plum family; occasional in wooded areas of the grounds.

Corylus. HAZELNUT

Corylus americana. AMERICAN HAZELNUT.
Location: Fruticetum. Economic Garden. Wild: scarce.
Natural distribution: Eastern North America.

Corylus Avellana. EUROPEAN HAZELNUT.
Location: Fruticetum.
Natural distribution: Temperate Old World.

Corylus Avellana var. **atropurpurea.** PURPLE EUROPEAN HAZELNUT.
Location: Fruticetum.

Corylus Avellana var. **urticifolia.** CUT-LEAVED EUROPEAN HAZELNUT.
Location: Fruticetum. Economic Garden.

Corylus maxima var. **purpurea.** PURPLE-LEAVED HAZELNUT.
Location: Fruticetum.
Natural distribution: Southern Europe.

Corylus pontica. ASIATIC HAZELNUT.
Location: Fruticetum.
Natural distribution: Western Asia.

Corylus rostrata. BEAKED HAZELNUT.
Location: Fruticetum.
Natural distribution: Northern North America.

Betula. BIRCH

Betula alba var. **ovalis.** OVAL HAIRY WHITE BIRCH.
Location: Arboretum.
Natural distribution: Europe and Asia.

Betula alba var. **rhombifolia.** RHOMB-LEAVED HAIRY WHITE BIRCH.
Location: Arboretum.

Betula alleghanensis. SOUTHERN YELLOW BIRCH.
Location: Arboretum.
Natural distribution: Eastern United States.

Betula Andrewsii. ANDREWS' BIRCH.
Location: Arboretum.
Natural distribution: Colorado.

Betula coerulea. BLUE BIRCH.

Location: Arboretum.
Natural distribution: Northeastern United States.

Betula davurica. DAHURIAN BIRCH.
Location: Arboretum.
Natural distribution: Transbaikalia and Amur Region.

Betula Ermani. ERMAN'S BIRCH.
Location: Arboretum.
Natural distribution: Manchuria to Japan.

Betula fontinalis. WESTERN RED BIRCH.
Location: Arboretum.
Natural distribution: Rocky Mountains.

Betula glandulifera. SCRUB BIRCH.
Location: Fruticetum.
Natural distribution: Northern North America.

Betula lenta. CHERRY BIRCH.
Location: Arboretum. Along road east of Museum. Along path west of Conservatory Range I. Wild: common on wooded ridges.
Natural distribution: Eastern North America.

Betula lutea. YELLOW BIRCH.
Location: Arboretum. Triangle near Lake Bridge. Along path west of Conservatory Range I. Near Pinetum plaza.
Natural distribution: Eastern North America.

Betula nigra. RIVER BIRCH.
Location: Arboretum
Natural distribution: Eastern United States.

Betula papyrifera. PAPER BIRCH.
Location: Arboretum.
Natural distribution: Northern North America.

Betula pendula. WHITE BIRCH.
Location: Arboretum.
Natural distribution: Europe and Asia.

Betula pendula var. **dalecarlica** (*Betula pendula* var. *laciniata*). FERN-LEAVED WHITE BIRCH.
Location: Arboretum.
Natural distribution: Sweden.

Betula pendula var. **gracilis.** WEEPING FERN-LEAVED WHITE BIRCH.

Location: Arboretum.

Betula pendula Mandschurica. MANCHURIAN WHITE BIRCH.

Location: Arboretum.

Natural distribution: Manchuria.

Betula pendula var. **Tauschii.** JAPANESE WHITE BIRCH.

Location: Arboretum.

Natural distribution: Japan.

Betula populifolia. GRAY BIRCH.

Location: Arboretum. Along path, north end of Herbaceous Grounds. Wild: along woodland borders, or more rarely in the woods.

Alnus. ALDER

Alnus alnobetula. MOUNTAIN ALDER.

Location: Fruticetum.

Natural distribution: North Temperate Regions.

Alnus Alnus (*Alnus glutinosa*). EUROPEAN ALDER.

Location: Arboretum.

Natural distribution: Europe.

Alnus cordata. HEART-LEAVED ALDER.

Location: Arboretum.

Natural distribution: Corsica and southern Italy.

Alnus elliptica. CORSICAN ALDER.

Location : Arboretum.

Natural distribution : Corsica.

Alnus incana. HOARY ALDER.

Location: Arboretum.

Natural distribution: North temperate regions.

Alnus japonica. JAPANESE ALDER.

Location: Arboretum.

Natural distribution: Japan.

Alnus rugosa. SMOOTH ALDER.

Location: Fruticetum. Along path east of Museum. Wild: common in low places and along lakes and streams.

Natural distribution: Eastern United States.

Alnus subcordata. CAUCASIAN ALDER.

Location : Arboretum.

Natural distribution : Caucasus and northern Persia.

Alnus tinctoria. DYE ALDER.
Location: Arboretum.
Natural distribution: Japan.

FAGACEAE. Beech Family

Fagus. BEECH

Fagus grandifolia. AMERICAN BEECH.
Location: Arboretum. Along driveway at Viburnum triangle, south of Museum. Wild: common in wooded areas; fine examples along the Bronx River near the Japanese Cherry Collection.
Natural distribution: Eastern North America.

Fagus sylvatica. EUROPEAN BEECH.
Location: Arboretum. West end of West Lake.
Natural distribution: Europe and Caucasus.

Fagus sylvatica var. **heterophylla.** FERN-LEAVED EUROPEAN BEECH.
Location: Arboretum.

Fagus sylvatica var. **pendula.** WEEPING EUROPEAN BEECH.
Location: Arboretum. Near Depot Plaza. South of Mansion.

Fagus sylvatica var. **purpurea.** PURPLE EUROPEAN BEECH.
Location: Arboretum. Near Depot Plaza.

Fagus sylvatica var. **purpurea pendula.** PURPLE WEEPING EUROPEAN BEECH.
Location: Arboretum.

Fagus sylvatica var. **Riversii.** RIVERS' EUROPEAN BEECH.
Location: Arboretum.

THE FIFTIETH ANNIVERSARY OF THE TORREY BOTANICAL CLUB

The Fiftieth Anniversary of the Torrey Botanical Club was celebrated on October 18-20, the meetings of the eighteenth being held at Columbia University, that of the nineteenth at the New York Botanical Garden, and that of the twentieth at the

Brooklyn Botanic Garden. On the evening of the eighteenth, the members of the Club dined at the Faculty Club of Columbia University, the dinner being followed by a discussion of a proposed "American Botanical Abstract Journal." In the scientific programs of the various meetings, papers were presented by members of the Garden staff as follows:

"History of the Torrey Botanical Club," by John Hendley Barnhart.

"Reminiscences," by N. L. Britton.

"The Individuality of the Bean-pod as compared with that of the Bean-plant," by Helene M. Boas.

"The Ferns of Tropical Florida," by John K. Small.

"Fossil Plants from Porto Rico," by Arthur Hollick (read by title).

"Bermuda Algae," by Marshall A. Howe.

"Reminiscences," by Arthur Hollick.

"The Flora of the Isle of Pines, Cuba," by N. L. Britton and Percy Wilson.

"Collecting Fungi at the Delaware Water Gap," by W. A. Murrill.

"Flora of the Rocky Mountains and Adjacent Plains," by P. A. Rydberg.

"Statistical Studies in *Cichorium*," by A. B. Stout.

"Recent Botanical Exploration in Colombia," by H. H. Rusby.

"Life History Studies in *Sclerotinia*," by F. J. Seaver and W. T. Horne.

The meeting at the Garden on Friday afternoon, the nineteenth, was held at the Mansion. In his remarks of welcome, Dr. Britton referred to the fact that the existence of the Garden was due to the activities of a special committee of the Torrey Botanical Club, headed by Mrs. Charles P. Daly. After the reading of papers, tea was served and visits were made to the new Rose Garden and contiguous points of special interest. The organization of this Fiftieth Anniversary Celebration was in the hands of a committee consisting of N. L. Britton, *chairman*, C. S. Gager, R. A. Harper, M. A. Howe, and H. M. Richards.

MARSHALL A. HOWE

FLOWER EXHIBITIONS

The American Gladiolus Society held an exhibition in the Museum Building, August 23 to 26, under the auspices of the Garden, the Horticultural Society of New York, and the New York Florists' Club. One of the largest, if not the largest exhibition of its kind ever held in this country, it required two floors of the building to accommodate the display, which comprised something over 70,000 blooms. The three organizations under whose auspices the exhibition was given contributed the fund for the general prize-list, and in addition there were many special prizes offered.

The rotunda on the main floor and the aisles to the east and west of it were occupied. The most artistic feature of the exhibition was the striking exhibit of Mr. B. Hammond Tracy, of Cedar Acres, Wenham, Mass., a group of many kinds, tastefully arranged in baskets, the colors harmoniously blended. This method displays better than any other the rich coloration of the gladiolus flower. On the floor below, the exhibits were staged on large central tables and on other smaller tables in the alcoves.

There were displayed many rare and valuable forms of this most popular flower, both professionals and amateurs contributing largely to the success of the exhibition. The Garden City Achievement Medal, offered by the *Garden City Magazine* to the winner of the largest number of first prizes in the non-commercial classes, was won by Mrs H. Darlington, of Mamaroneck, N. Y., P. W. Popp, gardener, with fifteen first prizes, the nearest competitor being Mr. Madison Cooper, of Calcium, N. Y., with twelve.

A Dahlia Exhibition was held Saturday and Sunday, September 22 and 23, by the Horticultural Society of New York, in cooperation with the Garden, in the Museum Building. There was an excellent display of this popular flower, and there was good competition in most of the classes. The attendance was large, especially on Sunday.

The prizes were offered by the New York Botanical Garden

from the income of the William R. Sands Fund, and were awarded as follows:

In the classes open to all, the first prize for the largest and best collection, not less than six types, was won by Mr. Alfred E. Doty, of West Haven, Ct., the second by Mr. C. Louis Alling, of the same place, and the third by Mills & Co., of Mamaroneck, N. Y. For a vase of twelve cactus blooms, one or more varieties, Mrs. H. Darlington, of Mamaroneck, N. Y., P. W. Popp, gardener, was awarded first, Mr. Alling second, and Mr. Doty third. For twelve peony-flowered blooms Mrs. Darlington also won first, Mr. Alling second, and Mills & Co. third. In the class for twelve decorative blooms Mr. Alling was the winner of the first prize, Mills & Co. of the second, and Mr. Doty of the third. Mr. Doty secured first prize for a vase of twelve show or fancy blooms, Mr. Alling second, and Mills & Co. third. Mills & Co. were successful in winning the first prize for a vase of twelve pompon blooms, Mr. Doty second, and Mr. Alling third. In the single or collarette class, a vase of twelve blooms gave to Mr. Alling first, to Mr. Doty second, and to Mrs. Darlington third. Mrs. Darlington, in the class for a vase arranged for effect, won first, Mills & Co. second, and Mr. Alling third.

In the non-commercial classes, for a collection of not over fifty blooms, not less than four types, Mr. Wm. J. Matheson, of Huntington, N. Y., was awarded first, Mrs. Darlington second, and Dr. M. A. Howe, of Pleasantville, N. Y., third. Mrs. Darlington was more successful in the class for a vase of eight cactus blooms, winning first, Mr. Thomas Pierce Hollinsgworth, of Mamaroneck, N. Y., second, and Dr. Howe third. Mrs. Darlington was also winner of the first prize for a vase of eight peony-flowered blooms, as also for a vase of eight decorative blooms. In the class for eight show or fancy blooms, Dr. Howe won second. In the pompon class, eight blooms in a vase, the first prize was won by Mr. William Shillaber, of Essex Fells, N. J., J. P. Sorenson, gardener, the second by Mrs. Darlington, the third by Mr. Hollingsworth. Mrs. Darlington was awarded first prize for a vase of eight single or collarette blooms, Dr. Howe second, and Mr. Hollingsworth third.

The following special prizes were awarded:

Cedar Hill Nursery, Glen Head, N. Y., for a display of flowering shrubs and herbaceous plants, cash; Rev. W. O. Wyckoff, of Madison, Ind., certificate of merit for a new peony-flowered seedling "Mrs. Pfister."

The judges were John H. Troy, A. J. Manda, and Robert T. Brown.

GEORGE V. NASH

LECTURES FOR MEMBERS, MANSION LECTURE ROOM, WEDNESDAY AFTERNOONS, NOVEMBER, 1917, AT 3:15 O'CLOCK

November 7. "Recent Construction and Development of the Garden by the Aid of Gifts from Mr. Daniel Guggenheim, Mr. Murry Guggenheim, Mr. Edward D. Adams, Mrs. Frederick F. Thompson, Mrs. Robert E. Westcott, and the Emergency Fund Subscribed by Members," by Dr. N. L. Britton, Director-in-Chief.

November 14. "The New Rose Garden and Plans for Its Further Development; the 'Convention Garden' and Plans for its Modification into Special Horticultural Plantations; and Plans for the New Plantations of Lilacs, Peonies and Dahlias," by Mr. George V. Nash, Head Gardener.

November 21. "The School Garden and the Work of the Garden School," by Mr. Henry G. Parsons, Supervisor of Gardening Instruction.

November 28. "Educational and Investigational Work of the Garden," by Dr. W. A. Murrill, Assistant Director.

The lectures will be illustrated by lantern slides and otherwise.

At their close, opportunity will be given for discussion, and visits will be made to features and localities described.

Members coming by motor-car from the city reach the Mansion most directly by turning north on Pelham Parkway at the first road east of the Bronx River. Members coming by train, leaving Grand Central Terminal at 2:30, will be met by motor-cars at Botanical Garden Station at 2:55, if they notify the Director-in-Chief of their intention of attending.

NOTES, NEWS AND COMMENT

Professor George F. Atkinson, of Cornell University, attended the Torrey Club Anniversary and remained at the Garden for a week consulting the mycological herbarium with special reference to the large number of types of gill-fungi which it contains.

Mr. Paul C. Standley, of the United States National Museum, spent a week at the Garden studying the collections of the madder family in connection with his monograph of that family for *North American Flora.*

A large collection of excellent herbarium specimens of some of the rarer plants of the Hawaiian Islands has been sent to the Garden by Professor Joseph F. Rock, of the College of Hawaii.

Professor J. F. Adams, of Pennsylvania State College, is on leave of absence for a year and is spending the time at Columbia University and at the Garden. He is making a detailed study of a group of microscopic fungi, many of which occur as parasites on living plants.

Dr. Charles F. Fairman, of Lyndonville, New York, recently spent several days at the Garden in connection with his work on lower fungi. Dr. Fairman is a physician whose name is well known to mycologists both in America and Europe and his contributions to mycological literature are numerous.

Professor H. H. Whetzel was a recent visitor at the Garden. He is interested in plant pathology and secured while here information and material to be used in investigations which are being conducted by him at Cornell University.

An excellent edible mushroom, *Boletus luteus*, with tubes instead of gills, has become established under the young pine trees east and north of Conservatory Range I. This was noticed last year, but the spawn has spread very considerably since that time.

One of the best of the late-flowering plants in the Garden collection is *Polygonum polystachyum.* A specimen in the morphological garden produces feathery panicles of white blossoms through the month of October, and is very showy at a time when little bloom is left except that of the asters and chrysanthemums.

About one third of the species of *Crocus* are said to be autumnal, although we usually think of the plants of this genus as spring-flowering. In the flower beds near Conservatory Range 1, *Crocus speciosus* blooms every October. The lilac flowers with orange anthers and stigmas are attractive, but as the perianth-tubes are slender and have no leaves to support them, they are easily injured and do not last long. The leaves appear after the flowers.

Dr. C. H. Kauffman, who is preparing manuscript on certain genera of the gill-fungi for *North American Flora*, spent a very successful vacation in the Rocky Mountains, where he made large collections of *Cortinarius*. He is now on leave for a year from the University of Michigan and is connected with the Federal Horticultural Board, with headquarters in Washington.

The excellent condition of the new Rose Garden and the number of fine roses still in bloom attracted the attention of members of the Torrey Botanical Club attending the Fiftieth Anniversary October 18–20.

A new manual of fruit diseases has recently appeared, by Hestler and Whetzel, which treats the principal fungous diseases of garden and orchard fruits, the hosts, for convenience, being taken up in alphabetical order and the diseases in the order of their importance. This is the first attempt made in America to group together in one volume all the available information on this subject and to put it in such form that it is readily available to the practical fruit grower.

Bulletin 510 of the United States Department of Agriculture,

by C. J. Humphrey, deals with timber storage conditions in the eastern and southern states with reference to decay problems. The author discusses present conditions and methods of improving them; he also mentions and briefly describes a number of fungi that attack stored timber. The bulletin is an exceedingly valuable one, consisting of 43 pages and 41 figures.

A specimen of *Tyromyces Spraguei* was recently collected by Mr. Percy Wilson on the base of a living larch tree growing in the grounds of the New York Botanical Garden. This fungus occurs abundantly on chestnut and oak throughout the northeastern United States, but has never before been reported on a conifer.

M. Paul Hariot, author of various works on fungi and algae, and for many years in charge of the cryptogamic collections at the Muséum d'Histoire Naturelle of Paris, died on July 5. The liberality and patience with which M. Hariot always placed the treasures of his department of the museum at the service of scientific men will long be held in grateful remembrance by members of the Garden staff.

The collection of yew trees, located on a gentle southeastern slope near the center of the herbaceous garden valley, has been in excellent condition this season and some of the trees have borne an abundance of attractive, berry-like, coral-red fruits. The Japanese yew, *Taxus cuspidata*, is especially to be recommended for planting.

"The Cultivation and Diseases of the Sweet Pea" is the title of a book recently published by Dr. J. J. Taubenhaus, of the Texas Experiment Station, with an introduction by Dr. Mel T. Cook, of Rutgers College, New Jersey. The book is based largely on the practical experience of the writer and is written in a popular manner so as to appeal to the practical grower.

Dr. Charles Horton Peck, former state botanist of New York,

died at his home in Albany on July 11. Dr. Peck's official term of scientific service began in 1867, and extended over a period of forty-six years. He retired on account of illness and age in 1913, and at the time of his death was in his eighty-fifth year. The amount of work accomplished by this remarkable man and its bearing on the development of botany in the state can hardly be estimated. Scarcely a group of plants escaped his critical attention. As a memorial to his conspicuous service to American mycology, an exhibit of 57 very handsome mushroom models, by Mr. Henri Marchand, has recently been installed in the State Museum at Albany.

Dr. Carl Skottsberg, assistant professor of botany in the University of Upsala and the recently appointed director of the new botanic garden at Göteborg, Sweden, spent two or three weeks in New York in the latter part of October and the first part of November. Dr. and Mrs. Skottsberg were on their way back to Sweden after devoting several months to floristic and phytogeographic studies in the Juan Fernandez Islands and on Easter Island, the former 350–450 miles off the coast of Chile and the latter about 2,000 miles west of the Chilean coast. Dr. Skottsberg was a member of the Swedish South Pole Expedition under the leadership of Nordenskjöld in 1901–1903, during which time he visited Graham Land, the South Shetland Islands, Tierra del Fuego, the Falkland Islands, and South Georgia. An important part of his collections was lost by the sinking of his ship, the "Antarctic," in February, 1903, but the small part that was saved and the parts previously landed have enabled him to publish valuable papers on the marine flora of the antarctic and subantarctic regions.

A violent rain and wind storm on the morning of October 24 uprooted 27 trees in various parts of the grounds, being more destructive than any storm in a number of years. The damage was not confined to any one part of the grounds, for trees went down here and there, several falling across paths. No planted trees were lost, those destroyed being in the woodlands and along

their borders. Several large oaks were lost. While we always regret the loss of a tree, the wood will, under present circumstances, be acceptable for furnaces at the mansion and at the propagating houses.

It has been found necessary this year to rebuild some of the benches on which potted plants are supported in several houses of Conservatory Range 1. These benches were built at the time the greenhouses were constructed, about fifteen years ago, consisting of iron uprights and frames with slate bottoms. Although the iron work has been painted repeatedly, it has rusted under the successive coats of paint, and the deterioration went so far as to cause the benches to collapse in places. With this experience, it was determined to rebuild the benches in concrete, and a satisfactory and substantial model was obtained and the work is in progress. About 600 running feet of benches have already been replaced, and at least as much more require replacing at the present time; it is expected that the entire system of iron benches will ultimately have to be replaced, but the concrete construction will be permanent and will require no expense for painting.

Dr. H. H. Rusby returned on the 29th of September from a three months' expedition up the valley of the Magdalena River, in the Republic of Colombia. Although the objects of the expedition were mainly in the field of medical botany, a general botanical collection of more than twelve hundred numbers was secured. These collections were principally the work of Dr. Francis W. Pennell, of the Garden staff, who accompanied Dr. Rusby. Arrangements have been made by which Dr. Pennell is to remain in Colombia for several months, during which time he will collect in districts where little botanical work has heretofore been performed. Dr. Rusby will present an illustrated account of his jour ey to the Torrey Botanical Club at its evening meeting on February 12.

Meteorology for September.—The total precipitation for the month was 1.62 inches. Maximum temperatures recorded for

each week were 75° on the 4th, 80° on the 14th, *85° on the 20th,* and 82° on the 27th. Minimum temperatures were 59° on the 2d, *35° on the 11th*, 41° on the 23d, and 50° on the 30th. On the morning of the 11th a slight frost injurious to such plants as *Coleus* occurred in scattered and quite local areas.

ACCESSIONS

MUSEUMS AND HERBARIUM

228 specimens of mosses, hepatics, and lichens from North America. (By exchange with the United States National Museum.)

2 specimens of marine algae from California. (By exchange with Dr. N. L. Gardner.)

76 specimens of flowering plants from Labrador. (By exchange with Harvard University.)

12 specimens of marine algae from Bermuda. (Given by Mr. F. S. Collins.)

1 specimen of *Phialea fructigena* from New York. (By exchange with Professor H. M. Fitzpatrick.)

9 specimens of fungi from Ohio. (By exchange with Dr. C. H. Farr.)

1 specimen of *Lepiota naucina* from Illinois. (By exchange with Mr. D. E. Lancing, Jr.)

1 specimen of *Tyromyces Spraguei* from the New York Botanical Garden. (Collected by Mr. Percy Wilson.)

1 specimen of *Pezicula carpinea* from Sky Lands, New Jersey. (Collected by Dr. N. L. Britton.)

1 specimen of *Cyathus stercoreus* from the New York Botanical Garden. (Collected by Dr. N. L. Britton.)

1 specimen of *Agaricus arvensis* from New York City. (By exchange with Dr. G. Clyde Fisher.)

1 specimen of *Melanoleuca* from Colorado. (By exchange with Professor T. D. A. Cockerell.)

1 specimen of *Prunulus leaianus* from New York. (By exchange with Mrs. Diamant.)

1 specimen of *Schizophyllus alneus* from Long Island. (By exchange with Dr. G. Clyde Fisher.)

3 specimens of *Fulvifomes juniperinus* from Oregon. (By exchange with C. R. Stillinger.)

14 specimens of fungi from Jamaica. (By exchange with Dr. C. H. Farr.)

2 specimens of fungi from Dutch Guiana. (By exchange with Mr. Jacob Samuels.)

3 specimens of fungi from New York. (By exchange with Professor H. M. Fitzpatrick.)

6 specimens of fungi from New Jersey. (By exchange with Mr. C. A. Schwarze.)

75 specimens of fungi from northern Africa, "Mycotheca Boreali-Africana," fascicle 8, 9 and 10. (Distributed by R. Maire.)

324 specimens of fungi from Porto Rico. (Collected by Professor F. L. Stevens.)

70 specimens of South American ferns from Sodiro's herbarium. (By exchange with Professor C. M. Hicken.)

30 specimens of mosses from Eastern United States. (Given by Mrs. N. L. Britton.)

510 specimens of flowering plants from northern New York. (By exchange with Harvard University.)

2 specimens of hepaticae from New Hampshire. (By exchange with Miss Annie Lorenz.)

PLANTS AND SEEDS

31 plants from Colombia. (Collected by Dr. H. H. Rusby.)

1 plant, *Prunella vulgaris*, white form. (Given by Miss E. M. Kittredge.)

6 plants, large palms, for conservatories. (Given by Mr. Ogden Mills.)

6 plants, *Opuntia* sp., for conservatories. (By exchange with Mr. J. M. Johnston.)

2 plants, *Opuntia crinifera* and *O. rubescens*. (Given by Mr. Arthur Koster.)

12 plants for conservatories. (Given by Mrs. Post.)

2 plants, *Citrus* sp., for conservatories. (Given by Mr. Austin Joy.)

5 plants, all cacti, for conservatories. (By exchange with U. S. National Museum, through Dr. J. N. Rose.)

7 packets of seed from Colombia. (Collected by Dr. H. H. Rusby.)

2 packets of seeds. (By exchange with Missouri Botanical Garden.)

1 packet of seeds of *Impatiens biflora*, pink form. (Given by Miss E. M. Kittredge.)

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OF

The New York Botanical Garden

EDITOR

KENNETH ROWLAND BOYNTON

Head Gardener's Assistant

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Sand-dunes on the Isle of Palms, near Charleston South Carolina. The habitat of several kinds of prickly-pears Photo by W. C Coker.

JOURNAL

OF

The New York Botanical Garden

VOL. XVIII November, 1917 No. 215

CACTUS HUNTING ON THE COAST OF SOUTH CAROLINA

(WITH PLATE 207)

While in the field in southern Florida in the winter of 1916, the following communication reached me: "Please stop off not alone at Charleston to get those coastal low opuntias, but make a stop in northern Florida and go over to Apalachicola and see if you cannot find the old *Pes-Corvi* locality." This note from Dr. Britton was in reference to certain kinds of prickly-pears he and Dr. Rose desired to secure for study in connection with their monograph of "The Cactaceae."

Consequently, I arranged to visit both the localities mentioned above, and started north during the evening of one of the warmer days of the winter, in fact the warmest of all while I was in Florida. I left Miami with the thermometer registering about eighty degrees Fahrenheit. Upon reaching Jacksonville the next morning the thermometer registered about thirty degrees! This sudden, not to say violent, drop in the temperature not only chilled me, but it decidedly cooled my ardor as far as a trip to Apalachicola was concerned, for, upon inquiry, I learned that the time and energy required to reach that ancient but isolated town necessitated traveling about twenty-four hours in unheated railroad cars and waiting during the night at little-protected railroad junctions. All things considered, it did not take me long to decide to pass Apalachicola by for the time

[JOURNAL for October, 1917 (18): 213–235 was issued November 30, 1917.]

being. However, I stopped long enough in Jacksonville to report conditions at Royal Palm Hammock to Mrs. W. S. Jennings, then president of the Florida Federation of Women's Clubs, into whose custody Royal Palm State Park had recently been committed by the legislature of the State of Florida.*

Continuing northward the same day, I reached Charleston, South Carolina, late in the evening. Having learned of my intended visit, Professor Paul M. Rea, director of the Charleston Museum, had arranged various details in advance of my arrival, so that every moment of my stay could be used to advantage in the field. I wish to thank Professor Rea, and the members of his staff, for valuable aid. I am particularly indebted to Miss Laura M. Bragg, curator of books and public instruction, who arranged for the field work, and also to Mr. Jesse Sharpe of the board of trustees of the Museum, who kindly contributed both his time and his motor-boat to furthering our exploration.

Three profitable and very instructive days were spent in collecting and in making observations in or near the coastal regions about Charleston. That city and vicinity was one of the few centers of botanical activity in North America during the eighteenth century and the earlier part of the nineteenth. In fact these activities played such an important part in the botanical and horticultural affairs of both America and Europe that a few paragraphs on that subject, the later developments of which were the cause of my visit, may not be out of place here.

At a very early period in the history of the United States, Charleston was an important seaport and the principal seat of learning in the southern Atlantic States. It was also the gateway to the vast wilderness lying not only to the west, but also to the north and the south. In addition to the resident botanists, both American and European plant collectors and botanical authors passed to and fro; some of them made the colony their temporary headquarters. Many kinds of shrubs and trees were shipped from the port of Charleston, not only to the northern states, but also to Europe, where specimens were propagated and widely cultivated both in England and on the continent.

* See Journal of the New York Botanical Garden 17: 165–172. 1916.

Not a few of the colored plates in European botanical and horticultural magazines of the earlier part of the last century were made from specimens of trees and shrubs taken to England and France from South Carolina and the contiguous territory.

Before the beginning of the eighteenth century, about 1696, Edmund Bohun* and Robert Ellis sent specimens from Charleston to London. In 1722 Mark Catesby† came upon the scene. About 1760 Thomas Walter‡ came from England and settled near the Santee River north of Charleston. Beginning with the sixties of the eighteenth century, there was a steady influx of botanists to Charleston. In 1760 the Bartrams§ began a

* Edmund Bohun (1672–1734), son of the famous English writer of the same name, lived as a merchant at Charleston from 1696 until the summer of 1701. With his friend Robert Ellis he collected plants about Charleston for Petiver and Sloane; these are still preserved in the Sloane herbarium at the British Museum (Natural History). John Hendley Barnhart.

† Mark Catesby (1679–1749), an Englishman, who spent seven years in Virginia before he was forty years old, was so impressed with the strange natural objects about him that he resolved to return to America for the sole purpose of studying them. He arrived at Charleston in 1722, and collected and painted plants and animals in South Carolina, Georgia, Florida, and the Bahamas, for four years; the results appearing in his sumptuous "Natural history of Carolina, Florida, and the Bahama Islands," published in 11 numbers (1730–48), and completed only shortly before his death. His collections are represented in the Sherard herbarium at Oxford and the Sloane herbarium.—J. H. B.

‡ Thomas Walter (1740–1788), an Englishman by birth, settled in South Carolina as a planter in early life. His "Flora caroliniana" (1788) is astonishing when considered as the work of a solitary student in an isolated field, and will ever maintain its position as a botanical classic. Walter's grave, in what was once his garden, the second botanical garden established in America, is now in a forest wilderness. The British National Herbarium contains a collection of plants made by Walter, presumably several years before the publication of his Flora. —J. H. B.

§ John Bartram (1699–1777), the first native American botanist, was greatly encouraged in his work as a collector of seeds and living plants by correspondence with Peter Collinson (1694–1768), of London, who eventually secured him an appointment as "King's botanist." Bartram traveled and collected from New York to Florida. He first visited Charleston in March, 1760, and again in the summer of 1765, when he made that city the starting-point for his long land journey in Georgia and Florida.

William Bartram (1739–1823) had the advantage of a better education, and of association with his father's scientific work from childhood. He accompanied his father to Florida in 1765, insisted upon remaining there, and settled as a planter on the St. Johns River, where he stayed about two years. In 1772 he began the extensive journey in the Carolinas, Georgia, and Florida, reported in his published

series of visits to the southern states. The elder, John Bartram, had established, at his home in Philadelphia, the first botanical garden in America. Some of the plants from the South went to his garden, others were shipped to England.

In 1780 John Fraser* and his son John began collecting plants for cultivation in England. In 1786 the Michaux,† father and son, went to Charleston, and later William Baldwin‡ appeared. After the American Revolution an additional continental Euro-

"Travels." He was a botanical artist of much enthusiasm and considerable ability.—J. H. B.

* John Fraser (1750–1811), one of the most famous European collectors of American seeds and living plants, in Newfoundland during the Revolution, and in the southern United States after its close, crossed the Atlantic repeatedly in his quest between 1780 and 1810. He made the acquaintance of most if not all of the few American botanists of that day, and was responsible for the publication of Walter's "Flora caroliniana." It is believed that some of the plants described in the flora were collected by Fraser in regions never visited by Walter. Fraser's son, of the same name, accompanied him in his travels from 1799 to 1810, and continued the botanical exploration of the southeastern states after his father's death. -J. H. B.

† André Michaux (1746 1802), after establishing his reputation as a botanical explorer by his work in Persia from 1782–1785, was sent upon a similar mission to the United States, under the auspices of the French government. In 1786 he established a nursery at Charleston, for the care of his living plants while they awaited shipment; and Charleston remained his headquarters until he sold the garden in 1792. Before his return to France, in 1796, he had collected plants from Hudson Bay to Florida, and as far west as the Mississippi, and gathered the material for his flora of North America, published the year after his death under the editorship of the French botanist Richard. Michaux's herbarium is carefully preserved at the Jardin des Plantes in Paris.

François André Michaux (1770 1855) accompanied his father to America in 1785, although only fifteen years old at that time, and remained here for five years. He was in America again, with Charleston as his headquarters, from October, 1801, until March, 1803, traveling meanwhile from New York to South Carolina, and in Kentucky and Tennessee. He traveled even more extensively in the eastern United States, from Maine to Georgia, and west to the Ohio, from 1806 to 1809. He was particularly interested in American forest trees, and is best known for his elaborate publications devoted to them. He was one of the two passengers from Albany to New York, on the first trial trip of the first Fulton steamboat, in 1807. —J. H. B.

‡ William Baldwin (1779 1819), a medical graduate of the University of Pennsylvania and surgeon in the United States navy, an earnest collaborator with Elliott upon the Sketch, was responsible for the most of that work in so far as it related to Georgia. Baldwin was in Charleston in November and December, 1811, and doubtless at other times.—J. H. B.

pean botanist, Johann Schoepf* and a West Indian, Félix L'Herminier,† collected plants about Charleston. This list brings us up to the beginning of the nineteenth century and it might likewise be continued to the present time. Thus Charleston has had an almost continuous line of transient and permanent exotic botanists and plant collectors extending over a period of more than two centuries. Neither was that region lacking in native botanists of more or less distinction. This line also had an early beginning. About the time of Mark Catesby's advent, or shortly after it, Alexander Garden‡ began his career at Charleston. After him came James Macbride,§ Stephen Elliott,‖ and John L. E. W. Shecut.¶

* Johann David Schoepf (1752–1800) was an army surgeon with the Bavarian troops in the pay of the British during the Revolution. Being a trained physician and botanist, keenly interested in America but confined to garrison duty in New York, Philadelphia, and Rhode Island throughout the war, he remained after the declaration of peace, and traveled throughout the middle and southern states and the Bahama Islands. His account of his travels, rich in botanical data, was published in 1788, in two volumes. He was also the author of the earliest work on American medicinal plants (1787). The last ten years of his life were spent as a medical practitioner and educator at Ansbach.—J. H. B.

† Félix Louis L'Herminier (1779–1833) resided in the island of Guadeloupe, in the West Indies, where he made extensive collections, most of the time from 1795 to 1829. He happened to be in Charleston in 1815, when the Charleston Museum was established, and he was appointed the first superintendent, many of his collections being purchased as a nucleus of the public exhibits.—J. H. B.

‡ Alexander Garden (1730–1791) was a graduate of the University of Aberdeen, and after receiving his medical degree at Edinburgh began the practice of his profession at Charleston in 1752. During the thirty years of his residence there he became, if not the most famous citizen, surely the most eminent professional man, of the colony. His loyalty to the British crown during the Revolution compelled his return to England, where he died. He began the study of plants upon his arrival in Charleston in 1752; was a friend of Bartram and Colden, and a correspondent of Linnaeus, Collinson, Ellis, Gronovius, and other eminent botanists.—J. H. B.

§ James Macbride (1784–1817), a Yale graduate, and practitioner of medicine at Pineville, South Carolina, was an enthusiastic botanist and a friend of Elliott. He seems to have suggested and stimulated the preparation of Elliott's "Sketch," and to his memory there is a glowing tribute in the preface to the second volume. —J. H. B.

‖ Stephen Elliott (1771–1830), a graduate of Yale, and prominent in the history of South Carolina as representative and senator in the State Legislature, and as president of the State Bank for nearly twenty years, was the author of the remarkable work modestly entitled by him a *sketch* of the botany of South Carolina

The various collectors and botanists mentioned above were generally well known and nearly or quite all of them have either genera or species of plants, or both, named for them. Among the native botanists, Garden's name is perpetuated in the well-known genus of the Old World, *Gardenia*, with a number of species in cultivation. Macbride's name is associated with two rare but beautiful herbaceous plants of our southeastern United States, as *Macbridea*. A handsome but rare and locally distributed shrub or small tree in the coastal plain of Georgia and the adjacent parts of South Carolina bears the name *Elliottia*, in honor of Elliott.

Dr. Elliott flourished in the first and second decades of the last century. His predecessors ignored the cacti growing in the vicinity of Charleston or they included all of them in the Linnaean *Cactus Opuntia*. This oversight seems rather remarkable when we consider not only the many acute observers already mentioned, but also the group of plants involved, which are not only attractive by their extraordinary habit, but also disagreeable by their vicious armament. During the years 1816–1821 Elliott published the first volume of his Sketch.* On page 537 of that work he accounts for but one species of prickly-pear; but in an accompanying note he says, "It is possible that there are now three distinct species on the seacoast of the Southern States covered under this name [*Cactus Opuntia*]. In the supplement to this work, if I should be permitted to complete it, the inquiry shall be resumed." As a result of failing health the supplement never appeared. The question became dormant again and not until four decades had elapsed was the problem revived.

and Georgia, although it filled two thick volumes and is a treasury of detailed original observations. His herbarium is now in the custody of the Charleston Museum.—J. H. B.

¶ John Linnaeus Edward Whitridge Shecut (1770–1836) was a physician at Charleston from 1791 until his death. His interest in scientific matters was broad, including botany, and in 1806 he published the first volume of a botanical compendium to which he gave the title "Flora Carolinaeensis." This curious title was intended to honor the name of Carolus Linnaeus, and at the same time emphasize the fact that the author was a Carolinian; the work is in no sense a flora of Carolina.—J. H. B.

* A Sketch of the Botany of South Carolina and Georgia.

The record that was instrumental in causing the request that I visit Charleston in search of prickly pears was in the form of some notes presented by Professor L. R. Gibbes,* a prominent educator of his time, at a meeting of the Elliott Society of Natural History held January 15, 1858,† or nearly forty years after Elliott published the note just quoted. This record had recently been brought to light by Dr. Barnhart, and it is reprinted here for the benefit of students interested in *Opuntia*, especially those who may want to study the kinds growing about Charleston.

"Prof. L. R. Gibbes made the following remarks, 'On the representatives of the genus Cactus in this State.'

"Elliott, in his Sketch of the Botany of South Carolina, says, under *Cactus opuntia*, that, it is probable, there are now three distinct species on the sea-coast covered under this name, but neither he, nor any other botanist, appears to have paid any close attention to them. In excursions during the past year, I have had the genus in view, and have endeavored to collect its representatives; and now lie on the table four, if not five, distinct forms, obtained within a few miles of Charleston—possibly four distinct species.

"1. The first, which we will call *Opuntia tunoidea*, falls under Engelman's subgenus *Platopuntia*, section Grandes, is erect, or sub-erect, with large ovate joints, armed with yellowish spines, tipped with brown, about three quarters of an inch long. The flowers and fruit we have not yet procured. The plant is infested with a cochineal insect, covered with a white tomentum.

"2. The second, which we call *Opuntia macrartha*, falls under the same section with the preceding, and seems to be near *Opuntia angustata*, of Engelman, from the west of the Rio Grande; a prostrate species, joints from ten to fifteen inches long and three inches wide, one-third of an inch thick; no spines,

* Lewis Reeve Gibbes (1810–1894), a graduate in medicine, but professionally a teacher throughout his long career, was a native of Charleston and professor in the College of Charleston for fifty-five years. He was both mathematician and naturalist, and published but little upon any subject, but his ability as a botanist was well known and widely recognized. His herbarium is now incorporated with that of the New York Botanical Garden.—J. H. B.

† Proceedings of the Elliott Society of Natural History 1: 272–273.

fruit two and a half inches long, slender, clavate. 3. The third species is *Opuntia vulgaris*, the *Cactus opuntia* of Elliott, and others, common throughout the State. 4. The fourth, which we will call *Opuntia frustulenta*, probably falls under Engelman's section, Xerocarpeae, of the same sub-genus; plant prostrate, joints subcylindric, two to six inches long, armed with spines, white, three fourths of an inch long, large for the size of the plant, joints separating readily. This species seems to be near *Opuntia fragilis* Haworth, *Cactus fragilis* Nuttall, from Upper Missouri. It has been found so far only on the sea islands, and is well known to their inhabitants, who call them *Dildoes*, and say that they have never seen them flower. This is the form exhibited to the Society on the 1st September last."

The first day of my field work was devoted to cactus-hunting on the Isle of Palms.* This island is well named, for much of its area back of the front sand dunes is clothed with a fine growth of the cabbage palm. There is also considerable hammock there. We followed the dunes in a northerly direction, but for some distance not a cactus was encountered. Even after proceeding for the distance of a mile or two we had not observed a prickly pear. However, presently my attention was attracted towards my lower extremities by a pricking sensation on my shins. Upon looking down, I noticed a quantity of prickly-pear joints clinging to my trousers after the manner of sand spurs! These were the joints of the smallest prickly pear of the eastern United States and one of the plants for which we were searching. The joints are commonly only one to two inches long and very turgid; but they have relatively long, very slender and rigid spines. The plants are nearly of the same color as the coastal sands. The joints fall apart with the slightest shock. On account of their color, plants easily escape the eye; while on account of their readily disarticulating stems and their long slender spines, the joints promptly become attached to clothing at the slightest contact. The remarkable facility with which the joints adhere to clothing is so pronounced that it seems almost as if they had the power to spring to their victim.

* For observations on the vegetation of the Isle of Palms, see W. C. Coker, Torreya 5: 135–145.

Not far from where we found this little cactus we discovered one of the larger kinds described by Professor Gibbes. This plant had evidently flowered in the early winter or perhaps in the late autumn, as there was an abundance of fruit on some of the clumps.

Many other interesting plants were observed and some mosses and fungi were collected. Particularly interesting was the occurrence of the Chinese tallow tree in the swamps back of the sand dunes. This, although devoid of foliage, was easily recognizable, while its abundance and its intermingling with the native plants would lead one to consider it a native plant, if it were not actually known to be naturalized. There was ice on the water standing in the swamps, but the cactus plants of the nearby sand dunes were not at all injured by the low temperature.

The second day was spent in the opposite direction, or to the south, instead of to the north. We went by motor-boat direct to Folly Island. The first interesting plant encountered upon landing on the inside shore was Elliott's pine. This locality represents the known northern limit of its geographical range. It occurred there true to its typical habitat, that is, with its feet in the water, so to speak, and its habit, flowers, and cones quite distinct from the Cáribbean pine with which it is often, not to say persistently, confused. The next tree observed was the twin oak, a relative of the live oak. This locality, too, represented the known northern limit of its geographical range. Further inland we found the live oak. We hunted hammocks and open places for prickly pears, but without success. A man working in a field about the middle of the island told us that formerly there had been plenty of "dildoes" there; but that he had plowed them up and destroyed them. From what information we could get, this plant was evidently one of the large-jointed species of Professor Gibbes. Upon reaching the coastal hammocks and dunes we again found quantities of the little *Opuntia* of the Isle of Palms. It had the same characters and the same characteristics, particularly that of exhibiting strong attachment to one's clothing. The hammocks there, like those on the Isle of Palms, offered interesting kinds of mosses and

Quercus dentata. JAPANESE TOOTHED OAK.
Location: Arboretum.
Natural distribution: Japan.

Quercus ellipsoidalis. HILL'S OAK.
Location: Arboretum.
Natural distribution: North Central United States.

Quercus glandulifera. GLAND-BEARING OAK.
Location: Arboretum.
Natural distribution: Japan.

Quercus grosseserrata. LARGE-TOOTHED OAK.
Location: Arboretum.
Natural distribution: Japan.

Quercus heterophylla. BARTRAM'S OAK.
Location: Arboretum; several trees raised from seed from a single individual showing an interesting gradation between the parents.
Hybrid between *Quercus Phellos* and *Quercus rubra*.

Quercus imbricaria. SHINGLE OAK.
Location: Arboretum.
Natural distribution: Eastern United States.

Quercus lobata. CALIFORNIA WHITE OAK.
Location: Arboretum. Fruticetum.
Natural distribution: California.

Quercus lyrata. SWAMP POST OAK.
Location: Arboretum. Along drive west end of west lake. Along drive near Viburnum triangle south of Museum.
Natural distribution; Southeastern United States.

Quercus macrocarpa. MOSSY-CUP OAK.
Location: Arboretum. Along drive Lake Bridge to South Gate, near drinking fountain and near Pinetum plaza.
Natural distribution: Eastern North America.

Quercus marilandica. BLACK JACK OAK.
Location: Arboretum.
Natural distribution. Southeastern United States.

Quercus Michauxii. COW OAK.
Location: Arboretum.
Natural distribution: Southeastern United States.

Quercus montana. CHESTNUT OAK.
Location: Arboretum.
Natural distribution: Eastern United States and Ontario.

Quercus nana. SCRUB OAK.
Location: Fruticetum.
Natural distribution: Northeastern North America.

Quercus palustris. PIN OAK.
Location: Arboretum. Along driveway from Depot Plaza to Fruticetum. Along path from Plaza at 200th Street entrance to approach to elevated railway. Along driveway southeast of Museum. Wild: common.
Natural distribution: Eastern United States.

Quercus palustris × Quercus imbricaria. HYBRID OAK.
Location: Arboretum.
Hybrid.

Quercus prinoides. SCRUB CHESTNUT OAK.
Location: Fruticetum.
Natural distribution: Eastern United States.

Quercus Prinus. ROCK CHESTNUT OAK.
Location: Arboretum. Wild: occasional in the south woods west of the Bronx River.
Natural distribution: Northeastern United States.

Quercus Robur. ENGLISH OAK.
Location: Arboretum.
Natural distribution: Europe and western Asia.

Quercus Robur var. **atropurpurea.** PURPLE-LEAVED ENGLISH OAK.
Location: Arboretum.

Quercus Robur var. **Concordia.** GOLDEN ENGLISH OAK.
Location: Arboretum.

Quercus Robur var. **fastigiata.** COLUMNAR ENGLISH OAK.
Location: Arboretum.

Quercus Robur var. **fastigiata cupressoides.** NARROW-LEAVED COLUMNAR ENGLISH OAK.
Location: Arboretum.

Quercus rubra. RED OAK.
Arboretum. Along driveway from Depot Plaza to Fruticetum.

Along driveway south of Museum. Along path south of the west lake. Wild: common.

Natural distribution: Eastern North America.

Quercus Schneckii. SCHNECK'S OAK.

Location: Arboretum.

Natural distribution: South Central United States.

Quercus serrata. SAW-TOOTHED OAK.

Location: Arboretum.

Natural distribution: China and Japan.

Quercus sessiliflora. SHORT-STALKED ENGLISH OAK.

Location: Arboretum.

Natural distribution: Europe and western Asia.

Quercus sinuata. WALTER'S OAK.

Location: Arboretum.

Hybrid between *Quercus nigra* and *Quercus Catesbaei.*

Quercus stellata. POST OAK.

Location: Arboretum.

Natural distribution: Eastern United States.

Quercus velutina. BLACK OAK.

Location: Arboretum. Near Economic Garden. Southeast of Museum, along path to Economic Garden. Wild: common.

Natural distribution: Eastern United States.

NOTES FROM THE HERBACEOUS COLLECTIONS—III

Plants of *Siegesbeckia orientalis* grown in the Nursery and Herbaceous Grounds the past summer proved to be rather robust weeds, but altogether interesting in some features. The species, which is found in many tropical countries, is a small yellow-flowered, cordate-leaved composite of branching habit. The involucral bracts are spreading, slender, club-shaped, and covered with viscid hairs, by means of which the flowers, and particularly the fruiting parts, cling to one's hands or clothing. It has been said that these bracts are insect-catching. We have not noticed this interesting feature as yet. In *Rhodora* for April, 1917, E. E. Sherff notes the occurrence of this plant at

Athens, Illinois, where it is a relic of a collection of cultivated plants of fifty years previous. One season's experience here denotes such a persistency for this plant.

Another composite, with a similarly interesting feature, is *Carpesium cernuum* of Europe and temperate Asia. This has broad oval leaves and large, solitary heads of flowers with broad yellow disks. The collecting of seeds of this plant brought to light the interesting tenacious character of these seeds as regards each other. Upon examination of a specimen in the Columbia University herbarium, bearing the date 1841, it was found that some seeds there were still fastened together as if pasted.

Among the annual flowers of our borders here for the past few seasons has been one sold by the seedsmen as *Bidens atrosanguinea*. Its outward appearances were those of a *Coreopsis lanceolata*, with dark, velvety red flowers, or of a low, single dahlia. However, it proves to be *Cosmos diversifolius* Otto, of Mexico and South America, called black cosmos, with tuberous dahlia-like roots. It is a very pretty and satisfactory summer flower.

An odd late-flowering plant is *Tricyrtis hirta*, the Japanese toad lily. It flowers in late October and early November, showing racemes of large bell-shaped flowers which are white, tipped with yellow and covered with purple dots. The toad lily was first found by Thunberg, who described it as *Uvularia hirta*. In 1862 it was rediscovered by Fortune and introduced into cultivation.

KENNETH R. BOYNTON

NOTES, NEWS AND COMMENT

The following botanists enrolled in the library as visitors during September and October: Dr. R. C. Benedict, Brooklyn, N. Y.; Professor Mel. T. Cook, New Brunswick, N. J.; Dr. J. Bequaert, New York; Carl Bannwart, Newark, N. J.; Dr. Charles E. Fairman, Lyndonville, N. Y.; Paul C. Standley, Washington, D. C.; and Dr. Carl Skottsberg, Upsala University, Sweden.

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THE DELICIOUS FRUITS OF ACTINIDIA

In the collection of vines at the northern end of the Herbaceous Garden Valley, not far from the Museum Building, is a magnificent specimen of *Actinidia arguta*, which was obtained from the Department of Plant Introduction at Washington in 1898 and has been growing rapidly ever since. The past season, it fruited abundantly and the writer had an opportunity to examine and test the flavor of the fruits in various stages. Several years ago, he had a similar opportunity while visiting Dr. W. Gilman Thompson at his summer home in Stockbridge, Massachusetts, where he found a porch covered with a large vine of this species in full fruit.

During a recent visit to Washington, Dr. Fairchild supplied an interesting publication of his on the most promising species of this genus and Mr. Bisset showed a collection of herbarium specimens and fruits. It cannot now be doubted that *Actinidia arguta* is a valuable plant, hardy in this region, which is ornamental and also yields an abundance of good, edible fruit. The fruits of the more tender species, *A. chinensis*, are considerably larger, but are covered with a densely hairy skin, so that they have to be peeled. If this skin can be changed by amelioration or hybridization, the plant should prove a valuable one for the southern United States.

The genus *Actinidia* contains over twenty species, most of them natives of eastern Asia, and about seven are in cultivation. The species are mostly climbing shrubs with handsome foliage, white or rarely pinkish flowers, and berry-like fruits with small

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seeds. They prefer moist, rich soil and a half-shaded or sunny exposure. They are easily propagated by seeds, cuttings, or layers. *A. kalomikta*, which is hardy in New England and eastern Canada, has rounded leaves variegated with white or pink; white flowers; and oblong fruit which is blue and sweet. The fruits are dried by Russian settlers in Siberia and put aside for winter use in bread and confectionery. *A. polygama* is hardy as far north as Massachusetts. Its leaves and twigs are very much relished by cats, so that it is necessary to protect them with wire. The two most valuable species are *A. arguta* and *A. chinensis*, which will be described a little more fully. In both of these species it is necessary either to plant both sexes or to obtain specimens with polygamous flowers if fruit is desired. The flavor of the fruit in both species varies considerably, but it is said to be always excellent.

Actinidia arguta

This species grows rapidly and is remarkably free from insects and diseases. The leaves are broad and shining; the flowers white and nearly an inch across; the fruits somewhat oblong, greenish-yellow, an inch or more long, with thin, smooth skin and sweet, excellent flavor, reminding one of figs. In northern Korea, the plant is known as the "Tara," or wild fig. The fruits may be eaten raw, cooked, preserved, or canned. This plant would probably have been more used in this country if so many male plants had not been distributed and if the species came into bearing sooner. The plants observed have usually required 8 or 9 years to produce fruit.

Actinidia chinensis

The leaves of this species are heart-shaped and dark-green; the flowers large, creamy-white, and two inches across; the fruit, which is known in China as "Yang-Taw," is egg-shaped, one to two inches long, russet-brown, densely hairy, with green flesh and excellent flavor, resembling that of the gooseberry. When the fruits are picked and left for a few days until soft, they are very fine eating. They ordinarily need about as much sugar as

strawberries do. Delicious jam, pies, and sauce can be made of them. This is the most beautiful species of the genus, having the largest leaves, flowers, and fruit. Unfortunately, it is not hardy in the region about New York. It has been grown at Chico, California, where it flowered profusely, but all the plants proved to be males. The flowers produced were large and white, with abundant, yellow stamens, which made the male plants very attractive as ornamentals, although valueless as food producers.

W. A. MURRILL.

HARDY WOODY PLANTS IN THE NEW YORK BOTANICAL GARDEN

(Continued)

ULMACEAE. Elm Family

Ulmus. ELM

Ulmus alata. WINGED ELM.

Location: Arboretum.

Natural distribution: Southeastern United States.

Ulmus americana. AMERICAN ELM.

Location: At and near Depot Plaza. Near approach to elevated railway. Herbaceous Grounds. Along driveway west of Museum. In front of Mansion. Wild: common.

Natural distribution: Eastern North America.

Ulmus campestris var. **Berardii.** BERARD'S ELM.

Location: Fruticetum.

Horticultural origin.

Ulmus foliacea. SMOOTH-LEAVED ELM.

Location: Arboretum.

Natural distribution: Europe and western Asia.

Ulmus foliacea var. **pendula.** WEEPING SMOOTH-LEAVED ELM.

Location: Arboretum.

Ulmus foliacea var. **umbraculifera.** PERSIAN ELM.

Location: Arboretum.

Natural distribution: Persia and Turkestan.

Natural distribution: Persia and Turk
Natural distribution: Persia and Turk

Ulmus foliacea var. **Wheatleyi.** WHEATLEY'S ELM.
Location: Arboretum.
Ulmus fulva. SLIPPERY ELM.
Location: Arboretum, near Nursery. Wild: scarce.
Natural distribution: Eastern North America.
Ulmus glabra. SCOTCH ELM.
Location: Arboretum.
Natural distribution: Europe to Japan.
Ulmus glabra var. **grandidentata.** THREE-LOBED SCOTCH ELM.
Location: Arboretum.
Natural distribution: Europe to Japan.
Ulmus laevis. SMOOTH ELM.
Location: Arboretum.
Natural distribution: Central Europe to western Asia.
Ulmus parvifolia. CHINESE ELM.
Location: Arboretum.
Natural distribution: China and Japan.
Ulmus pumila. DWAR ELM.
Location: Arboretum.
Natural distribution: Central Asia.
Ulmus serotina. RED ELM.
Location: Arboretum.
Natural distribution: Southeastern United States.
Ulmus Thomasi. ROCK ELM.
Location: Arboretum.
Natural distribution: Northeastern North America.

Celtis. HACKBERRY

Celtis canina. DOG HACKBERRY.
Location: Arboretum.
Natural distribution: Northeastern United States.
Celtis caucasica. CAUCASIAN HACKBERRY.
Location: Arboretum.
Natural distribution: Caucasus and northern Persia.
Celtis georgiana. GEORGIA HACKBERRY.
Location: Arboretum. Wild: rather common.
Natural distribution: Southeastern United States.

Celtis occidentalis. HACKBERRY.
Location: Arboretum. Wild: occasional.
Natural distribution: Eastern North America.
Celtis sinensis. CHINESE HACKBERRY.
Location: Arboretum.
Natural distribution: China and Japan.
Celtis Smallii. SMALL'S HACKBERRY.
Location: Arboretum.
Natural distribution: Southeastern United States.

Zelkova. ZELKOVA

Zelkova serrata. SHARP-POINTED ZELKOVA.
Location: Arboretum.
Natural distribution: Japan.

MORACEAE. Mulberry Family

Morus. MULBERRY

Morus alba. WHITE MULBERRY.
Location: Arboretum.
Natural distribution: Asia.
Morus alba var. **pendula.** WEEPING WHITE MULBERRY.
Location. Arboretum.
Morus alba var. **tatarica.** RUSSIAN MULBERRY.
Location: Arboretum. Fruticetum. Approach to elevated railway.
Natural distribution: Russia.
Morus rubra. RED MULBERRY.
Location: Arboretum.
Natural distribution: Eastern United States.

Toxylon. OSAGE ORANGE

Toxylon pomiferum. OSAGE ORANGE.
Location: Arboretum.
Natural distribution: South central United States.

Broussonetia. PAPER MULBERRY.

Broussonetia papyrifera. PAPER MULBERRY.
Location: Arboretum.
Natural distribution: China and Japan.

TROCHODENDRACEAE. Kadsura Tree Family

Cercidiphyllum. KADSURA TREE

Cercidiphyllum japonicum. KADSURA TREE.
Location: Arboretum. Approach to elevated railway.
Natural distribution: Japan.

Eucommia. EUCOMMIA

Eucommia ulmoides. ELM-LEAVED EUCOMMIA.
Location: Arboretum.
Natural distribution: China.

RANUNCULACEAE. Crowfoot Family.

Paeonia. PEONY.

Paeonia Moutan. TREE PEONY.
Location: Fruticetum. Along path from approach to Elevated Railroad to Conservatory Range I.
Natural distribution: China.

Xanthorrhiza. SHRUB YELLOW-ROOT.

Xanthorrhiza apiifolia. SHRUB YELLOW-ROOT.
Location: Fruticetum. Boulder Bridge.
Natural distribution: Southeastern United States.

LARDIZABALACEAE. Voqui Family.

Akebia. AKEBI.

Akebia quinata. AKEBI KADSURA.
Location: Viticetum.
Natural distribution: China and Japan.

BERBERIDACEAE. Barberry Family.

Odostemon. MAHONIA.

Odostemon japonicus (*Mahonia japonica*). JAPANESE MAHONIA.
Location: Fruticetum.
Natural distribution: Himalayan Region to China.

Odostemon japonicus var. **gracillimus.** SLENDER JAPANESE MAHONIA.
Location: Fruticetum.

Odostemon nutkanus. OREGON GRAPE.
Location: Fruticetum.
Natural distribution: Northwestern North America.

Odostemon nutkanus var. **diffusus.** SPREADING OREGON GRAPE.
Location: Fruticetum.

Odostemon nutkanus var. **opacus.** DULL-LEAVED OREGON GRAPE.
Location: Fruticetum.

WINTER COURSES IN GARDENING.

Using a portion of one of the propagating houses for greenhouse purposes, winter courses in gardening have been given during November and December to classes on Tuesday and Saturday mornings, as announced in the September issue of the JOURNAL.

Further winter courses will be organized in the same greenhouse for January and February, commencing on Saturday morning, January 12, at 9 o'clock. Intending students who would not be able to attend on Saturday mornings will be accepted at other times during the week if applications are sufficiently numerous.

Instruction will include greenhouse bench work in propagating, potting, greenhouse and cold frame practice in propagating, potting and seed testing, together with lectures and conferences. The fee for these courses will be $10, which will include all necessary material and supplies.

All correspondence relative to this instruction should be addressed to HENRY GRISCOM PARSONS,
Supervisor of Gardening Instruction, Mansion,
New York Botanical Garden, Bronx Park.

NOTES, NEWS AND COMMENT

Holding out against the cold weather until after Thanksgiving in the flower beds near Conservatory Range 1, were fine groups of pansies and tufted pansies. The latter group, a white-flowered variety of *Viola cornuta* called White Perfection, bloomed throughout the summer and autumn, and, like the common pansy, was at its best during the cooler season. Blooms of both were seen on December 5. *Centaurea montana*, the bluest of all the centaurys, showed new growth and second bloom in November.

Three plants of the Angel's Trumpet, *Datura arborea*, bloomed in Conservatory Range 2 in November. Each plant had about fifteen great white flowers, nearly one foot in length.

Furcraea macrophylla, with long, fleshy leaves well-armed with spines, has been in bloom in Conservatory Range 1. The flowering stalk is more than fifteen feet high, with many flower-laden branches.

The Bronx River Parkway Commission, in developing their Parkway Reservation, which commences at the northern end of the New York Botanical Garden and extends northward through Bronx Valley to Kensico, has recently been constructing a driveway and path system to connect with Garden roads and paths, and the driveway thus built was opened for traffic on December 1st, requiring a slight modification of the surfacing of the Garden road at the point of connection, which was done by the Parkway Commission without cost to the Garden. While the work was in progress, we did some grading along this boundary in order to properly connect one of the paths.

A magnificent specimen of *Tetrapanax papyriferum*, native of the Island of Formosa, bloomed in Conservatory Range 2 in the latter part of November. Planted under a bench, the roots of

this plant have run through and across the house and under concrete walks. The leaves, some of which measured two feet across, are dark green above, and white on the under surfaces. There were three flowering branches three feet long, each branch averaging a dozen spikes, each spike with fifteen globular clusters of white flowers. It is from the pith of the stem of this plant that rice paper is made.

Meteorology for November.—The total precipitation for the month was 0.76 inches. Maximum temperatures recorded for each week were 50° on the 2d, *67° on the 6th*, 57° on the 15th, and 53° on the 23d. Minimum temperatures were 27° on the 1st, 8th, and 14th, 20° on the 26th, and *17° on the 27th.*

ACCESSIONS

Plants and Seeds

7 plants for conservatories. (Given by Mr. John H. Voss.)

32 plants, all cacti. (By exchange with Mr. Geo. F. Gaumer.)

10 plants for Arboretum. (Purchased.)

96 plants, specimen evergreens, for Pinetum. (Given by Hicks Nurseries.)

3,000 bulbs, for decorative planting. (Given by John Scheepers & Co., Inc.)

1 packet of seeds of *Rhamnus Purshiana.* (Given by Dr. W. W. Stockberger.)

6 packets of seeds of New Zealand plants. (By exchange with Mr. J. W. Poynton.)

2 packets of seeds of Brazilian plants. (Given by Mr. Godfrey Davidson.)

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