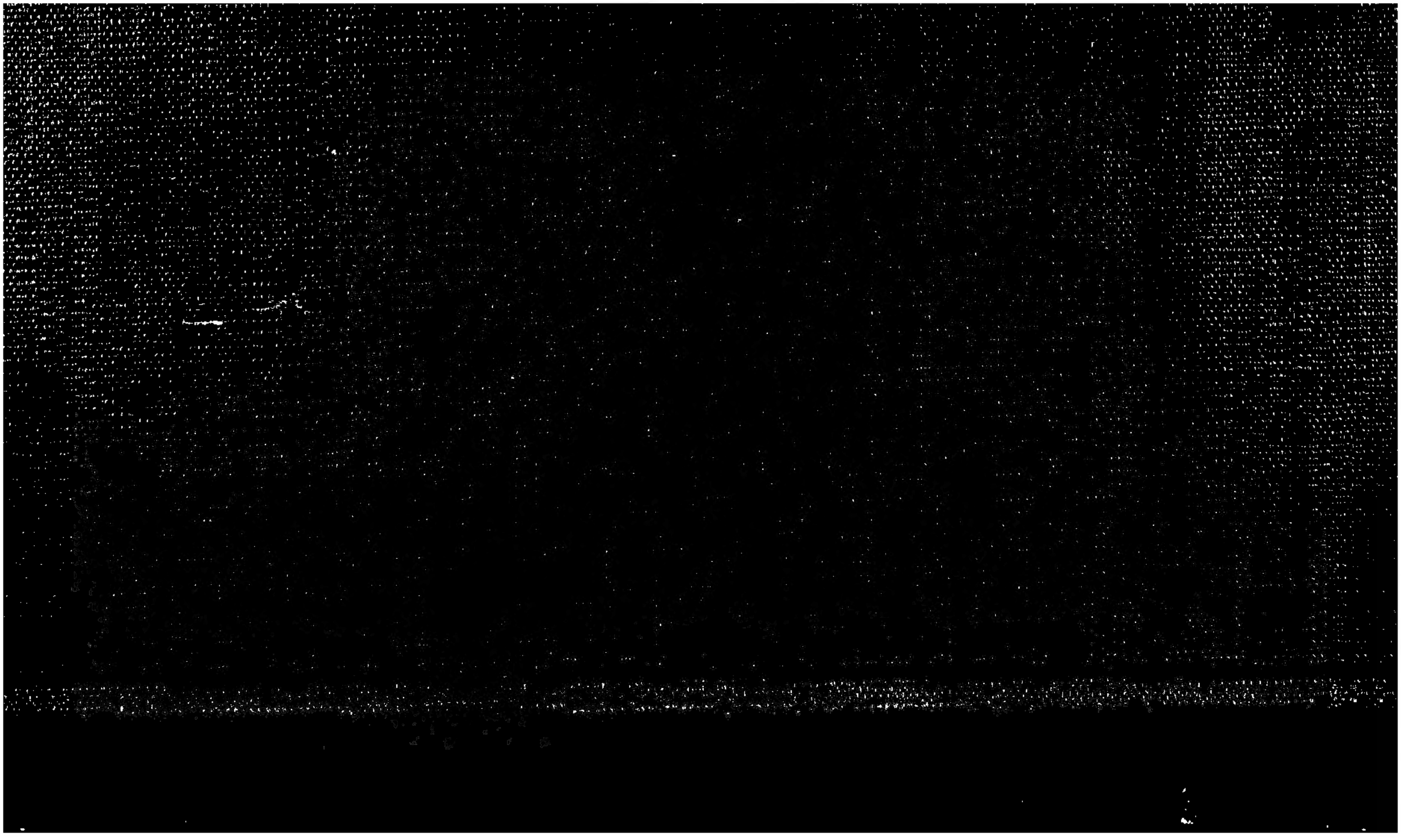

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THE ROYAL-PALM — ROYSTONEA REGIA

The fact that the most stately of our native palms should have eluded the notice of explorers in Florida up to as late a date as about three score years ago, with one possible exception mentioned on a succeeding page, is significant. It clearly reflects the fact that some of the more interesting and instructive parts of the Florida peninsula had not been penetrated by the white man.

The year 1920 found us quite accurately acquainted with the existing geographic distribution of the royal-palm (*Roystonea regia*) in Florida. In past ages, perhaps, its geographic area was more extensive and the plants more evenly distributed. At present, this palm occurs, in a native condition, in several isolated, disconnected colonies. The history of the royal-palm in Florida, traced backward, is interesting, both in its detail and in its brevity

in fact, the definite evidence leads into oblivion within the short space of little over half a century.

In the later-published tree books we may find definite and concise, even if not always correct, information concerning the geographic distribution of the royal-palm in Florida. Thus we find these statements referring to the ranges of the palm in Florida:

"The trees also grow in southern Florida, near Miami, and on both the eastern and western sides of the Everglades, . . ."[1]

"Florida, hummocks on Rogue [Rogers] River twenty miles east of Caximbas Bay, Long's [Long] Key, and the shores of Bay Biscayne near the mouth of Little River; . . ."[2]

[1] Nathaniel Lord Britton, Tree Book, 143. 1908.
[2] Charles Sprague Sargent, Manual, 114. 1905.

A decade earlier it is recorded that the royal-palm "inhabits hummocks on Rogue's [Rogers] River about twenty miles east of Caximbas Bay, Long's [Long] Key off the southern coast [of Florida], and the shores of Bay Biscayne near the mouth of Little River."[3] Still earlier the recorded distribution was "Little and Big Palm Hummocks" 15 and 25 miles east of Cape Romano (Curtiss), near the mouth of Little River, and on Elliott's Key; . . ."

"A tree 18–30 meters in height, with a trunk 0.60 meters in diameter; rich hummocks, often forming extensive groves; in Florida rare and local."[4]

Writing of the discovery of the royal-palm in Florida, C. S. Sargent says: "Another West Indian species, *Oreodoxa regia*—Royal Palm, which is common in Cuba, extends into southern Florida, . . . The presence of a lofty Palm in southern Florida was hinted at more than sixty years ago, and the fact is mentioned in the preface to Nuttall's North American Sylva, but it was not until 1859 that this Palm was known to be *Oreodoxa regia*. In that year Dr. Cooper found it on Bay Biscayne, and twenty years later Mr. A. H. Curtiss established the fact of its presence on Rogue's [Rogers] River and Long's [Long] Key."[5]

In the same year he also says: "The name of the person who discovered *Oreodoxa regia* in the United States is not known." Then in a foot-note he continues: "Nuttall,[6] in his preface to The

[3] Charles Sprague Sargent, Silva 10: 31. 1896.

[4] Charles Sprague Sargent, Report on the Forests of North America, 218. 1883.

[5] Charles Sprague Sargent, Garden and Forest 9: 152. 1896.

[6] Thomas Nuttall was born 5 January, 1786, at Long Preston, near Settle, Yorkshire. He became a journeyman printer, and early acquired a taste for botany. During thirty-three years of residence in the United States, from 1808 to 1841, he devoted most of his time to botanical study, collecting plants not only in the northeastern states, but in the middle west, the south, across the Rockies and on the Pacific coast, and in Hawaii, and publishing his remarkable little work on the "Genera of North American plants," as well as numerous other important contributions to botanical literature. He also became well known as an ornithologist. In 1841 he returned to England, and made his home at "Nutgrove," a small estate near Rainhill, Prescot, Lancastershire, where he died 10 September, 1859.—JOHN HENDLEY BARNHART.

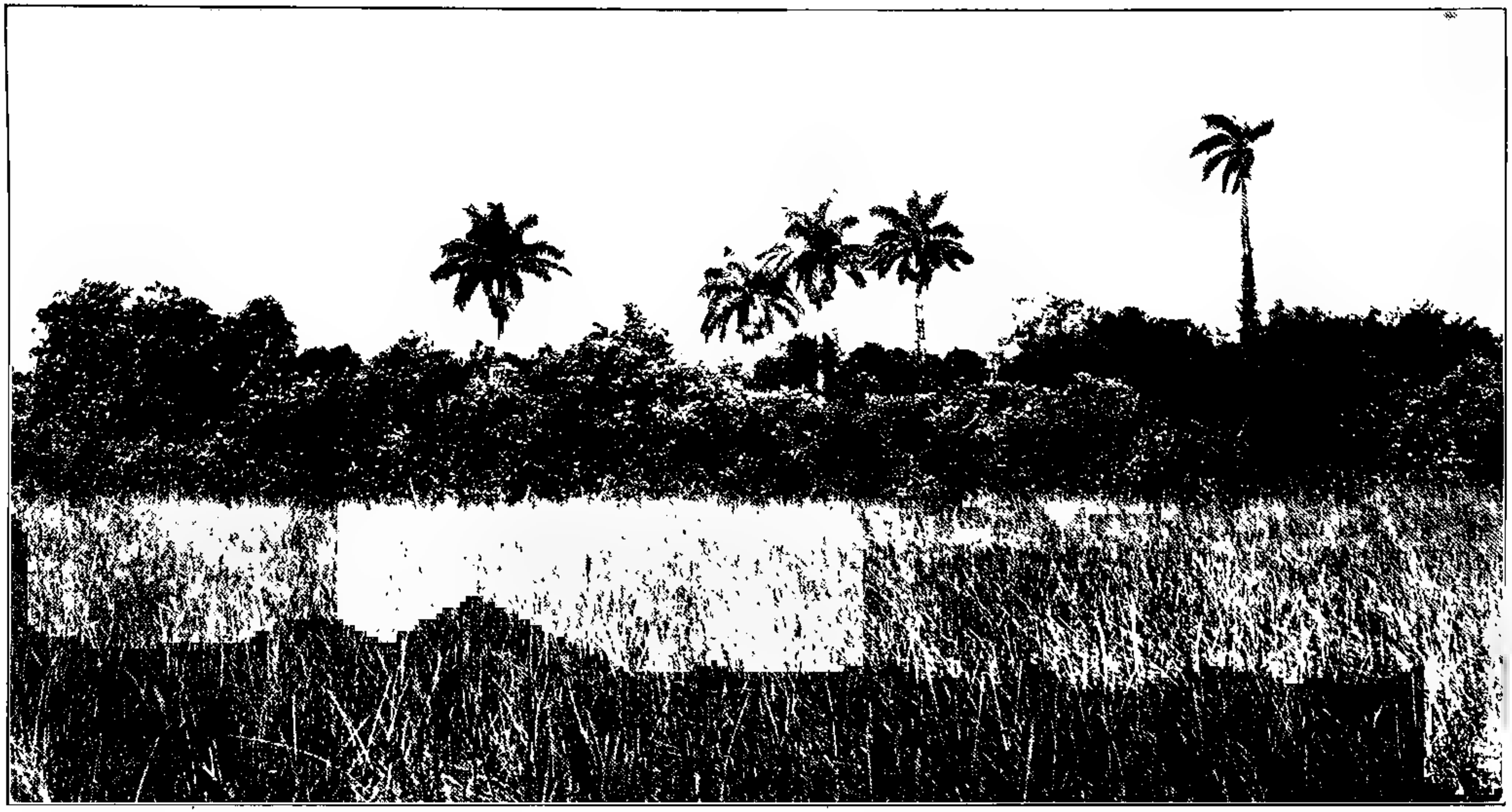

FIGURE 1. The northern part of Royal Palm hammock in the Royal Palm State Park, looking west. Several palms, about one hundred and thirty feet tall, tower above the growth of broad-leaved vegetation whose major elements are large or gigantic, live-oaks, pigeon-plums, mastics, gumbo-limbos, butter-bonglis, red-bays, lancewoods, and satin-leafs. All these large trees and many smaller kinds, as well as the palms, grow in almost pure humus which covers the rock foundation.

Sylva of North America (viii), states that he was informed of the existence of a Palm ninety feet high growing at some distance from the coast in east Florida. This palm must have been *Oreodoxa regia*. It was seen by Dr. J. G. Cooper,[7] in 1859, on the shores of Bay Biscayne, where Dr. A. P. Garber[8] subsequently collected it, and its existence on Rogue's [Roger's] River and Long's [Long] Key was established by Mr. A. H. Curtiss."[9]

"The Palm mentioned by Nuttall in the introduction to his Sylva is found, as I was informed by several persons, in large groves, between Capes Sable and Romano, and one tree three miles north of Fort Dallas. It was called 'Royal Palm,' and said to grow 120 feet high. It is probably the Bahamian 'Cabbage Palm' (*Oreodoxa oleracea,* Mart.). This was evidently the palm

[7] James Graham Cooper, son of the well-known ornithologist, William Cooper (1798–1864), was born in New York City, 19 June, 1830. He studied medicine, graduating from the College of Physicians and Surgeons of his native city in 1851, and spending two years in hospital work. From 1853 to 1855 he was in the territory (now the state) of Washington, as surgeon and naturalist to the northern division of the Pacific Railroad Survey. In the spring and early summer of 1859 he visited the entire east coast of Florida, from Key West to the St. Mary's River. A few years later he settled in California, which was his home for the remainder of his life. In 1865 and 1866, he was naturalist to the geological survey of the state, but for many years, in spite of delicate health, he supported himself by the practice of his profession. He was perhaps better known as an ornithologist than as a botanist, but he collected plants extensively and made important contributions to botanical literature. Notwithstanding the fact that his health was never robust, he accomplished a vast amount of work, and lived to the age of seventy-two years. He died at Hayward, Alameda County, California, 19 July, 1902.—J. H. B.

[8] Abram Paschall Garber was born 23 February, 1838, at Columbia, Pennsylvania. He graduated from Lafayette College in 1868, and studied medicine at the University of Pennsylvania, receiving his degree in 1872. He went to southern Florida as a health-seeker about 1877, and while there devoted much time to the collection of the plants of that region, whose flora was then little known. In 1880 he also collected plants in Porto Rico. In 1881 he returned to Pennsylvania and died there, at Renovo, the same year, 26 August.—J. H. B.

[9] Charles Sprague Sargent, Silva 10: 32. 1896.

FIGURE 2. In Royal Palm hammock on eastern coast (Dade Co.) of Florida. A single palm in the jungle of broad-leaved trees. Rodents and weevils are often so abundant and active where the royal-palm grows that scarcely one of the myriad seeds produced annually by a single tree ever sprouts or at least grows to maturity. When a palm does survive, it soon pushes its crown high above the forest roof.

found by [William] Bartram,[10] in 1774, near Lake Dexter, on the St. John's river, latitude 28° 55′, and to all appearances wild. Some were ninety feet high, with 'plumed' (pinnate) leaves thirty feet in length. (Travels, page 114.) As no one has seen them lately, they may have been destroyed by the severe frosts of 1835."[11]

Nuttall writes as follows in his Sylva:

"In the islands of the Everglades, considerably inland in East Florida, we have been informed that a Palm about 90 feet high, forming a magnificent tree, has been seen, but of this plant we have been unable to obtain, as yet, any further account."[12]

Back to the time of Nuttall's note all the records concerning the occurrence of the royal-palm in Florida have been correct, except for minor details and some errors. The palm attributed to Long's [Long] Key and to Elliott's Key is evidently *Pseudophoenix* and not *Roystonea*. The royal palm has not been found off the Florida mainland, at least not on the islands of the Reef.

William Bartram's reference, in the latter half of the eighteenth century, to a palm growing on the lower Saint John's River, near Lake Dexter, marks the beginning of the history of the royal-palm in the Continental United States and makes William Bartram the discoverer of it this side of the Gulf Stream. Bartram's statement runs as follows:

"The Indian not returning this morning, I set sail alone. The coasts along the St. John's River, south of Lake George, on each side had much the same appearance as already described. The

[10] William Bartram was born 9 February, 1739, at the botanic garden of his father, John Bartram, at Kingsessing, near (now in) Philadelphia. He had the advantage of a better education than his father, and was an artist of considerable ability. He was a clerk in Philadelphia for a few years, and then a merchant in Carolina, but he was more interested in botany than business. In 1765 he joined his father in exploration in Florida, and when his father returned home in 1766 he remained as a settler on the St. John's; but the next year he returned to Kingsessing. From 1773 to 1778 he was engaged in botanical travels in the Carolinas, Georgia, and Florida, of which an account was published in book form in 1791. The rest of his life was spent in scientific study at the garden at Kingsessing, in the homes of the owners of the garden—at first his brother John, later, Colonel Carr—and it was there that he died, 22 July, 1823.—J. H. B.

[11] James Graham Cooper, Ann. Rep. Smithsonian Institution, 1860: 440. 1861.

[12] Thomas Nuttall, North American Sylva 4: viii. 1842.

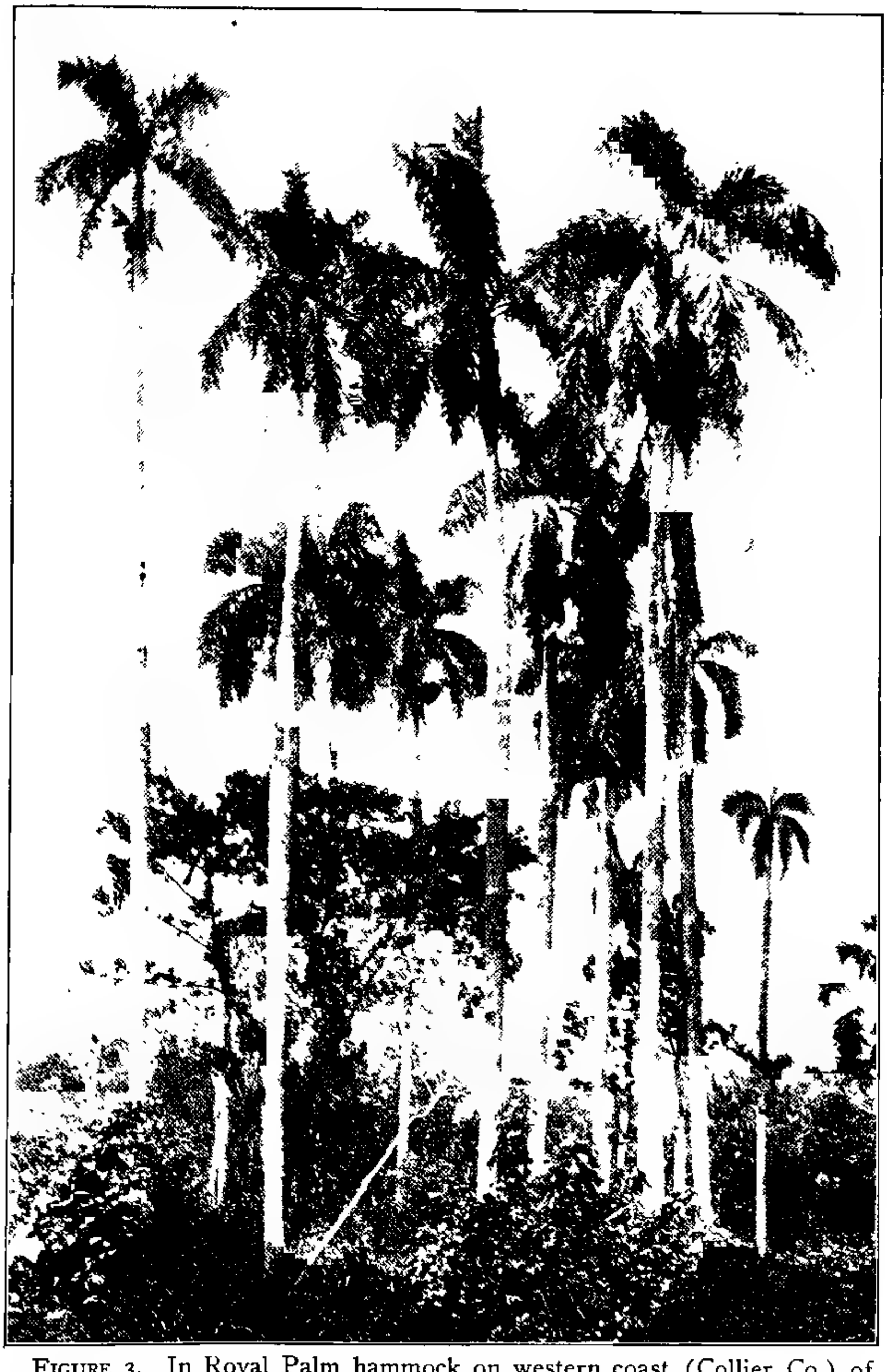

FIGURE 3. In Royal Palm hammock on western coast (Collier Co.) of Florida. A natural group of palms of various ages. When rodents and weevils, natural enemies of this palm, are not too destructive, palms spring up and continue to grow in colonies. However, two other agents have not only removed individuals, but sometimes wiped out whole colonies, either by digging them up for ornamental plantings or by vandalism—wanton burning of the hammock.—Photograph by W. M. Buswell.

palm-trees here seem to be of a different species from the cabbage tree; their straight trunks are sixty, eighty, or ninety feet high, with a beautiful taper, of a bright *ash colour,* until within *six or seven feet of the top,* where it is a fine *green colour,* crowned with an orb of rich green plumed leaves: I have measured the stem of these plumes fifteen feet in length, besides the plume, which is nearly of the same length."[13] The italics are ours.

Now, this palm mentioned by Bartram could have been nothing else but the royal-palm. We may, then, consider that up to a century ago this plant grew naturally up to the northern part of the Florida Peninsula, carried northward by birds, and existed there owing to a protracted warm spell, or that it was introduced there generations ago by the aborigines who, doubtless, used this palm in their domestic economy. At any rate the palm was there, and, apparently, it has completely disappeared.

All this evidence, although indirect, indicates, among other things, that up to about a century ago Florida had a protracted warmer and perhaps less changeable climate, that the sporadic occurrence of tropical and semitropical plants in the more northern part of the peninsula represents the remains of a generous distribution of more typically southern plants further north. In passing, it may be said that Florida and the adjacent regions hold intensely interesting problems, considered from the past, present, or future.

What may have happened in the thirties of the last century in northern peninsular Florida actually happened in the southern part of the peninsula in the nineties of the same century. Three tall royal-palms grew in a hammock near the headwaters of the river upon which the settlement of Everglade in Collier County is situated. They flourished up to 1894. The cold weather of 1894 and 1895 killed them, but the trunks are still standing, though gradually decaying. No other royal-palms are in the immediate neighborhood. The species may be dying out this side of the Gulf Stream. If it has not been facing extermination from natural causes, it is now certainly confronted by more serious conditions brought about by the white man's advent in the region. In addition, an insect pest has recently been imported which bids fair to exterminate the cultivated royal-palms, if not promptly checked.

[13] William Bartram, Travels in North and South Carolina, Georgia, East and West Florida, 113–114. 1792.

If it gets headway on the native ones, the royal-palm will soon disappear from the State.

The royal-palm has quite a restricted geographic range in Florida. It is represented naturally in only three counties—Dade, Monroe, and Collier. The colony of the Bay Biscayne region is in a precarious condition, if it is not already exterminated.

The large colony of Royal-Palm Hammock of Dade County, sometimes called Paradise Key, is under protection, and there are several outlying trees or small colonies in nearby hammocks.

It occurs sparingly in the Cape Sable region and on some of the higher islands in the Ten Thousand Islands; all in Monroe County. In Collier County there are royal-palm hammocks several miles east of Marco Island. Further inland in the Fahkahnatchee Cypress there is a stretch of the royal-palms extending for fifteen miles north and south just west of Deep Lake.

The old trees are quite safe, as a rule, while they last, but the young ones throughout nearly the natural range have been damaged by fires or removed and sold for ornamental plantings. When the trees that are too large for transplanting pass away, it will be interesting, if not encouraging, to see what the present colonies will have to show for specimens.

In the country that was latest accessible and well known as most prolific in vegetable life, the natural plant resources are changing or disappearing most rapidly, largely through the carelessness and vandalism of the white man.

The royal-palm was formally described and published, in 1815, from specimens collected near Havana, Cuba, or twenty-five years after William Bartram mentioned it as growing in Florida.

It was given the generic name *Oreodoxa,* but this was untenable, as it belonged to a different kind of palm. Later it was named for General Roy Stone, and it is now known as *Roystonea regia.*

Contrary to the habit of our other palms, all of which have an aspect of naturalness, the royal-palm alone suggests artificiality. A tall gray symmetrical typically unblemished concrete-like column (trunk), often swollen between bottom and top, capped with a long, narrower, close-fitting apical ferrule (leaf-sheaths), which emits from its top a great plume of gigantic dark-green feathers (leaves), gives us something bizarre in our flora.

JOHN K. SMALL.

THE SELECTION OF SHRUBS FOR HOME PLANTING[1]

One of the outstanding things advocated in the selection of shrubs for home planting was that each person should really give some consideration and thought to his yard and in developing it himself should be original and show some individuality. There is altogether too much inclination on the part of home owners today to plant nothing but "our future American national shrubs," the Van Houtte Spirea, and its first assistant, the Japanese Barberry. In a like manner, excessively conspicuous plants, such as the Colorado Blue Spruce, the Umbrella Catalpa, and the Weeping Mulberry, should not be used in the front lawn just because the neighbors have them. If one would stop to think, one would soon realize that these excessively conspicuous plants are entirely out of place in the front lawn.

Another point strongly emphasized was the fact that we should always pick shrubs adapted and fitted to the location. It will avoid the disappointment of shrubs refusing to grow, it will avoid shrubs obscuring vision and light from windows and will generally make the initial cost the entire cost of any planting. Every shrub, every tree, every vine has a certain predestined size to which it will grow and we should carefully consider this ultimate size before planting. This will do away with the necessity of "bobbing," cutting back, and butchering trees and shrubs where we are using them in an informal planting.

Hardiness is another important factor so often overlooked, for there are plenty of good hardy shrubs so that we need not try to depend on those which die back every year or two. Along this line, the speaker advised buying the material direct from a reliable nursery rather than from house to house peddlers of nursery stock, since these peddlers often know little or nothing about what they are selling.

Variety always adds interest and so we may make our home plantings interesting by using variety in our shrubs rather than confining ourselves to one or two kinds. Among those shrubs particularly recommended for home use were the following: for relatively low planting, Lemoine Deutzia, Froebel Spirea, Golden St. Johnswort, Kerria, Coralberry, Japanese Barberry, Fragrant

[1] Abstract of an illustrated lecture given at The New York Botanical Garden on Saturday afternoon, November 6, 1927.

Sumac, and Thunberg Spirea; for slightly taller shrubs, growing from four to six feet high, Sweetshrub (*Calycanthus floridus*), Jetbead, Goldentwig Dogwood, Ibota Privet, Regel Privet, Winter Honeysuckle, Eva Rathke Weigela; for tall shrubs, growing from six to twelve feet or more, Coral Dogwood, Double White Deutzia, Winged Euonymus, Border Forsythia, European Privet, Tatarian Honeysuckle, Sweet Mock-orange, Goldleaf Ninebark, Pink Weigela, and for shady places, where it is so often difficult to make things grow, Ibota Privet, European Privet, Morrow Honeysuckle, Tatarian Honeysuckle, Goldleaf Ninebark, Snowberry, Coralberry, Arrowwood, Wayfaring Tree, and European Cranberry Bush.

Persons desiring further information on these subjects were advised to write to their state universities, their state experiment stations, or to the United States Department of Agriculture at Washington, D. C., for bulletins on these various lines.

VICTOR H. RIES.

CHRYSANTHEMUMS (1927)

The photograph (FIGURE 4) shows a corner of the latest display of chrysanthemums at The New York Botanical Garden. Through the interest of Mr. Elmer D. Smith, the chrysanthemum hybridist, a diversified collection is presented each fall in the Central Display House, Conservatory Range 2. Some three hundred plants of about one hundred varieties were shown in 1927. The season was a fairly good growing one, the only drawback being the earliness of blooming, so that the flowers were gone sooner than usual. A portion of a previous display was pictured in the JOURNAL (27: 10. 1926) and in this connection some of the visitors' favorites were at that time discussed, including Izola, Co-ed, Sunshine, Maple-leaf, anemone-flowered types; Billie Burke, Bright Eyes, Little Tot, and other baby pompon types; and the favorite small single variety Anna. These were all exhibited last year and newer sorts added. Mention may be made of the large artistic singles Jean, white, and Laona, pink. These are larger than Anna, with more shaggy appearance.

The extremely attractive new anemone types are represented by Bellingham, light pink; Berneita, pink and white; Nokomis,

FIGURE 4. A group of single, anemone, and pompon chrysanthemums in the Central Display House of Conservatory Range 2 of The New York Botanical Garden, November, 1927. Photograph by Mr. Sigurd Fischer.

amaranth and white, and Tronesta, an early pink. In this section great advance is being made, and we are promised some surprises by Mr. Smith. The prominence of pompons in the chrysanthemum schedule is being met by new varieties each year.

In our collection Minong, white, Gold Coin, yellow, Muskoka, bronze, and Unalga, yellow, were favorites.

The commercial and exhibition class of pompon varieties demands an ever extending range. Varieties with large flowers grown as pot plants; varieties suitable for disbudding to make graceful cut flower sprays; baby or button types as cut flowers and, more useful, as pot plants; and varieties with differing blooming dates, heights, and decorative values, are in our autumn show.

KENNETH R. BOYNTON.

DOCTOR W. GILMAN THOMPSON

Through the death of Dr. W. Gilman Thompson, The New York Botanical Garden has lost one of its earliest members, friends, and supporters. He became a member of the Corporation in 1895, the year the land for the use of the Garden in Bronx Park was appropriated by the Commissioners of Public Parks, and we well remember his help in attaching the first label to a tree in the summer of that year; his Corporation membership continued until his death. He served as a Scientific Director from 1896 to 1901; as an elected member of the Board of Managers from 1902 until 1926, and as President of the Garden from 1913 to 1922. During all these years he was very seldom absent from any meeting. He visited the Garden at frequent intervals and was prolific in wise advice and suggestion.

His major botanical interest was in native wild plants and he knew intimately a great many species inhabiting New York and New England. His love for nature was very evident, and he would tramp long distances for this enjoyment. My last excursions with him were during last July, while visiting him at Stockbridge, Massachusetts, when I accompanied him on a canoe trip on the Konkapot Creek, and we talked about the varied vegetation of its shores for several hours, and also ascended Mt. Everett to see the interesting vegetation of its summit. He was apparently in perfect health at that time, and enjoyed active exercise; his sudden death within four months afterwards was wholly unexpected.

During his distinguished medical career he gave much attention to pharmacology and dietetics, lecturing on these subjects

during his professorships in the medical colleges of Cornell University and New York University. He thus had a wide knowledge of vegetable drugs and foods. He was fond of garden flowers and grew choice varieties at his country home at Stockbridge.

Dr. Thompson was born in New York on December 25, 1856, and died here on October 27, 1927. His will provides a bequest of $5,000 to the Garden.

The following resolutions were adopted by the Board of Managers at their meeting on November 17, 1927:

Resolved, That the Managers of The New York Botanical Garden deplore the loss of their former president and esteemed associate; and,

Resolved, That the foregoing memorial and resolution be published in the JOURNAL of the Garden.

N. L. BRITTON,
Secretary.

CONFERENCE NOTES FOR NOVEMBER

A regular monthly Conference of the Scientific Staff and Registered Students of the Garden was held on Wednesday, November 2, 1927, at 3:30 P. M., with a program as follows: "Further Studies of the Melastomataceae," by Dr. H. A. Gleason, and "The Species of *Hemerocallis,*" by Dr. A. B. Stout.

Dr. H. A. Gleason discussed some of the results of his researches on South American Melastomataceae. This essentially tropical family has long been noted for its interesting geographic distribution, all of the genera and all of the tribes save one being strictly limited to either the eastern or the western hemisphere, while important differences in the structure of certain tribes suggest a polyphyletic origin of the family. In most of the tribes both genera and species are sharply differentiated, but in the Miconieae, the largest tribe, with more than a thousand species, generic lines are poorly marked and the genera as at present recognized are very unequal in their scope. It may be necessary to develop a complete re-arrangement of the genera in this group. The investigation of the flora of northern South America has brought to light many undescribed species, particularly in the Andes, of which about fifty have already been published.

Dr. A. B. Stout discussed the species of *Hemerocallis* with special reference to the known wild species and to the identity of the cultivated types of these and of the hybrids that have been cultivated as clonal varieties. At the present time not more than six reliable species are to be recognized. Several forms described as species are to be included in the species *H. fulva,* which is somewhat variable as to size, shape, and color of flowers. The discussion was based on the study of a rather extensive collection of species and varieties now being grown at The New York Botanical Garden and being utilized in breeding for new types of day lilies.

A. B. Stout,
Secretary of the Conference.

CONFERENCE NOTES FOR DECEMBER

A regular monthly Conference of the Scientific Staff and Registered Students of the Garden was held on Wednesday, December 7, 1927.

Dr. Fred J. Seaver gave a brief talk under the title "Notes on Trinidad Fungi." Six weeks were spent on that island by the speaker in the winter of 1921, during which time more than six hundred collections of fungi were obtained. Most of this material had been determined some time ago. Little effort has been made to publish the results, owing to the fact that the Porto Rican fungous flora was in process of preparation and required all the time available. Since the completion of that work a more detailed study of some of the Trinidad forms has been undertaken.

The only part of the collection reported on in full was the rust collection. This was studied and reported by Dr. J. C. Arthur in 1922 and consisted of 169 collections, comprising 71 species, the largest collection of rusts ever brought out of Trinidad and probably the largest collection of rusts ever obtained in any island of the West Indies by any mycologist working alone for the same length of time. Dr. Roland Thaxter, of Harvard University, collected in Trinidad during the winter of 1913 and 1914; his entire rust collection consisted of 43 species. The total rust flora of Trinidad as represented by these two collections consists of 96 species, as compared with 181 species from Porto Rico, an island

more than twice as large and one which has been worked over for a number of years by numerous mycologists, including several rust specialists. These figures would seem to indicate that the rust flora of Trinidad may be larger than one would be inclined to think when we consider the small size of the island, about 35 by 48 miles. Further study is needed in order to determine these points with any degree of certainty.

The group considered in the present discussion was the order Hypocreales, many interesting species of which had been collected. A detail report of this work will appear in the March issue of *Mycologia.*

Mr. Kenneth R. Boynton then spoke on "Mr. N. E. Brown's Mesembryanthemums," with a display of a number of living plants to illustrate the different types discussed.

The Mesembryanthemums, or fig-marigolds, have been the object of special study by the distinguished botanist, Mr. N. E. Brown, under cultivation at his home in Kew, England. A few species have been grown in conservatories, outdoors in California, and similar climates, but those of more curious appearance and habits, communicated to him by British botanists and settlers in South Africa, showed such a diversity in character as to warrant segregation into various genera. A year ago the garden secured some two hundred plants of these segregates, and many of them have flowered here. Of those which seemed in condition to be temporarily removed from the conservatories, *Lithops, Gibbaeum, Argyroderma, Conophytum, Rimaria, Cheiridopsis, Pleiospilos,* and *Frithia* were exhibited before the Conference. A common feature of several of these genera is that of mimicry, in that they so closely simulate the ground in which they grow. The leaves are perfect imitations of greyish-brown stones. The "silver-skins," of the genus *Argyroderma,* in their homes among white quartz patches in the Karroo country have been known to remain hidden even to discerning botanists, so like the whitish material that surrounds them is the silver surface of the plants. Some oval-topped species of *Lithops* with all but the brownish surface, which has been found to be transparent, hidden in the top of the soil, have been passed over by travelers, later to be found in flower. One gets a distinct impression of stones blooming from

many of the other species when they are in flower. Another genus with the exposed surface transparent and acting as "windows" is *Frithia*. Here the leaves are cylindrical, tufted, and without chlorophyll at the apex. Although these are naturally buried in the soil up to this "windowed" apex, Mr. Brown warns against burying them in cultivation in our climate. The flowers of many species are showy, and the capsules extremely interesting in their hygroscopic properties. Several capsules from plants in the garden collection were placed in water at the Conference, and opened after a few minutes disclosing their curious mechanism. At home they open during rainy season, allowing the seeds to escape.

The above summaries were supplied by Dr. Seaver and Mr. Boynton.

A. B. STOUT,
Secretary of the Conference.

NOTES, NEWS, AND COMMENT

Dr. A. B. Stout, Director of the Laboratories, represented The New York Botanical Garden at the meetings of the Botanical Society of America and the American Association for the Advancement of Science, held in Nashville, Tennessee, December 26–30. He presented an invitation paper on "Dichogamy in Flowering Plants" at the joint session of the affiliated societies and Section G of the American Association for the Advancement of Science.

Dr. Arthur Hollick was one of the guests at the exercises held in connection with the dedication of the new botany laboratory at Wellesley College, Wellesley, Mass., on Friday, November 4, 1927. The exercises began at 10:30 A. M., with a reception of the guests, followed by inspection of the buildings and conservatories, and luncheon at 1:00 P. M. At 2:30 a meeting was held in the botany lecture room, where brief addresses were made on various aspects of botanical investigation. A banquet was served in Alumnae Hall in the evening, after which an address was de-

livered by Dr. W. E. Lepeschkin, of the Russian Peoples University of Prague, visiting professor at Washington University, Saint Louis. The exercises closed with an address by Dr. C. Stuart Gager, of the Brooklyn Botanic Garden, after which the laboratory building was officially declared dedicated.

Dr. John K. Small, Head Curator of the Museums and Herbarium, spent four weeks in November and December in further botanical exploration in Florida. With the coöperation of Mrs. Arthur Curtiss James he was able to cover about four thousand miles in the State, visiting all the fifteen plant regions. Collections of several dozen plants of live iris from about thirty different localities were taken to Coconut Grove, Florida, and set out in the James reservation for the winter. Some of these will be brought to the Garden towards spring, when the weather permits. Selected herbarium and museum specimens were gathered. These represent some rare rediscoveries and the discovery of a new tree. The live material sent to the Garden represent a collection of seedling Torreya trees (*Tumion taxifolium*) and many herbaceous perennials, future subjects for illustration in *Addisonia*. Many seeds of herbaceous and woody plants were gathered for growing at the Garden and for distribution to other botanical gardens.

The following visiting botanists have registered in the library during the autumn: Mr. John M. Fogg, Jr., Gray Herbarium, Cambridge, Mass.; Professor Arthur P. Kelley, Rutgers University; Miss Mary E. Brumfield, New Jersey College for Women, New Brunswick, N. J.; Professor H. H. Whetzel and Mr. S. H. Burnham, Ithaca, N. Y.; Mr. John C. Wister, Philadelphia, Pa.; Professor L. O. Overholts, State College, Pa.; Miss Anne Hof, Miss Marjorie Warner, and Mr. Carleton R. Ball, Washington, D. C.; Professor S. A. Forbes, Illinois State Natural History Survey, Urbana, Ill.; Miss Mildred Matthias, Missouri Botanical Garden; Mr. Dean A. Pack, Salt Lake City, Utah; Mr. W. Alanson Bryan, Los Angeles, Calif.; Mr. Arthur D. Houghton, San Fernando, Calif.; Mr. John E. Johnson, Balboa, Canal Zone; Professor Louis Marie Lalonde, University of Montreal; Professor Y. Ilvessalo, Helsinki, Finland; Professor W. Lepeschkin, Prague,

Czechoslovakia; Dr. Yushun Kudo, Taiwan Imperial University, Japan, and Professor Dr. Hugo Glück, Heidelberg, Germany.

In the lecture on "Virus Diseases of Plants," given at The New York Botanical Garden on Saturday afternoon, November 26, by Dr. L. O. Kunkel, of the Boyce Thompson Institute for Plant Research, emphasis was placed on the fact that these diseases constitute a distinct group of plant maladies which have characteristics that separate them from all other plant diseases. The manner in which they cause damage to crop and ornamental plants was shown, and their remarkable similarity to certain human and animal diseases was given consideration. It was pointed out that insects play an important rôle in the transmission of virus diseases to healthy plants. The mysterious nature of these diseases and the difficulties encountered in attempts to control them were briefly mentioned. The symptoms, geographical distribution, spread, host range, and economic importance of some of the better-known virus diseases of plants were discussed. About fifty lantern slides were shown to illustrate the chief points emphasized in the lecture.

Meteorology for November. The total precipitation for the month was 4.10 inches. The first killing frost was on the morning of the 8th. The maximum temperatures recorded at the Garden for each week or part of a week were *76° on the 1st,* 72½° on the 12th, 70° on the 17th, and 74° on the 23rd. The minimum temperatures were 30° on the 7th, 27° on the 10th, *25° on the 20th,* and 31° on the 26th.

Meteorology for December. The total precipitation for the month was 3.22 inches, 0.20 of which was from a 2-inch snow. The middle lake was first frozen over on the morning of the 4th. The maximum temperatures, recorded at the Garden for each week or part of a week, were *66° on the 8th*; 60° on the 12th; 47° on the 21st; and 50½° on the 31st. The minimum temperatures were 22° on the 4th; 15½° on the 10th; 18° on the 19th; *15° on the 25*; and 28° on the 27th.

Meteorology for the year 1927. The total precipitation for the year was 56.04½ inches, including a total snowfall of 15.9 inches,

which is figured as equal to 1.59 inches of rainfall. This was distributed by months as follows: January, 2.77 inches (including .52 as melted snow or 5.2 inches snow measurement); February, 2.42 (including .87 as melted snow or 8.7 inches snow measurement); March, 1.47 inches; April,.2.84 inches; May, 5.28 inches; June, 3.42 inches; July, 9.75 inches; August, 9.97½ inches; September, 2.99 inches; October, 7.81 inches; November, 4.10 inches; and December 3.22 (including .20 as melted snow or 2 inches snow measurement.)

The maximum temperature recorded for the year was 94° on July 13th. The minimum temperature was 0° on January 27th. The first killing frost of the autumn occurred on the morning of November 8th. The latest freezing temperature of the spring was 31° on the morning of April 24th.

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THE BULBS AND BULB-HABITS OF LILIES

THE BULBS OF PURELY VEGETATIVE PLANTS

A lily bulb makes its start in life at the time a seed germinates or when a bulblet starts as a bud anywhere on the mother plant. The first leaf becomes somewhat fleshy in its basal part and thus the bulb begins. Soon the bulb becomes the major part of the plant. Its condition determines when flowers are to be produced and its behavior at that time determines whether the plant is to continue to live after it has flowered. There are times when there are abrupt changes in its habit of growth. There are critical stages in its behavior that are vital to the life of the plant as a whole. To a certain degree these developments in the lily plant may be assisted through the intelligent coöperation of the gardener.

Each lily bulb has a cycle of development. For a time the young bulb is purely vegetative and it may take several years of vegetative life before it develops to blooming size or condition. It is stated by Elwes[1] that seedlings of *Lilium monadelphum* grow very slowly and "sometimes do not flower till the tenth year after sowing." During the purely vegetative period of growth the bulb contains, normally, but one central bud. The scales increase in number and size and there is an accumulation of food until that time when the central bud becomes a flowering stalk.

All lilies are alike in that the scales of the young bulbs extend up into the air and have green blades. But a decided difference

[1] A monograph of the genus Lilium, by Henry John Elwes, 1877.

is seen in the behavior of the seed-leaf or cotyledon of the seedlings, and in respect to this there are two distinct groups of lilies. In one group of species the seed-leaf of seedlings functions as a green leaf. For the viable seeds of these species there is usually prompt germination, even when the seeds are sown in autumn, provided they are placed in a hothouse. The seedlings of various species, *Lilium tenuifolium* for example, will often have the seed-leaves fully expanded in the air and the young plants well started within twenty days after the sowing of the seed. In the other group of species the seed-leaf remains in the soil and it is the first true leaf that appears in the air, but there are marked differences in the promptness of its appearance. In certain species, of which

FIGURE 1. At *1* are shown seedling bulbs of *Lilium speciosum* at the end of the second summer of their growth. At this stage the outer scales have leafy blades that live during one period of growth. The contractile nature of roots, highly developed in lilies, is here well shown. At *2* are shown seedlings of *Lilium superbum* at the end of their third year of growth. They are now leafy and concentric but as they reach blooming age the combination of mother and daughter bulbs becomes strongly rhizomatous as seen in FIGURE 6. At *3* are seen two young bulbs of *Lilium superbum*, each attached to a segment of a scale from which they are developing. In this case, the young bulbs arose as small branches and are rhizomatous, thus resembling the daughter bulbs which arise from the mature bulbs of this species rather than the seedling bulbs. At *4* are young bulbs of *Lilium croceum* from scale propagation. In this case the stem of the young bulb is so short that the young bulb sits closely on the scale and is concentric in shape. Young bulbs of all lilies that are grown from seed are very much alike in general form and shape. They are concentric and leafy. Young bulbs developed on the scales of bulbs that are strongly rhizomatous may start out as miniature rhizome bulbs.

Lilium speciosum may be cited, the first true leaf pushes into the air very soon after the seed germinates. In other species, *Lilium superbum* and *L. canadense* for example, the young seedlings grow entirely in the earth throughout the first year; but the development is rather slow and is confined chiefly to the growth of roots and the enlargement of the base of the cotyledon. The first leaf does not appear above ground until the second summer.[2]

Thus in growing seedlings of the various lilies the gardener meets rapid growth and development in certain species but in others the development following germination is so slow that green

[2] For further discussion and for illustration of seedlings of lilies, see article on "Seedling Lilies" in Jour. N. Y. Bot. Gard. **25**: 185–194. 1924.

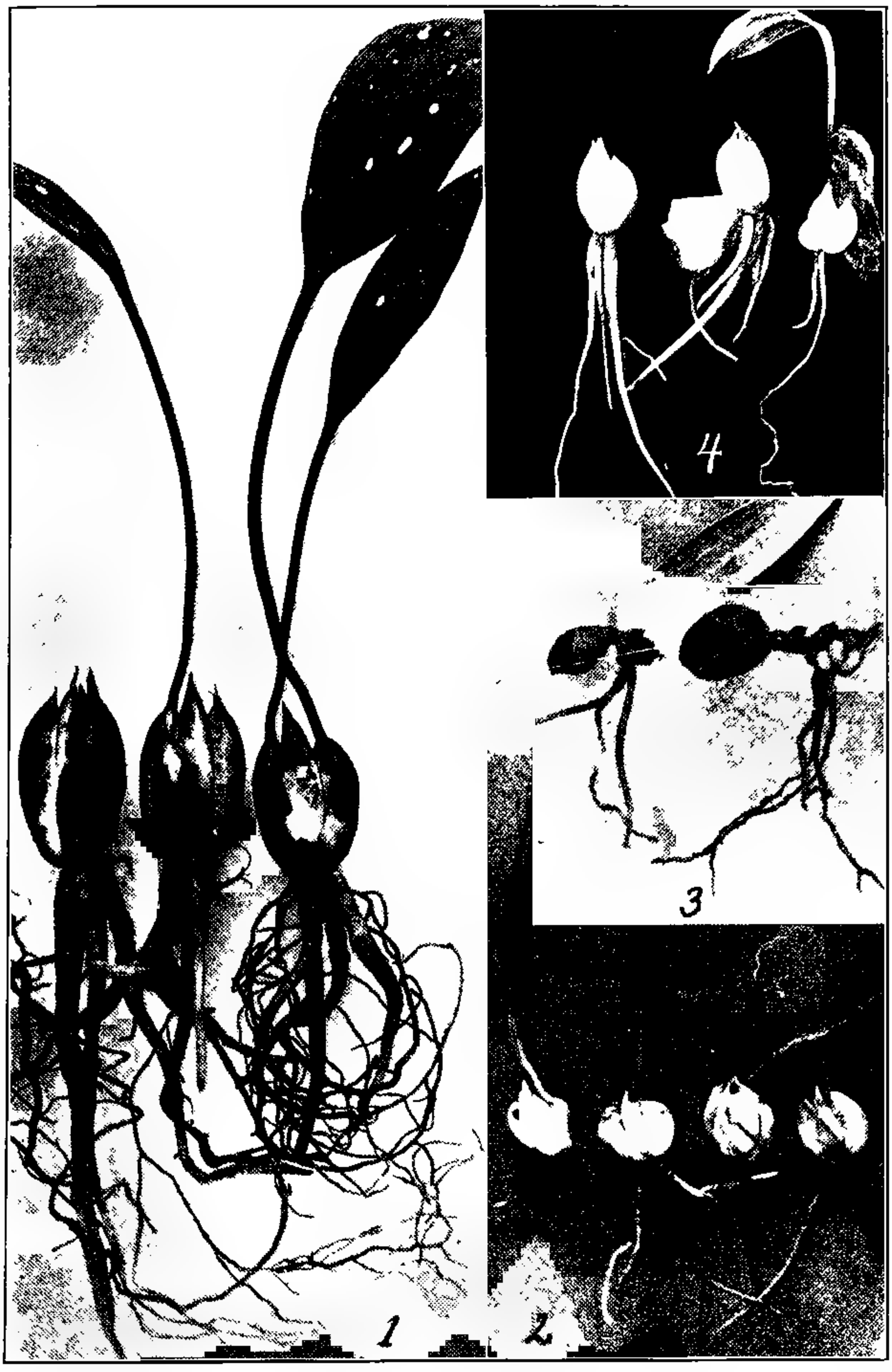

FIGURE 1. See explanation on opposite page.

leaves show above the ground only in the second year after the planting.

For at least a time after the appearance of the first green leaves, the young bulbs of all lilies have, apparently, quite the same form and general habit of growth (see FIGURE 1). The outermost scales have green blades and after the blades die the fleshy bases remain alive for a time. Then, as these shrivel and decay, the next inner scales become the outermost leaves, performing their work in turn. The scales increase in number and in size and thus the bulb becomes larger.

It appears that for a time the stems in the young bulbs grown from seed are quite alike for all lilies. They are low flattened domes that stand nearly erect. They consist of thin closely compacted nodes from which ascend the scales. In this stem, death proceeds from the base upward. The dead and dying oldest basal

FIGURE 2. The mature bulbs and flowering plants of *Lilium candidum* (*1*) and of *L. Henryi* (*2*) show two very different habits of growth. In both cases the mother bulb is concentric and when it spends itself in a flower-stalk a new or daughter bulb develops on one side of the main bulb-stem and is somewhat enclosed within the old scales of the mother bulb, as is shown by the dissections. But for *Lilium candidum* the flower-stalk does not produce roots and the scales of the bulb remain leafy, while for *L. Henryi* the flower-stem forms many roots and the bulb scales are not leafy as they are in the young bulbs. The mature or flowering bulb of *Lilium candidum* is hence simpler and less specialized than the mature bulb of *Lilium Henryi,* and the flower-stem of *L. candidum* is also less specialized.

sections tend to be of somewhat less diameter than the lowest living sections immediately above them. The living portion of the stem is hence an almost erect but very flat cone. Young bulbs developed from the scales of bulbs of such species as *L. superbum* may develop as small rhizome bulbs and thus resemble in miniature the daughter bulb that arises from a mature bulb of this species (see FIGURE 6).

As the bulbs of lilies pass from the purely vegetative period into the blooming condition, when flower stalks and daughter bulbs are produced, very noticeable differences arise in respect to the character of the scales and the character, the position, and the method of growth of the stem of the bulb.

THE MATURE BULBS OF BLOOMING PLANTS

The bulbs that come to the gardener through the trade are mature and ready for blooming. They have passed through the

FIGURE 2. See explanation on opposite page.

vegetative period and are in fact usually the daughter bulbs of plants that have bloomed at least once. They have reached the extreme stages of development characteristic of the different species.

Thus, in speaking of the bulbs of lilies, one may be referring to (1) the young bulbs from seeds, scale-propagation, or bulblets that have not grown to blooming size, or (2) to a daughter bulb that is entirely separated from its mother bulb, or (3) to the combination of a mother bulb and its daughter bulb or to several generations of such combination.

The general form of these mature bulbs is determined chiefly by the character of the stem of the bulb itself and in this respect all lily bulbs fall into two types, the *concentric* type and the *rhizomatous* type.

The concentric type: In this type of lily bulb (see FIGURE 2) the bulb-stem retains the shape and position that it had in the young bulb, even after the plant passes into a period of blooming

FIGURE 3. Semirhizomatous bulbs of *Lilium columbianum* (at *1*), of *L. Bolanderi* (at *2*), and of *L. monadelphum* (in sectional view). The bulb-stem is a short creeping rhizome with a dying end (*a*) and a bud end. When the bud produces a flower-stalk (as at *b* in *3*) a new lateral bud (*c*) rapidly develops close to one side and within the mother bulb and this bud continues the life of the plant. In these mature bulbs the scales are all strongly overlapping and none are leafy.

and daughter bulbs are produced. The bulb remains almost concentric with its scales arranged about a short and nearly vertical stem. The daughter bulb develops at one side of this stem as a short lateral branch more or less enclosed within the shell of the mother bulb. When this new bud arises close to the flower-stem and is enclosed by the scales of the mother bulb which remain alive, the form is most nearly concentric. It may, however, be located at one side, develop many new scales, and assume of itself much the same shape as the mother bulb had. In other cases, two or more daughter bulbs may arise in a whorl about the central core of the mother bulb, each one being concentric and all remaining attached to the old stem, from which most of the old scales have withered away. In still other cases the daughter bulbs may become completely separated although they lie close together.

Most species of lilies have bulbs of the concentric form or they are nearly concentric, but there are differences among them in the

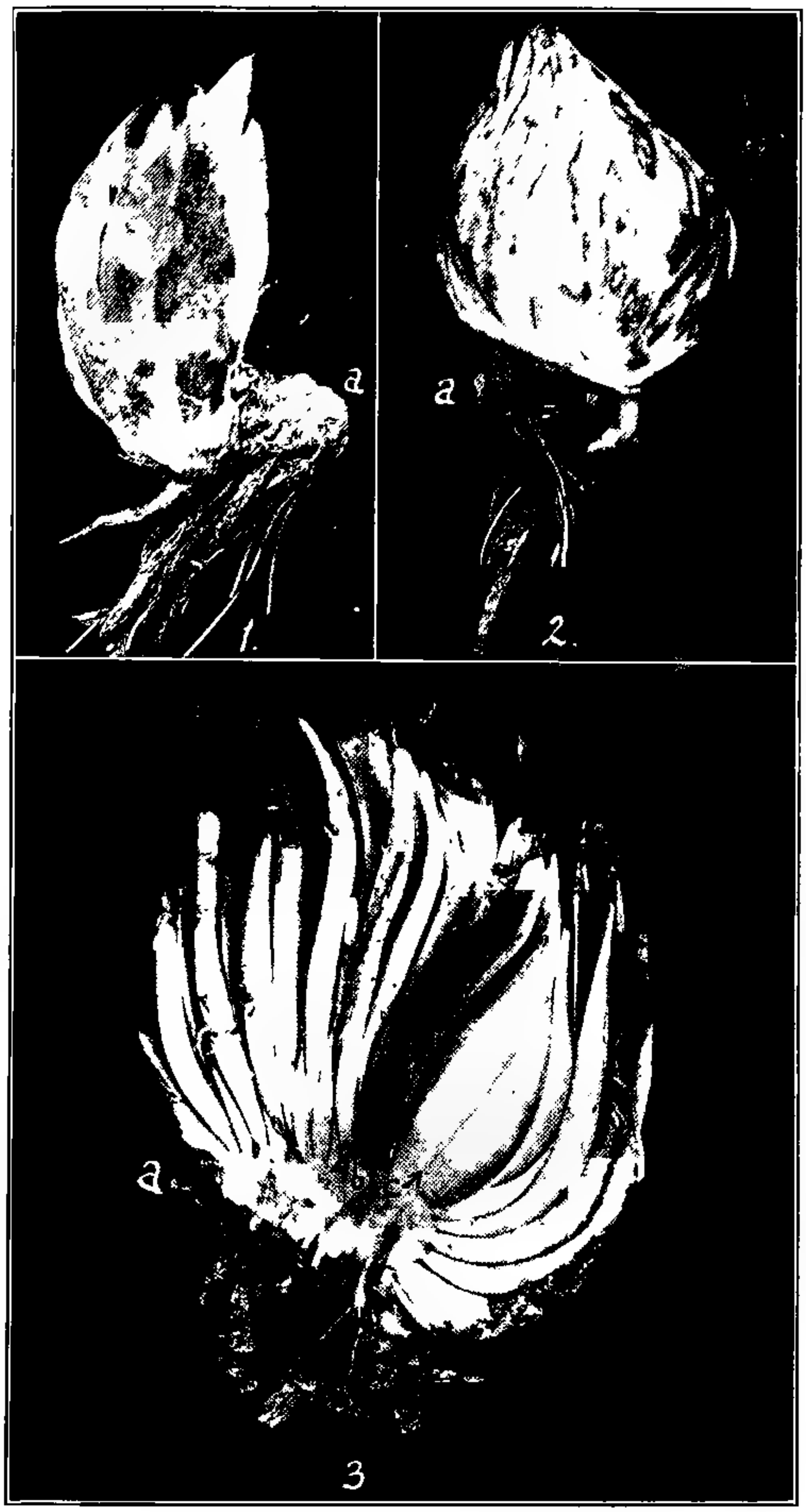

FIGURE 3. See explanation on opposite page.

size of the bulbs, in the size and the thickness of scales, and in the degree to which the daughter bulbs are enclosed within the outer scales of the mother bulb.

The rhizome type: In several species of lilies the stem of the mature bulbs becomes a rhizome that lies horizontally in the soil. The most extreme type of this general class is that in which the daughter bulb is at the end of a very noticeable lateral branch which is naked of scales in a section where it emerges from the mother bulb. This condition is best developed in the bulbs of *Lilium superbum* (FIGURE 6), *L. canadense* (FIGURE 5), *L. Grayi,* and *L. carolinianum.*

Another type of rhizomatous bulb is that in which the scales fully or almost fully cover the entire rhizome, or at least they cover its upper surface continuously. *Lilium Parryi, L. pardalinum,* and *L. parvum* have bulbs of this type (FIGURES 4 and 5). The stem of one of these bulbs may be more than an inch in diameter and several inches long and it may be branched. The oldest living section may be as many as five or more years old. In these, the stem constitutes a large part of the bulb.

A less pronounced grade of rhizomatous bulb is seen in such species as *Lilium Humboldtii, L. Bolanderi, L. columbianum,* and *L. monadelphum* (FIGURE 3). The bulb-stem is comparatively short and constitutes a small portion of the bulb, but it is nearly horizontal in position. The scales are large, broad, and much overlapping and hence the bulb verges strongly towards the concentric type. The difference is chiefly that the new daughter buds are formed consecutively on the same side, and each is in turn enclosed in the scales of its mother bulb. This soon makes the basal outline of the bulb somewhat acentric, throws the stem of the bulb into a more or less horizontal position, and gives to it a dying end and a living or bud-forming end. Besides, the scales may persist for several years.

THE SCALES OF THE BULBS OF LILIES

Turning the attention to the character of the scales of mature or flowering bulbs, one notes that there are wide differences among the various species.

Perhaps the simplest condition is that in which the scales retain the leafy habit after the bulb comes to blooming. Of the common

garden lilies this is best seen in *Lilium candidum.* In late summer and in the autumn, the new daughter bulbs send up green blades from many of their outer scales and thus the bulb continues in the vegetative habit characteristic of small and seedling bulbs (see FIGURE 2). In certain other lilies rarely seen in gardens, such as *Lilium giganteum* and *L. cordifolium,* the bulb consists merely of the bases of the leaves. There are a few species, such as *Lilium hyacinthinum, L. Thomsonianum,* and *L. lophophorum,* of which the last-named can scarcely be considered as a true *Lilium,* with bulbs having membraneous outer scales.

But in most species of lilies the modification of the scales of the bulbs progresses until in the mature bulbs there is a wide departure from the leafy character. First the scales cease to extend into the air as green blades and become only organs for the storage of food. In the greater number of species the scales are broad, rather flat, much overlapping, and somewhat strongly appressed to each other, giving such bulbs as are seen in the species *Lilium auratum, L. speciosum, L. Henryi, L. croceum, L. Martagon,* and *L. tigrinum,* all bulbs of the concentric type, and also as in such species as *L. Humboldtii* and *L. monadelphum,* which are of the semirhizomatous type.

A still greater change in form gives scales that are more narrow and rather thick in proportion to the width, so that these two dimensions are nearly equal. This condition is seen in the mature bulbs of *Lilium Parryi, L. parvum, L. superbum, L. canadense,* and *L. philadelphicum.* All except the last-named are bulbs that are strongly rhizomatous. Also in these species, the outer scales of the bulbs are very frequently composed of two or three segments so weakly attached that they break apart readily. Toward the center of the bud the scales are entire and more closely appressed to each other. But the jointed character of the scales is partially developed in many broad-scaled bulbs of the concentric type by the decided lobing frequently present in outer scales. In young bulbs of these species the leafy scales show no trace of segments. It is not determined with certainty just how the most complex types and shapes of scales are related to the simple leaves of the young bulbs. In most species the scales are obviously whole leaves much thickened and much shortened. But in none of the lilies are the leaves of the young bulbs or of flower-stems

distinctly divided into petiole and leaf-blade with joints between. The two- and the three-jointed scales on the outer part of the bulbs of various species of lilies are rather anomalous and highly specialized structures.

When the blooming time of a lily bulb is reached, profound and sudden changes in the habit of growth occur. The central or main bud now shoots up into the spire of a flower-stalk. Its new internodes become the elongated segments of an aerial stem that is much different in appearance from the flat, thin, much compressed discs of the same stem located below in the bulb. At each node of this aerial a green leaf or a whorl of such leaves is produced in marked contrast to the fleshy, colorless, sister leaves below. At the apex is wrought a miracle—the metamorphosis of a flower.

FIGURE 4. Above is an upper surface view of an unusually fine bulb of *Lilium pardalinum* obtained directly from the wild by a collector working for Mr. John T. Scheepers, to whom the writer is indebted for this bulb. Below is shown a sectional view of the same bulb. The strongly developed rhizome is almost entirely covered with scales. The dying end is at *a*; the flower-stalk, for the summer preceding the collection of the bulb, stood at *b*. Five daughter bulbs on short lateral stems are present and one of these is shown in the sectional view below. Many of the scales are decidedly jointed, a characteristic of many lilies.

Throughout the life of lily bulbs, roots arise from the base and the outer rim of the stem at the base of the bulb, or in the rhizomatous bulb from the under side of the advancing rhizome. Besides serving in the functions of ordinary roots these roots are very frequently strongly contractile. They extend down into the soil where they may be rather firmly anchored by branches. Then by a process of wrinkling the roots shorten and actually pull the bulb deeper into the soil. Thus the seedlings which start life near the surface are able to descend to a depth of several inches by the time the bulb reaches blooming. The roots of the daughter bulbs of flowering bulbs are also more or less contractile and their action tends to draw the new bulbs to the lower level of the old mother bulb. Otherwise, especially in the concentric type of lily bulb, the daughter bulbs would in a few years stand at the surface of the soil. With the extreme types of rhizomatous bulb, in *Lilium*

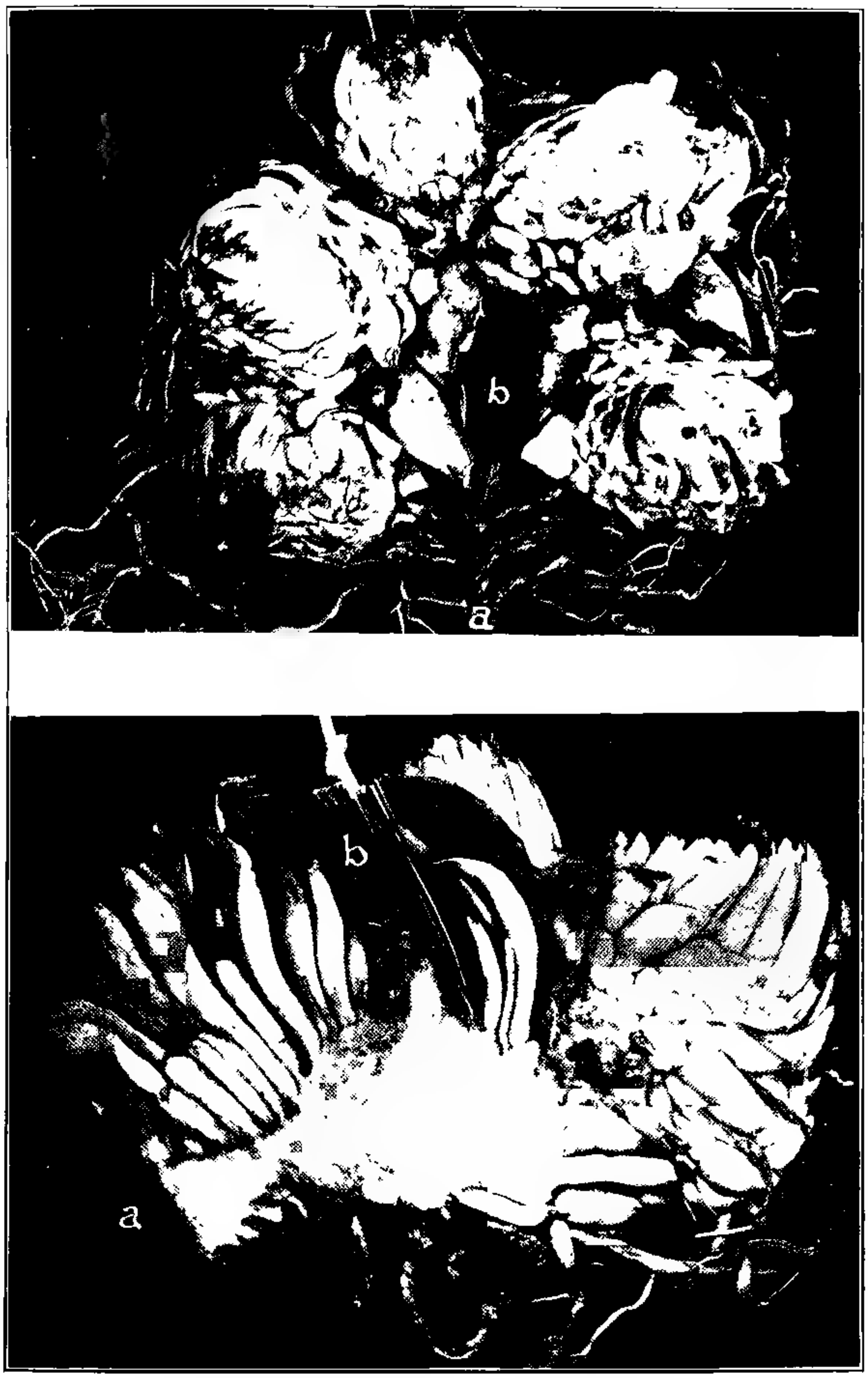

FIGURE 4. See explanation on opposite page.

superbum for example, the lateral branch with its new daughter bulb may have a very decided downward slant.

The rooting of flower-stems in lilies

Besides the roots from the base of the bulbs, most species of lilies also have roots from the flower-stem in the soil above the bulb. It is frequently stated that such lilies are stem-rooting but this is not fully accurate for the roots that develop from the base of bulbs also arise from the stem, in fact from the same stem. These roots on the flower-stem perform an important rôle in the nourishment of the flower-stem and also of the new daughter bulb. Where the flower-stem emerges from the bulb it may be no larger than a lead pencil; above the roots and at the level of the soil it may be an inch or more in diameter. The growth of such

FIGURE 5. Below is shown a rhizomatous bulb of *Lilium parvum*. The rhizome is covered with scales that are mostly jointed and from which many of the upper segments have been broken. This bulb has the scars of at least five flower-stalks and is hence at least five years old. Above are two typical bulbs of the species *Lilium canadense* as they appeared when dug from the wild in November. One is sectioned to show the various parts. The mother bulb is at the right, the dying end of its rhizome is at *a*, and the dead flower-stem is at *b*. The daughter bulb is at the end of a thick fleshy branch which is naked in its basal portion (*c*). The flower-stem of the daughter bulb is at *d* and is already protruding from its bulb. In the summer of the following year this flower-stem will produce flowers, the older or mother bulb shown at the right will decay and a daughter bulb of the new generation will be produced. Thus in lily bulbs there is annually the death of the older parts and the formation of new parts. This is somewhat more conspicuous in the strongly rhizomatous bulb than in the concentric type.

a stem is obviously largely independent of the bulb below after the the flower-stalk develops to the point where its roots are established.

The most vigorous species of the common garden lilies are strongly flower-stem rooting, such as *Lilium auratum, L. Henryi, L. speciosum, L. Humboldtii, L. regale, L. croceum, L. tigrinum, L. sulphureum, L. superbum,* and *L. canadense.* Such species should be planted deeply enough to permit the adequate development of these important roots. In a large and well-established cluster of plants of any of these lilies the soil above the bulbs soon becomes somewhat impoverished and more or less filled and replaced with a mass of dead roots. To maintain the best conditions for continued growth of the plants, the soil above the bulbs should

FIGURE 5. See explanation on opposite page.

be worked over in the autumn, the masses of dead roots removed, and a supply of rich soil added to form a covering of from four to six inches above the tops of the bulbs. With such treatment the bulbs do not need to be disturbed as long as the plants remain healthy and are not crowded.

Progressive death in lily bulbs

When a lily plant has produced flowers, the entire flower-stalk dies down to or into the center of the mother bulb. This flower-stalk is an extension of the stem in the bulb. The main bud of the bulb has been carried up on the end of its stem which became the flower-stalk. If the life of that plant is to be continued, at least one new daughter bud must develop within or from the mother bulb whose main bud is expended in a stem and flowers. Also, if this new bulb is to bloom in the following year it must

Figure 6. A very fine bulb, or rather a combination of three generations of bulbs, of a plant of *Lilium superbum* that grew wild on Staten Island. The plant was dug on August 25, which was soon after the time of flowering. The bulb which bloomed that summer stands in the middle. Its daughter bulb which is to bloom in the following summer is at the right and it is already of good size, with a root system that is almost fully developed. At the left is the bulb which bloomed in the previous year. Usually at the time of the blooming of a bulb its mother bulb has fully decayed, so in most cases the bulb combination present in plants of this species consists only of a flowering bulb and its daughter bulb.

grow to maturity very rapidly and complete in a single summer a development that admits of flowering. It obtains some food from the old or mother bulb and also from the flower-stem with its green leaves. It can actually manufacture its own food when its scales send up green blades, but this is done by only a few species. The daughter bulbs are, in many species of lilies, fairly well developed in respect to size at the time the flower-stalks of the mother bulbs die, but they continue to enlarge and especially is there the continued development of the rudiments of the flowers which they contain. In some species the flower-stalks begin to elongate and to rise out of the daughter bulbs in autumn. In the following summer these bulbs send up flower-stalks and in their turn become the mother bulbs of another crop of daughter bulbs.

Thus throughout the successive years in the life of any lily plant the death of the older parts and the formation of newer parts occur each year. Seldom does any considerable portion of

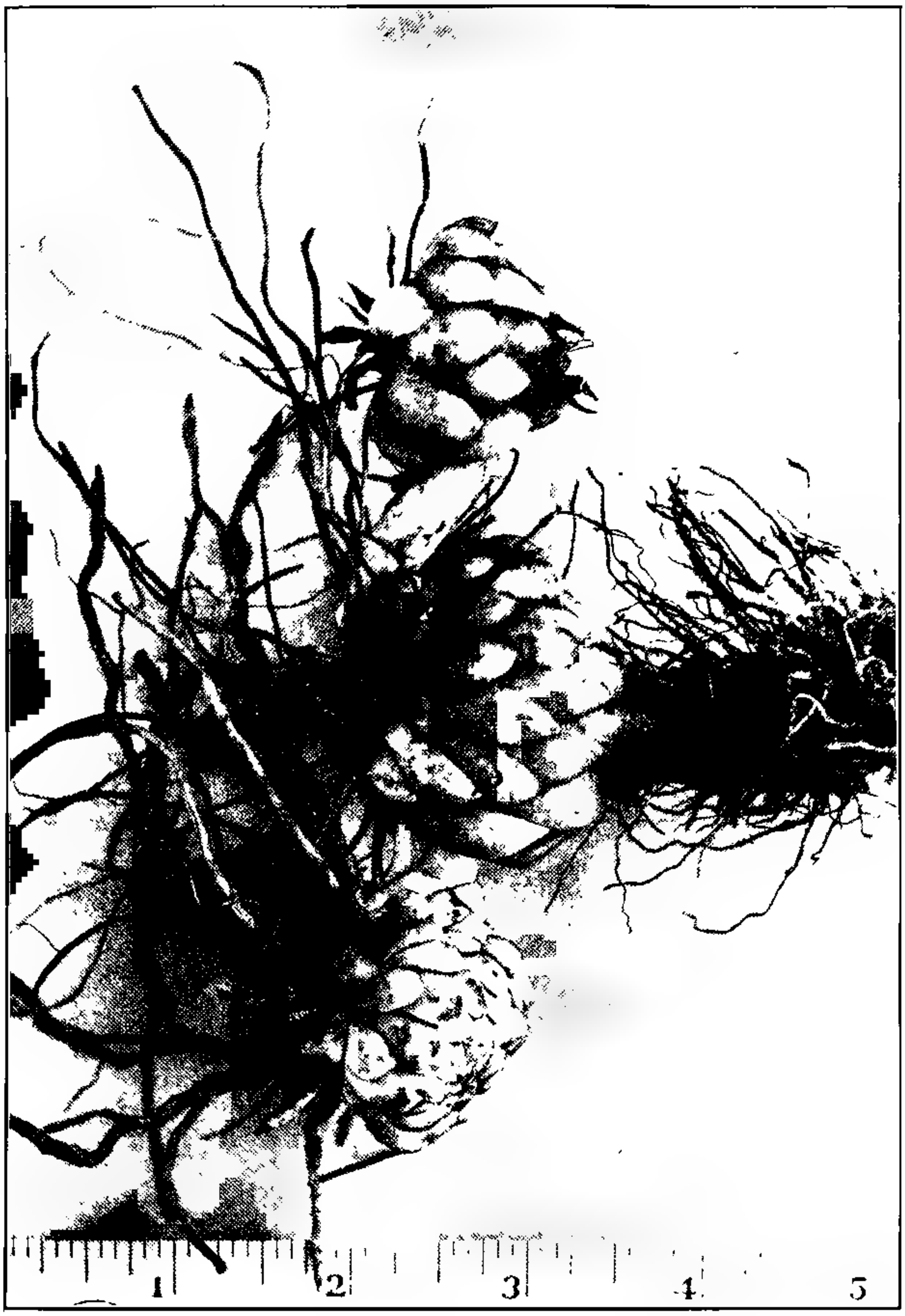

Figure 6 Cephalonation on annacite nana

a mature lily bulb remain alive for more than two or three years. The rather short period of time during which a new daughter bulb is developing is a critical one. At this time death is close on the trail behind life, ready to overtake it if it falters. Thus when conditions are so unfavorable that a new lateral bud does not develop that plant disappears. This happens all too frequently when bulbs are obtained in the trade for transplanting into the garden. They are not able to survive the shock of the transplanting and produce new daughter bulbs.

In a few species of lilies the bulbs have the habit of blooming once only. That is, daughter bulbs are not readily produced by bulbs that come to blooming age. Of the ordinary garden lilies this is the case with *Lilium tenuifolium.* Such lilies must be propagated chiefly from seeds. In the case of a few species rarely seen in cultivation (*L. giganteum,* for example) the bulb lives for several years before it reaches blooming age and the daughter bulbs are on offsets which also require several years of vegetative growth. Various of the most desirable lilies, such as *Lilium auratum, L. superbum,* and *L. canadense,* usually form only one daughter bulb from a mother bulb at the time of flowering. Such lilies do not multiply in the flower garden. Other species, of which *Lilium Hansoni, L. regale, L. tigrinum, L. speciosum, L. Henryi,* and *L. regale* are good examples, frequently produce two or more daughter bulbs from one mother bulb. Such plants multiply in number. But if these daughter bulbs grow poorly and are of small size their flower-stems will be small and weak and further daughter bulbs may not be produced. Every effort should therefore be made to provide the best of cultural conditions for lily plants. The bulbs, especially of flower-stalk rooting species, should be planted rather deeply in well-drained rich garden soil and a renewal of the surface soil be made each autumn.

Vegetative reproduction in lilies

The power of vegetative reproduction is developed to a remarkable degree in lily plants. Species like *Lilium Sargentiae, L. tigrinum, L. bulbiferum,* and *L. sulphureum* normally produce bulbils abundantly in the axils of the green leaves along the flower-stem. Bulbils frequently form in this same location on plants of other

species, especially when the apical portion of the flower-stalk is blasted. Very frequently small bulbs develop along the flower-stem above the bulb either in the soil or just above it. If the flower-stems of many lilies are taken while still green and cut in segments and buried in soil or in sand, young bulbs readily develop. Scales broken from the bulb will regenerate buds from various points on their surface. The short fleshy scales or segments of scales from bulbs of *Lilium superbum* and *L. canadense* will live for a year or two on the surface of the ground, during which time they strike roots, turn green, and produce small bulbs. With most lilies, when the main bud of a mature bulb dies, which frequently happens in transplanting, the stem and many of the scales may remain alive for a year or more, in which case many small bulbs may be formed. But the mother bulbs are usually planted so deeply, even to give them only a proper depth, that these little bulbs have slight chance to extend green leaves into the air. If such bulbs could be lifted to near the surface and given proper care, they would have a chance to grow to flowering size. Those who produce lily bulbs for the market utilize the regenerative powers of lilies in propagating and increasing their stocks. The readiness with which young bulbs are formed greatly facilitate their task.

The sequence in the evolution of the various types of mature bulbs

Considering the characters of mature bulbs and the life cycles of the plants of different species of lilies, one can trace a sequence of development from the simplest to the most complex somewhat as follows:

A. Bulbs concentric, composed merely of the bases of green leaves, or at least some of the scales have green blades at all stages of growth. Daughter bulbs are the same. Flower-stem without roots.

* Daughter bulbs as offsets or inclosed bulblets, small, requiring several years of vegetative growth before blooming age is reached. Example, *Lilium giganteum.*

** Daughter bulbs inclosed within mother bulb, normally developing to blooming age in one season. Example, *Lilium candidum.*

B. Scales of mature or flowering bulbs and their daughter bulbs not extending above ground as leafy green blades.
  * Bulb concentric or nearly so.
    † Scales broad and fleshy. Example, *Lilium speciosum.*
    †† Scales narrow. Example, *Lilium philadelphicum.*
  ** Bulb semirhizomatous. Example, *Lilium monadelphum.*
  *** Bulb strongly rhizomatous.
    † Bulb-stem nearly covered with scales. Example, *Lilium pardalinum.*
    †† Basal portion of bulb-stem naked, scales narrow. Example, *Lilium superbum..*

In respect to the character of their mature bulbs, lilies are a rather diverse group of plants. The bulb itself is a specialized bud composed of numerous leaves sitting closely together on a short stem. In their early life the bulbs of the seedlings and of young plants derived by vegetative propagation have green blades to their scales and together with the central bud and the roots complete the entire plant. But, as the plant approaches or reaches the blooming period and produces daughter bulbs, its bulb becomes more and more specialized through the modification of the scales and through changes in the character of its stem and its branches.

The extent or degree of this modification evidently reaches its climax, for lilies, in the bulbs that are most strongly rhizomatous.

A. B. STOUT.

RESOLUTIONS RELATIVE TO THE SERVICES OF DOCTOR FREDERIC S. LEE TO THE NEW YORK BOTANICAL GARDEN

RESOLUTION OF THE BOARD OF MANAGERS

Resolved, The Board of Managers of The New York Botanical Garden accept with much regret the resignation of Doctor Frederic S. Lee as President.

Doctor Lee became a Scientific Director of the Garden in 1900 and has served as President and Chairman of the Executive Committee from 1923 to 1927. During that time, both as a Scientific Director and as President, he has given freely of his time to the affairs of the Garden.

Upon assuming the presidency, Doctor Lee made a careful study of the Garden's condition and its future needs and possibilities and prepared a valuable report thereon for this Board. During his presidency, the services of Olmsted Brothers were secured to make an investigation of the grounds of the Garden and to advise as to their future development. The report of Olmsted Brothers was in principle approved by the Board of Managers. Thereafter, under Doctor Lee's leadership, a campaign was undertaken to increase the Garden's endowment and to obtain funds for material improvements and equipment. During his presidency, the endowment fund of the Garden has been increased by more than $1,000,000.

As Chairman of the Scientific Directors, Doctor Lee also collaborated in preparing a report upon the Garden's scientific needs.

The Managers wish to record their appreciation of the services which Doctor Lee has rendered to the Garden and the extent to which he has given it his time and attention.

N. L. Britton,
Secretary.

November 17, 1927.

Resolution of the Scientific Directors

Resolved, The Board of Scientific Directors, on the occasion of Doctor F. S. Lee's resignation from membership, desire to express their very high appreciation of his long-continued and notable services to The New York Botanical Garden. The twenty-seven years of Doctor Lee's active connection with the Garden has been a period of rapid advance and considerable change of emphasis in many lines of educational and scientific activity. Doctor Lee's efforts were always directed toward increasing the Garden's effectiveness—both in its direct service to the city in the maintenance of its parks and other decorative plantings, and in the whole field of horticultural science and landscape art.

In working out a broad general program for the further development of the Garden, both as a great municipal center for the educational and decorative display of plant life in all its phases, and as a center for basic research in plant science, especially as related to practical problems of decorative planting under city

conditions, Doctor Lee's leadership must always be recognized as of fundamental significance for the development of applied plant science in its relations with a great metropolis.

That during Doctor Lee's service as President of the Board of Managers the Garden's permanent endowment was increased by over one million dollars was, in large measure, due to his untiring energy in presenting the claims of the Garden to public support, and his clear vision of the new opportunities open to an institution with a record of distinguished service in the study of the plant life of the western hemisphere, and so favorably located also for taking the leadership in the newer fields of experimental research.

The Scientific Directors sincerely hope that they may still have the benefit of Doctor Lee's continued interest and support.

R. A. HARPER.

JANUARY 14, 1928.

RESOLUTION OF THE ADVISORY COUNCIL

Resolved, That the Advisory Council of the Botanical Garden send to the Board of Managers an expression of its deep regret in the resignation of its President, Doctor Lee.

Doctor Lee's modern and enlightened policy of enlarging the usefulness of the Garden to meet the needs of the time, of enhancing its natural beauty by means of landscape gardening for esthetic effect, and his sympathetic attitude toward all suggestions made by the Council have been an inspiration to our members.

We hope that for the future good of the Garden, his plans, so earnestly and conscientiously conceived, may be followed by his successor as far as possible. We believe that in this way the growth of the Garden will be assured.

HELEN A. SCRIBNER,
Chairman.

DECEMBER 2, 1927.

FERNS AS HOUSE PLANTS[1]

The topic "Ferns as House Plants" will be broad or narrow according to the type of house for which the ferns are desired and according to the interests and care of the householder. For the great mass of New York City residents, cliff dwellers, the range of house ferns can almost be numbered on the fingers of one hand. In detached houses, furnishing better light and ventilation and with the interested care of those who regard plants

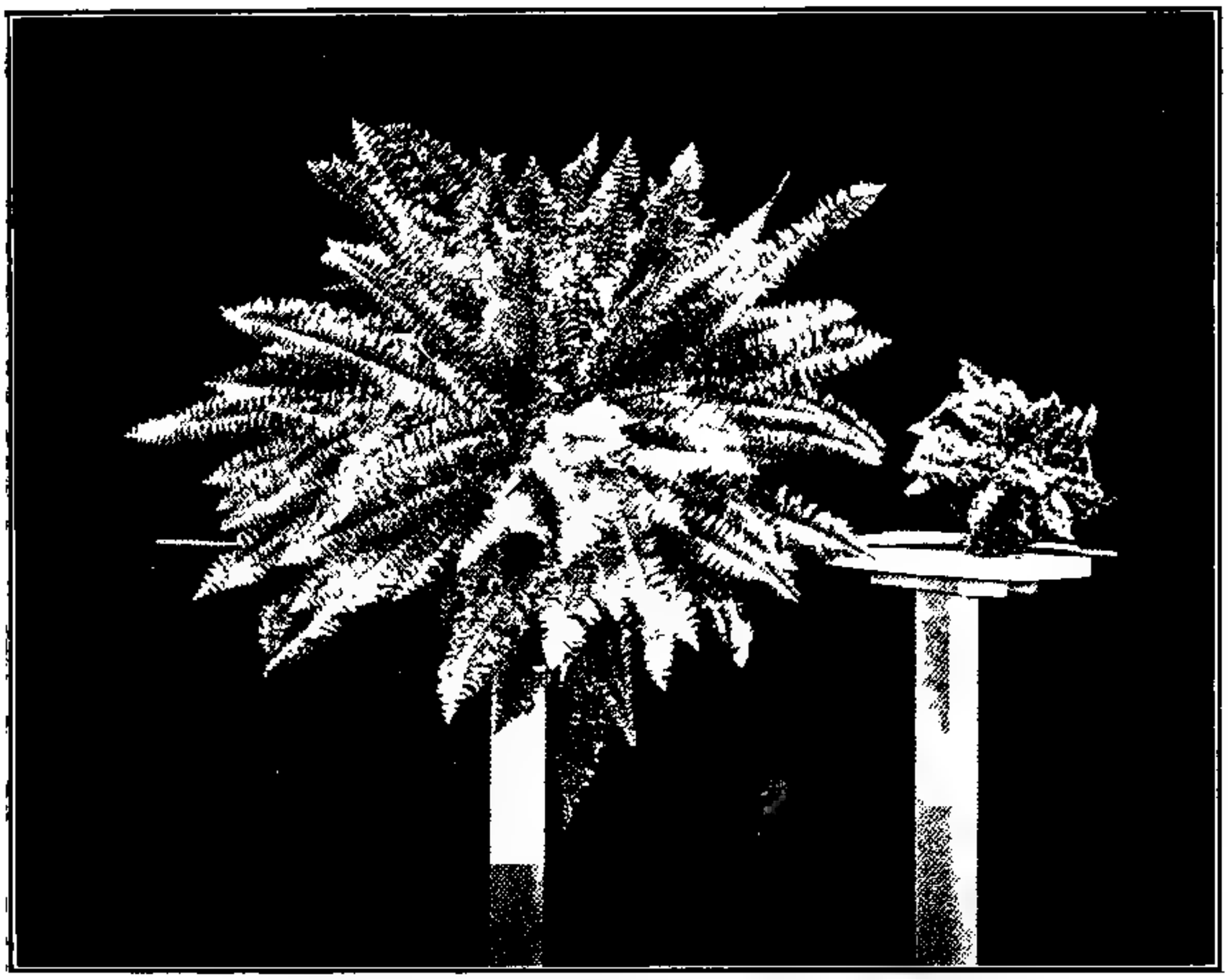

FIGURE 7. Specimen plants of Boston fern varieties: Randolph and a dwarf sport of Teddy, Jr. Note yardstick below pots, indicating relative size.

as living pets requiring personal attention, the number of "house ferns" will be considerably greater. If, further, the house includes a small bay window or conservatory room, or even a small conservatory, then the number of house ferns may rise into the hundreds.

The most popular house plant in the United States is undoubtedly the Boston Fern or one of its close derivatives. Production

[1] Abstract of an illustrated lecture at The New York Botanical Garden on Saturday afternoon, November 19, 1927.

of this type of fern is conducted on a scale and along lines not dissimilar to the general methods of mass production used in the fabrication of any common household adjunct. Probably two million specimens of some form of Boston Fern are raised every year and sold, and one or two growers raise several hundred thousand plants apiece each year. On the other hand, production in this country of a wider range of house ferns is restricted to relatively few growers, and the total number of forms regularly offered under their own names would not exceed thirty or forty. Of greenhouse ferns, probably another score of kinds could be listed.

It is interesting to compare the conditions in the United States with those in England, where a variety of factors have resulted in almost universal interest in house plants, with particular reference to ferns. The more equable and moist climate, the greater percent of the population living in separate houses and with fixed domicile have resulted in an interest in house ferns which those who enjoy ferns in this country can only view with great envy. The catalogue of one English fern-grower lists over 2,000 species and varieties of ferns, ranging from the commonest types of house ferns to the rarest of greenhouse forms.

The lantern-slide illustrations shown with this lecture represented mainly a special set prepared for this purpose under the auspices of the Brooklyn Botanic Garden, and almost entirely views of plants grown in the greenhouses of that institution. They were selected to show not only types of the ferns most commonly grown and used as house plants in this country, but also some highly desirable ones that ought to be better known in the United States, as well as others which require the more unusual conditions of a conservatory for their proper culture. The ferns shown represented a range in size from the tiny floating mosquito-fern which can be kept in the ordinary house aquarium, to the tall tree-fern type of the tropics, one or two of which are quite commonly sold in New York florist shops. There are tiny ferns with leaves an inch or so long whose habitat is the bark of trees, and other ferns which are classed as shrubs or vines with leaves 100 feet or more in length. There are ferns from every main land area of the globe.

Besides the consideration of different kinds of cultivated ferns, the lecture dealt also with some problems of the care and cultiva-

tion of ferns in the house, with particular reference to the widest needs of those who want plants under New York City conditions.

In this connection were considered such questions as the choice of the best varieties for apartment-house conditions, the problems of watering, light, air, insect pests, etc.[2]

Another topic in the lecture dealt with the plant-breeding methods by which the numerous new varieties, especially in the Boston Fern line, have been developed. The fact that in twenty-five years from the original Boston Fern at least two hundred dis-

FIGURE 8. Leather fern (*Polystichum andiantiforme*). An excellent house fern from South Africa, practically unknown in the florists' trade. (Leaves of this plant are two feet high.)

tinct varieties have arisen makes this question a matter of general interest as well as of more particular scientific concern and of importance to those able to give ferns something better than the ordinary apartment-house conditions. Some of the new varieties

[2] A leaflet dealing with house ferns and their care may be obtained by addressing the undersigned in care of the Brooklyn Botanic Garden, Brooklyn, N. Y.

and some of the stages in the process by which new varieties have developed were presented in a series of lantern slides.

RALPH C. BENEDICT.

PUBLIC LECTURES DURING FEBRUARY AND MARCH

The following is the program of illustrated lectures for February and March. They are given in the Museum Building of The New York Botanical Garden on Saturday afternoons, beginning at 3:30 o'clock. The doors are opened at 3:45 to admit late-comers.

February	4.	"Important Tropical Fruits,"	Dr. H. A. Gleason.
February	11.	"A Winter in Bermuda,"	Dr. Fred J. Seaver.
February	18.	"Yellowstone Park's Trees, Flowers, and Wonders,"	Dr. Henry R. Rose.
February	25.	"California Gardens,"	Miss Hilda Loines.
March	3.	"Rambles of a Naturalist among the Indians,"	Dr. Clyde Fisher.
March	10.	"Plant Hybrids: How They Are Produced and Their Uses,"	Dr. A. B. Stout.
March	17.	"Botanizing in Trinidad,"	Dr. Tracy E. Hazen.
March	24.	"Florida,"	Dr. J. H. Barnhart.
March	31.	"The Present Status of Evolution,"	Prof. John M. Coulter.

NOTES, NEWS, AND COMMENT

Dr. and Mrs. N. L. Britton left New York on January 26, with the intention of spending nine weeks in further botanical investigation in Porto Rico.

Dr. Herbert Maule Richards, Professor of Botany in Barnard College, President of the Torrey Botanical Club, and one of the Scientific Directors of The New York Botanical Garden, died on January 9, 1928.

Dr. John K. Small, Head Curator of the Museums and Herbarium, left New York on January 17, on leave of absence for about one month, to assist Mr. Thomas A. Edison in southern Florida in connection with studies of plants yielding rubber.

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GENERAL INFORMATION

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

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

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

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

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

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

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

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

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

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

A library of botanical literature, comprising more than 35,000 books and numerous pamphlets.

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

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

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

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

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

Contributions to the Garden may be deducted from taxable incomes.

The following is an approved form of bequest:

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

All requests for further information should be sent to

THE NEW YORK BOTANICAL GARDEN

BRONX PARK, NEW YORK CITY

VOL. XXIX MARCH, 1928 No. 339

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DAFFODILS

The daffodil is one of the most important, if not the most important of the early spring flowers, and while in the middle and northern states of this country it hardly fulfills the words of the poet Herrick as coming before the swallow dares, and braving the winds of March with glory, still it does give us some March bloom and quantities of April bloom, and in most seasons a few flowers as late as mid-May. Yet, with all its beauty and welcome earliness, the daffodil has never taken the important place in American gardens that it enjoys in Europe, and, as is the case with many other flowers, the gardening public in general has a very wrong conception of it, this conception having been gained from a knowledge of only a few varieties, especially of Golden Spur, Emperor, Empress, Sir Watkin, Barrii Conspicuus, and Poeticus Ornatus.

The Daffodil Committee of the Royal Horticultural Society has divided the daffodil flowers into ten different classes, based largely upon the form of the flower. It will not be necessary for us to go into all of these various classes, but an inkling of the system of classification may be obtained from the Trumpet Daffodil, which has a trumpet or crown as long or longer than the perianth, at one end of the scale, and the Poeticus section, which has the crown so much reduced that it is only a small eye in comparison to the total size of the flower. In between these two extremes we have sections composed of hybrids. Prominent among them is section II, the Incomparabilis section, in which the cup or crown is not less than one-third but less than equal to the length of the perianth segments. Section III, the Barrii section, has the cup

FIGURE 1. A part of the daffodil collection of The New York Botanical Garden, photographed May 9, 1926. Naturalized plantings of many varieties have been made here under the direction of Mrs. Wheeler H. Peckham The bulbs of most of these varieties increase in number from year to year, so that increasingly

or crown less than one-third of the length of the perianth segments. Thus, it will be seen that the sections depend upon this relationship between the crown and the perianth, and when that is thoroughly understood it is very easy to learn the different varieties.

The few varieties I have selected for mention above are well known. All gardeners know that they are planted in the fall and bloom the following spring and that they will bloom for four or five years, or longer, without further attention. Their cultural requirements, however, are not so well understood. To begin with, unlike the tulip, the daffodil really has no long dormant season. The leaf growth ripens late in June and the bulbs can then be lifted and stored until late fall. But it is very much better for the bulb to do the replanting in July or August, or even September, than to put it off until late October or November. The earlier the bulbs are planted, the better, and they will begin to make root growth and be in just that much stronger condition by spring. Therefore, if possible, the bulbs should be planted during the summer, or by the first of October, and planted during October or November only when it has been impossible to secure the bulbs earlier.

Daffodils will grow in any garden soil, but to be at their best they should have annual dressings of wood-ashes or bone-meal. Do not put manure anywhere near the bulbs, as it is dangerous. Depth of planting will depend somewhat on the soil and should be deeper in a sandy soil than in stiff clay. In general, shallow planting, about two or three inches in depth, is advantageous only for the nurseryman for propagating new offsets. For gardening purposes it is much better to put good-sized bulbs down six inches or even seven. All gardeners will realize the necessity of allowing the foliage to ripen naturally. The habit of cutting the foliage after blooming has destroyed thousands of bulbs. There is no more reason for cutting off daffodil leaves after bloom than there is for cutting down a rose plant after the first flowers have opened.

The multiplication of daffodil bulbs also is not readily understood by amateurs. In general, for increase in gardens, the bulbs should be lifted the third or fourth year, and all small offsets must be planted shallowly, the larger ones more deeply.

Daffodil culture in Europe has suffered greatly the last ten to twenty-five years from the inroads of daffodil-fly and eel-worm, and these pests have come to this country with the bulbs. There is no information at present as to how widespread or prevalent these infections are in this country, but probably no section is entirely free from them. Government officials are working on new methods of control, which perhaps may be effective in the future, but for the present there is no control except that of digging the bulbs and treating them with hot water at a temperature of between 110 and 112 degrees Fahrenheit for three hours. This requires a special sterilizing machine and cannot well be handled by amateurs without such a machine. Practically all commercial growers have this sterilizing machine and treat their own bulbs. No bulbs are allowed in interstate commerce unless they are so treated, or certified by government inspectors as being free from these pests; so that for practical purposes one need not fear buying new bulbs.

In my garden, in Philadelphia, I have had daffodils in bloom from the middle of March to the middle of May, although the bulk of the bloom will come about April 20th in normal seasons and last for about a week or ten days. The earliest variety to open is one which is at present scarce, although by no means a novelty, as it has been in cultivation for about forty years; this is the species *Narcissus minimus*, which is a wild Spanish form introduced by Peter Barr in 1885. It grows about three inches high and has a tiny yellow flower of true trumpet form. It likes a peaty soil and really belongs more in the rock garden than in the herbaceous border, this being equally true of *Narcissus Bulbocodium* and its varieties, and *N. cyclamineus, N. triandrus,* and other similar species, all of which are very dainty, none of them new, yet none of them known much in America. Their cultivation should be encouraged, but unless American gardeners demand these bulbs nurserymen will not find it worth while to bother with them, for they are not commercially dealt in to the extent that so many of the other varieties are.

In the general order of blooming the Trumpets come first, followed by the Incomparabilis section (usually called "Incomps"), the Leedsii's, which are really white-flowered "Incomps" and Barrii's. The Barrii section comes next and is followed by the

Poets and Poetaz. Among well-known varieties, the latest of all is Poeticus Recurvus, which lasts into May near Philadelphia, and with it blooms the little-known Gracilis, a yellow variety or hybrid of uncertain origin collected in southern France in the eighties, but not well known.

The trumpet class is divided into yellow trumpets, white trumpets, and bicolor varieties with yellow trumpet and white perianth. It was to the trumpet varieties that Herrick referred in his poem, and particularly to the wild trumpets, which are to be found in England, on the Continent, and down into Spain in differing size and form. They have been cultivated for centuries, but practically all of the daffodils known at the present day are modern in origin as compared to varieties of Irises or Peonies.

Golden Spur is an old Dutch variety, probably native to the Netherlands, and has been grown in America in millions for many years, it being the common forcing variety used by florists. Outdoors it will come into bloom near Philadelphia the last week in March or the first week in April, and it is known to many gardeners on account of this earliness. I believe that this variety should always be recommended to the beginner; but I hope that advanced gardeners will not be satisfied with it but will grow some newer varieties which are almost as early and will have better form and substance. The best known of all the yellow trumpets is Emperor, raised by Mr. Backhouse in England many years ago and put into commerce in 1870. This flower has held its position wonderfully, and well-grown Emperors are still pretty hard to beat. The advent of King Alfred in 1899 put a little "crimp" into the popularity of Emperor, but there is room for both varieties. King Alfred, unfortunately, is not so good a grower in most gardens. Van Waveren's Giant is one of the largest of all the trumpets. It is sometimes classed as a yellow trumpet and sometimes as a bicolor. It is distinctly not so yellow as Emperor or King Alfred. Tresserve is another variety of about the same date and seems to be a good garden plant, adapting itself to many conditions.

In general, all of these yellow trumpets are much alike. There is constant progress in their development and it expresses itself mostly along the line of perfection of detail. Sometimes this development is shown by enlargement in size, and occasionally by

increased color range. For example, Candlestick and Moonlight are a quite pale yellow, King Alfred is a brassy yellow, and Prospector is a deep golden orange-yellow. They vary also in height and in time of blooming. Golden Spur, Goldfinder, and Guinea Gold are about the earliest; Glory of Leiden, Lord Roberts, Sir Dighton Probyne, and Golden Flag are among the latest; and King of May is advertised in England as lasting until Recurvus opens, but it seems unlikely that it will hold as long as that in this country, due to our climate pushing these varieties forward more quickly. Among other trumpets worthy of trial are Apotheosis, Cornelia, Mustapha, and Robert Sydenham.

The bicolor trumpets bloom only a little later than the yellow trumpets. Empress is probably the best known of these for general planting, but does not, in my opinion, deserve its present-day popularity, as it has been surpassed by so many others. In general, for Empress type of bloom, Glory of Nordwyk, Martha, or Spring Glory are far more desirable.

Quite different from these and perhaps more suited to rock gardens is Apricot. Its trumpet opens a primrose shade and changes later to pinkish apricot. It is attractive for its novel coloring, because it holds well and is small and dainty for the rock garden. One of the most beautiful of modern bicolor trumpets is Mrs. John Hoog, which was introduced by van Tubergen in 1915. White trumpets are probably best known to the American gardening public through the old variety, Madame de Graaff, which was introduced by de Graaff in 1870 and has been largely grown ever since. Like many other old flowers, it is being superseded; but in white trumpets it is well to be a little careful and remember that we are dealing with experimental things under American conditions. Some of the new varieties do well; others seem promising and then develop weaknesses of constitution. For an early variety Alice Knights is splendid, though not very large. Possibly the best of the modern daffodils which has become well distributed is Mrs. E. H. Krelage, a Krelage seedling introduced in 1912. In Europe this is pure white but in this country it opens a yellowish or cream-white color, fading in a few days to pure white. Another famous white trumpet is Peter Barr. All of these have been surpassed by Beersheba; but this will probably not be available in American nurseries for many years. In

Europe it still brings about twenty-five dollars a bulb. It will long be out of reach of the gardening public and until the price becomes reasonable we had best stick to the other white trumpets and learn their requirements. An old variety, introduced by Backhouse in 1880, is W. P. Milner, a charming little daffodil for rock gardens or naturalizing.

The Incomparabilis varieties bloom just a little later than the trumpets, and with great range of color. They are commonly divided into all-yellows and bicolors, which have a yellow crown and white perianth. Among the small-flowering all-yellows, one of the best known is Gloria Mundi, which is another Backhouse seedling, introduced in 1884. It has a yellow crown, is decidedly stained a rich orange-scarlet, and it is plain to see that it is a forerunner of the modern Giant Incomparabilis with the red crown, for which breeders have been striving. Much larger is the well-known Sir Watkin, which is planted in America by the million, and is a thoroughly useful, dependable, and satisfactory garden plant in every respect. Some consider this a wild Welsh species or form, but other authorities claim that it was raised by a Mr. Pickston and introduced in 1884. Whatever its origin may be, Sir Watkin holds its place creditably among the finer daffodils, and demonstrates again that we cannot wholly cast aside old favorites. Another old variety which is rather late in blooming is Frank Miles, a small flower, valuable for borders and naturalizing. Homespun is still smaller; this was raised by Rev. Dr. Engleheart and introduced commercially in 1905.

There is coming to the fore among the "Incomps" a class of giant flowers, some of them very handsome, the most famous of which is the English seedling Fortune. This variety is sold abroad for about twenty-five guineas, and there are probably not more than one or two bulbs in America. It will probably be many years before American gardeners will have an opportunity to grow these, and while we are waiting for the price to come down there are other attractive novelties for our consideration, some of which are Helios (Engleheart, 1915) and Wheel of Fortune (Copeland, 1923). These are fine enough to kindle the enthusiasm of any daffodil grower, even though they are not low-priced; nor is Croesus (J. C. Williams, 1911) a cheap variety, but a good collection cannot well afford to omit it. This general

class includes many other daffodils; those mentioned, however, will suffice to give the gardener an inkling of the variation in form.

With regard to the bicolors from which to choose, there is a similar large variety: Artemis, Chieftain, Lucifer, Orangeman, Whitewell, and Will Scarlet are old enough to be fairly well known and every one of them is worthy of a place in the finest garden; and most of them are cheap enough to be planted in quantities. Newer and more expensive sorts are Dragoon (J. C. Williams, 1898), Holbein (van Tubergen, 1912), Great Warley (Engleheart, 1909), Macebearer (P. D. Williams, 1911), and Marshlight (P. D. Williams, 1910).

In the Barrii section we encounter again the distinction between the all-yellow and the bicolor, but in this case the cup is so small that its color does not count much in the picture and the general garden effect comes from the color of the perianth. There are comparatively few yellow Barrii's but the section is well known to every one through the variety Conspicuus, which is another of the famous Backhouse seedlings of 1880. In spite of foreign quarantine this variety can be purchased in this country by the thousand and ten thousand at reasonable prices, and it is a first-class flower in every respect. While it is not as fine as some of the more modern varieties, yet for the small garden there is nothing that surpasses Conspicuus in its class. Many will want Brilliancy (Engleheart, 1906), because it is larger, and it is also a little earlier. Rather different in color effect are Jasper, Nobility, and Torchlight, but all are good.

A choice of the yellow Barrii class is simple, whereas the white section is exceedingly difficult; good varieties are numbered by hundreds and it is, therefore, hard to choose between them. Some of them tend toward the "Incomps" in form, and it is not easy to classify them. Others, such as the beautiful Mrs. C. J. Hunt (van Waveren, 1922), almost seem to be Poets. Among the older daffodils that are suited to every garden is Dorothy Wemyss—not especially interesting as a single flower but lovely in masses, introduced by Backhouse in 1884; this is one of the oldest of the good varieties. More modern is Albatross (Engleheart, 1903), which is said to be a hybrid of Ornatus and Empress. It is a fine flower for cutting and stands up to two feet

high in the garden or in grass or woodland. Somewhat different and much smaller is Circlet (Engleheart, 1908), giving a soft sulphur-white rather than a pure white effect. Another "old timer" is Firebrand (Engleheart, 1903), smaller, yet effective, with its reddish cup, either in the grass or in the garden. But a much finer flower is the modern Firetail, still scarce and high-priced, although introduced as long ago as 1910. Introduced in the same year was Masterpiece, which is much more easily obtained; and two years previous the variety Miss Willmott (named for this famous English gardener) was raised in Holland by van Tubergen. No garden should be without this flower. Resembling Mrs. C. J. Hunt, is Red Beacon, and both are exceedingly fine; but perhaps Engleheart's Seagull (introduced in 1903), and his Southern Star (introduced in 1910, and very valuable for its earliness) should have precedence over these if the garden is not large enough to include all of them. Certainly Seagull comes as near as any flower to fulfilling all garden requirements. To give an idea of the range of this group, I shall mention White Star, a totally different flower of decorative type, four inches in diameter.

If I had to pick favorites from my daffodils, I should probably choose the Leedsii's first of all. These are pure white, come early, last well, and in my garden conditions increase more rapidly than any other group. Prominent in the Leedsii's (having the cup or crown less than one-third the length of the perianth-segments, thus closely resembling the Barrii section) are the old Mrs. Langtry and Duchess of Westminster, both of which were introduced by Backhouse in 1884. Opinions differ as to the former; I personally consider it long since superseded. But the Duchess of Westminster remains a valuable garden variety. Much like it and much better, I believe, is Queen of the North, a Barr seedling of 1908, one of the most beautiful of all daffodils and one deserving great popularity. Evangeline is very similar, as are many others. One of the finest of the new species is Arion (de Graaff, 1918), although this is apparently little known in this country. It has a large flower three inches across, and I have known it to have as many as seven flowers on one bulb in the second year. Very dainty also is Hera and Ice Gleam; and quite distinguished, because the cup opens a soft apricot shade which

fades to peach with age, is Salmonetta. Southern Gem is very early, and St. Ilario is late, as is the well-known White Lady.

The Giant Leedsii's are more like the "Incomps," the cup or crown being not less than one-third but less than equal to the perianth-segment. Most of them seem to be splendid growers in our climate, although they are apparently less known than the flowers of any other important section; indeed, I can use no well-known old flower to serve as an illustration when describing the newer varieties, for almost the oldest on my list are Sirdar and Lord Kitchener, introduced by Mrs. R. O. Backhouse in 1908. Nearly all are of the pure white type, and it seems to me that for most gardens they are better for white effect than white trumpets, which do not grow so well. Many of the largest of them are close to the border-line of white trumpets; indeed, one of Chapman's varieties has been given the name of Borderland for this reason. Among the smaller of these Giant Leedsii's, Capella, which was introduced by Pearson in 1909, is one of the most pleasing. Pearson brought out a dozen or more, among which was Puritan Maiden in 1916, a very lovely daffodil. It has almost trumpet proportions with pure white perianth, but the cup opens a lovely cream white. This flower seems to be only slightly known either in this country or abroad. Another large flower is Crystal Queen (Bath, 1910) which can be bought in quantities at a reasonable price. There is also Her Grace, an exquisitely frilled flower, not very large. But the most famous of the Giant Leedsii's are Mitylene, Phyllida, Silver Fox, and White Nile, all of which could be recommended to those who care for the pure white flowers of this general class.

The Poeticus section is one of great importance; it is known to all gardeners on account of the popularity of Ornatus and Recurvus, although those who know only these two can have little conception of the beauty of the modern Poets. Many of them, it must be admitted, are much alike, so it is hard to choose among them, but I will begin by recommending Thelma as the finest of the early varieties, and Dactyl and Dulcimer as two of the best among the late ones, almost as late as the old Recurvus. Next, let me call attention to a group of reasonably priced varieties, such as Epic, Glory of Lisse, Horace, Juliet, and Sonata, all of them originating between 1900 and 1910; and for those desiring

finer and more expensive flowers I would recommend Dactyl and Dulcimer (already mentioned) and Raeburn, Sarchedon, Snow King, and Socrates. This gives range of season and price, rather than range of form or color, although the cup will vary in the consistency of its red markings.

As all gardeners know, the Paper White Narcissus, quickly forced in the house in the winter, is not hardy; but that species has been combined with Poeticus to make a new group known as the Poetaz group. These are not hardy in the extreme north and may decrease there from year to year rather than increase; but around Philadelphia and New York they will hold their own fairly well. There are two types to be considered, namely, the white and the yellow, and while there are a great many varieties, the group is not remarkable for great variation of flower or length of season except in the case of some of the more recent additions. The following white varieties are mentioned according to the order of their earliness: Early Perfection and Laurens Koster; Antigone, Lucrece, and Mignon; and last of all, Sycamore. In yellows, Haemon is recommended for early bloom, Joconde and Orange Cup for mid-season and late, and Sovereign for very late blooming. All of these varieties are deliciously fragrant.

Another fragrant group—and one little planted—is the Jonquil group. The old Jonquil Rugulosus is to be seen in old gardens, and with it should be planted the newer Buttercup and Golden Sceptre; all are of delicate fragrance and the last named is the most satisfactory of all daffodils because of its long blooming season, for it remains in bloom sometimes for two to three weeks in spite of storms or hot weather.

Another group, better known, are the doubles. These are great favorites with many people. I have never cared much for them, although this unfavorable opinion is probably taken from the very bad old Van Sion which is seen in so many old gardens around Philadelphia and New York; it certainly is not worthy of garden position as its color is a poor greenish yellow. Much nicer is Primrose Phoenix, the origin of which is not known. It was found in an old Irish garden and introduced from there by the Barr firm in 1904, and is, in my opinion, the best of the doubles available. There are reports from England of many fine new

doubles which are more graceful, with beautiful flowers, but they will need thorough trial before recommendations can be made.

An old variety which figured in Parkinson in 1629, although apparently grown long before that time, is Alba Plena Odorata, sometimes called the Double Poeticus. It is a snowy-white, sweet-scented gardenia-like flower and is very popular wherever it is known, but in nearly all gardens of the Middle States this flower is exceedingly shy of blooming. Some say that it does better if the bulb is planted one or two feet deep—which sounds like pretty severe treatment; others say it requires cool, moist soil near a stream or pond. All who grow it agree that it is a difficult flower to make bloom; if this were not true, it would be one of the most popular of daffodils on account of its beauty of form and fragrance. Two little-known groups are the Triandrus and Cylamineus hybrids which get their daintiness from these species, but their size from another parent. There are many Triandrus hybrids grown in England; most of them, however, are but slightly known in this country. They cannot be recommended until they have been more extensively grown, for there is no real knowledge as to their requirements—or as to whether they will increase or decrease under certain garden conditions. Peter Barr discovered a wild hybrid in Spain in 1908 and named it Queen of Spain. Apparently, it had been crossed with a wild trumpet, and is a lovely canary-yellow flower, especially good for the rock garden or for particular places in the garden border. A pure white variety is Agnes Harvey, one of the most charming of this group, or of any group. I hope that many people will try these and that we may therefore know more about their requirements than at present.

The Cyclamineus hybrids are much the same as those mentioned above, in that we know but little about them. One of the most charming is Flycap, a nice little flower for the rock garden, having the distinct form of Cyclamineus, with its reflexed perianth, which has sometimes uncomplimentarily been compared to a donkey with his ears back—I hope this description will not scare gardeners away from it, because it is a lovely little flower.

The foregoing does not by any means exhaust the various types of daffodils, nor could one article mention all the varieties, for

their number is legion. But the important thing for American gardeners to bear in mind is the fact that both the English and Dutch breeders have done wonderful work with these flowers. This work is just becoming known in this country; yet with true American horticultural progress in mind we proceed to stick to the old things which everybody else has discarded! Let us hope that this habit has not become so fixed that the future will be without progressive effort in new fields embracing some of the many lovely varieties of daffodils now known to European horticulturists, which are total strangers to us, for certainly this charming flower must take first rank in the early spring gardens; and while we cannot expect the ordinary garden to grow fifty or a hundred different varieties, we could reasonably expect them to be willing to get away from Golden Spur, Emperor, Empress, and Poeticus, and grow a few good kinds of each of the sections mentioned.

The recent daffodil embargo has been a blow to those who wish to see a speedy increase in the popularity of these flowers, since it has cut us off from European supply before our American supply became adequate. It is unnecessary at this writing to go into the question of the wisdom or non-wisdom of the embargo. The writer does wish, however, to express the hope that this embargo will work in our favor, since it has made some of these varieties difficult to obtain, and our gardeners will, therefore, appreciate them and will be more desirous of securing them.

JOHN C. WISTER.

THE IMPERIAL GARDENS AT SCHÖNBRUNN

It was my privilege during the summer of 1926 to visit the famous imperial gardens of Schönbrunn at Vienna, Austria. Probably the foremost of their kind in Europe at one time, these gardens, still beautiful and worthy of visit, are today but a survival of a once great autocracy; gardens that soothed the ennui of courtiers and were undefiled by plebeian tread. The modern state, the present Austria, founded upon the ruins of that decadent monarchy, today throws open the gates of Schönbrunn to the rabble and swells its coffers, though mighty little, by the fees for the privilege. And the guides get their pourboires. Such is the irony of history.

But Schönbrunn is interesting in other respects, if one peruses its history, not only to the historian but to the horticulturist as well. For at one time Schönbrunn was a nucleus of eminent gardeners and a pioneer in plant exploration. A recent publication of the Austrian Horticultural Society commemorating a hundred years' activity of that organization contains a splendid account of the part Schönbrunn has played in the botanical world. The writer is greatly indebted to this publication for most of the information presented here, much of which is a direct translation of an article in that bulletin by Fritz Rottenberger, Director of the Vienna Bundesgarten.

It was J. B. Fischer von Erlach, the gifted architect of Vienna's beauty, whose magnificent plans for Schönbrunn were submitted to Emperor Joseph I in 1696. His project was tremendous and embodied, in short, a mighty series of terraces with the imperial palace on the uppermost, the others to be transformed into beautiful gardens of colonnades and cascades to overlook a great plaza for tournaments and tilting matches. But in the words [translated] of one writer: "it was an architectural dream such that not even the ample resources of the Viennese court could make it come true."

So Fischer von Erlach was forced to modify his extravagant ideas and to lay the gardens behind the palace, where they now are. Von Erlach never lived to see his work completed. He died in 1723 and for half a century Schönbrunn was gradually built up into its final state. But we cannot afford to dwell upon this interesting work that continued under Empress Maria Theresa, for we want to consider here the botanical interests of Schönbrunn. In the words of the recently issued publication already mentioned:

"The garden of Schönbrunn still harbors in its extensive cultivated areas a rich store of rare plants which would redound to the honor of any great botanical garden. Unfortunately these plant treasures are too little known in outside scientific and gardening circles and it would be desirable in the interest of science if recourse were made to them more frequently for the purposes of research.

"Among the names of important scholars and professional gardeners to whom the plant collections at Schönbrunn owe their size and fame the most prominent is that of the founder of the Aus-

trian Horticultural Society, Alexander Freiherr von Hügel. Hügel, who kept in his glass houses . . . the yields of his expeditions to the East Indies, Tibet, Kashmir, the Philippines, and Australia from 1831 to 1836, carried on exchange relations with Schönbrunn." In 1848 Hügel's entire collection from Australia went to Schönbrunn and most prominent of his contributions was a group of 20 genera and 131 species of Proteaceae, as well as a fine group of Rutaceae. The greater part of the tree ferns at Schönbrunn probably were also brought by Hügel.

The gardens themselves must have required as much effort to construct as was spent in securing exotic stock. "The garden director, Adrian van Steckhoven, who was summoned from Holland, and his faithful assistant, Richard van der Schot, laid out the gardens at Schönbrunn according to the imposing French plans." Already in 1754 there was quite a stock of plants, but for the most part it consisted of local flora. "Van der Schot, who undoubtedly was the originator and caretaker of the gardens, knew how to arouse the interest of the nature-loving emperor Francis I and to direct the latter's attention to foreign flora. This activity was supported by Nicolaus Jacquin, who at the time was studying medicine at Vienna but was already an ardent botanist. The Emperor sent Jacquin with Schot as assistant to the West Indies. The expedition left Vienna in 1754 and explored the islands of Martinique, St. Martin, St. Bartholomew, Grenada, St. Vincent, St. Domingo, Aruba, Jamaica, Cuba, Curaçao, and later Venezuela. The botanical yield was exceedingly rich and was sent back to Austria in seven consignments. Through the carelessness of a gardener, who neglected the heating of the glass houses, the greater part of these plants, brought over and cared for with so much trouble, were frozen in 1780. The loss affected Emperor Joseph very much and the desire finally matured in him to replace the damages. Upon the advice of Jacquin, Dr. Leopold Stupicz was accordingly sent back to the West Indies with the garden assistants Franz Boos and Franz Bredemeyer. The collectors separated and directed their activities to different regions. In 1784 Bredemeyer came back with a rich collection from South Carolina, while Boos explored the Bahama Islands and east Florida and reached Vienna with his collection in 1785. At the end of 1784 Bredemeyer was sent to the Antilles with the gardener

Schücht. The islands of Martinique, St. Domingo, Porto Rico, and Jamaica were again explored. Bredemeyer pressed as far as the region of the Orinoco in Caracas. The expedition took up four years and was unusually successful. The emperor seems to have been well pleased even with the first consignments and in 1785 sent Boos, with George Scholl as assistant, to South Africa with the task of exploring the region about the Cape of Good Hope and the Isle de France and of collecting plants for Schönbrunn. The result was no less than 280 cases of living plants. Schönbrunn owes to this expedition and to Boos its collection, unique in Europe, of Ericaceae, which is represented by 6 genera, 125 species, and over 100 varieties. The only specimen of *Fockea capensis* in cultivation probably came from this trip. For many years this plant, which defies all means of propagation, served as the last example of its kind. According to information from the garden inspector in South Africa, Dr. Marloth is supposed to have found other specimens of *Fockea capensis.* On the other hand, most of the heaths cultivated in Schönbrunn are no longer to be found in their native haunts. Emperor Joseph II still increased the already respectable collections through the purchase of certain collections in other conservatories, as well as by sending Jacquin's son on a trip through Europe in 1788. The latter brought back a notable enrichment of all foreign plants that might be secured, partly by purchase and partly by barter.

" Jacquin appears now to have turned the attention of the Emperor toward North American trees and shrubs, for from 1788 to 1789 there arose the Arboretum. . . . An increase of glass houses followed at the same time. On February 19, 1790, the garden director, van der Schot, died, and, on the following day, Emperor Joseph II, as a result of which, all further collecting activities suffered a set back. A short time later, however, Leopold II summoned Nicolaus v. Jacquin, who meanwhile had become Professor of Botany and Chemistry at the University of Vienna, to assume scientific directorship of Schönbrunn and with this move there arose out of an amateur garden a scientific institution." Jacquin published an important work in 1798 on the plants at Schönbrunn which had its effects on botanical study all over Europe. He " kept in intimate contact with Linnaeus and to the

best of his ability furthered the latter's System which at that time was fundamental."

In 1799, after an absence of fourteen years, Scholl returned to Vienna with but a part of his collections, for he couldn't carry them all on board ship. He brought with him a fine group of Cycads, particularly of Encephalartos, as well as an herbarium of Cape plants which is still kept in the Natural History Museum. Further work was done toward building up the collections under Francis II, though for the most part through purchase and exchange.

Attention was also directed toward fruit culture in an effort to improve the stock of that time. The esteem of Jacquin, who was now directing the work at Schönbrunn, "must have been very great at court for frequently his influence can be observed, as, for example, in the decree of the Emperor that the young Archdukes should care for little gardens of their own and plant them according to the Linnaean System. . There were in 1816 3,600 species of rare plants at Schönbrunn. The unusually great wealth of Cape plants was not even approximately matched by any other European garden. The scientific arrangement and working out of these plant treasures by Jacquin, the most prominent European botanist, and his influence upon the Schönbrunn gardens made this institution the most important and magnificent in the world, for even the Kew Gardens at London, in spite of their great plant importations from colonies, did not come up to Schönbrunn." The history of Schönbrunn speaks of Alexander von Humboldt, who visited Schönbrunn before his trip around the world in order to study tropical plants there and to consult with Jacquin. It is not without interest to note that the gardener, Philipp Welle, was appointed to join the imperial commissioner, Stürmer, who was intrusted with the custody of Napoleon on St. Helena, to collect plants on the island. Welle brought a great number of living plants and much herbarium material from St. Helena to Schönbrunn, of which nothing remains any longer in the collections.

In 1817 Jacquin died and his son was appointed his successor. The latter, however, accepted his office only nominally and though the great collections were still preserved, Schönbrunn began to lose in prestige. In 1817 another expedition was sent to

Brazil by Francis I, occasion for which was caused by the marriage of the Archduchess Leopoldina with the Crown Prince of Portugal, who later became Emperor of Brazil. The court gardener, Heinrich Wilhelm Schott, who was sent along as assistant to the director, Dr. Mikan, had the job of laying out an "acclimation garden" in Rio de Janeiro in order to secure material capable of being transported. In spite of many difficulties, by the end of 1818 he succeeded in gathering and cultivating over 200 species of tropical plants. Schott directed his attention principally toward palms, aroids, bromeliads, figs, and ferns. In order to do justice to his task Schott secured a second gardener. . . . In 1819 Joseph Schücht accordingly arrived in Brazil. In the fall of that year 3,500 plant specimens in 50 cases were ready for shipment. Schott made two big expeditions into the interior of Brazil with decisive success and returned in the fall of 1820 to Vienna with an extensive herbarium, timber notes, and living plants, the result of three years' absence. The yield of the expedition was extraordinarily large and required five shipments. The last load alone consisted of 67 cases. The herbarium included 2,000 species in 7,000 specimens. Schott was then appointed assistant to the very aged court garden and menagerie director, Franz Boos." In 1821 more plants were brought from Haiti, this time by a gardener attached to a private industrial expedition sent for business purposes.

"The Brazilian expedition necessitated the building of a number of new glass houses, among them a palm house. Through this work the reconstruction of the Arboretum became necessary, which had to give way to a new layout. The management of the court garden from 1827 to 1839 was directed by Franz Bredemeyer; from 1839 to 1845 by Phillip Welle; and after his death Heinrich Wilhelm Schott was selected as garden and menagerie director. Schott was not only a particularly skilled gardener but also a learned botanist and understood how to bring his institution upon a scientific basis."

"Still another and this the last expedition was undertaken in 1859 to Brazil with the coöperation of the Archduke Ferdinand Maximilian. The scientific director of the trip was a physician, Dr. Heinrich Wawra, whose assistant, Franz Maly, later became garden inspector. Madeira, Teneriffe, St. Vincent and Brazil were explored. The botanical yield from the second expedition

into the virgin forests of Brazil was especially notable. The living plants and seeds brought back from this trip included about 400 species."

In March of 1865, Schönbrunn lost its leader, Schott, through his death. In this year, presumably through the bad counsel of one of the high court officials, it was decided to devote the most energy to the cultivation of decorative plants for court affairs and to give the collections second consideration. Through careful selection the finest specimens only of the collections were to be preserved. But fortunately, Adolf Vetter, who had been called to manage the garden, did not follow this decree explicitly and took care to preserve as many plants as possible of botanical value. Vetter reconstructed the badly neglected park layouts and through purchase increased the orangerie. Under him a greater number of glass houses as well as the palm house were built. Vetter laid especial value on the maintenance of the Ericaceae, Rhodoraceae, Proteaceae, Rutaceae, and Aroids.

Vetter retired in 1889 and in his place Anton Umlauft was appointed court garden inspector. A man of unusual knowledge, coupled with a captivating amiability, he understood how to interest the otherwise conservative head court official in new buildings and plant purchases. After some years, in 1896, when Umlauft became director of the court gardens we see Schönbrunn once more rise into prominence. The collections of Proteaceae were augmented through the purchase of Prince Rohan's collection. Through the purchases of the collections of Baron Hruby and of Förster, as well as others, the orchids experienced such an increase that seven glass houses could scarcely accommodate them. Upon the instigation and coöperation of the garden assistant, Anton Hefka, thousands of orchid hybrids of great beauty were secured, so that orchid auctions as in England took place and buyers came streaming in from all over Europe. The collection of Nepenthes was one of the largest if not the largest in Europe. Umlauft placed great emphasis upon the building of the great palm house which is the largest in Europe, with an area of over 23,000 square feet and a height of more than 100 feet.

The war and post-war times tore so many gaps in the plant stock of Schönbrunn and caused such arduous labor for its devoted director that he decided to resign from further service in

the spring of 1919. Next to Schott one of the most renowned gardeners was lost to the world upon the death of Umlauft. The war struck Schönbrunn severe wounds but even more severe was the aftermath. Scarcity of personnel, scarcity of fuel and especially of money brought the institution close to failure. The glass houses and the big palm house were of necessity heated by green wood obtained from the Tyrol and elsewhere through forestry practices. There were lacking pots, tubs, soil, manure, and all such cultivating devices and it must really be termed a wonder that the great plant collections could be kept with proportionately little loss. After the assumption by the state, Schönbrunn began to recover slowly from the heavy blows and, thanks to the support of the state, reconstruction can now take place step by step. Through exchange, gifts, and purchases, the gaps in the plant stock are beginning to fill up and with several years of struggle and work Schönbrunn will again be able to raise her head proudly. . . . It is planned to remove the botanical institute and garden as well as the horticultural schools to Schönbrunn and to erect here the center of botanical and professional study. . . . If and when the shrunken means of the state will realize this excellent plan unfortunately is beyond our power to predict.

Only a few of the plants now under cultivation at Schönbrunn can be mentioned here. In the palm house are two particularly fine specimens of *Todea barbara,* the Grape Fern, which inhabits the southern hemisphere from South Africa to New Zealand. These plants came from the Cape and their age is estimated to be several centuries. A particularly well-developed specimen of **Cereus peruvianus monstrosus,* the Hedge Cactus from South America, as well as a massive *Rhapis flabelliformis,* the Fern Rhapis from China and Japan, attract attention. There are specimens of *Cibotium Schiedei,* the Mexican cibotium; *Alsophila australis,* the Australian tree-fern from Tasmania and Australia; **Cyathea dealbata,* a tree-fern from New Zealand; as well as **C. medullaris,* the Sago fern, from the same country; *Blechnum brasiliense,* the Brazilian Blechnum; *Balantium antarcticum,* from Australia and Tasmania; **Angiopteris Theysmaniana,* from Java.

Of the palms the most valuable are specimens of **Daemonorops periacanthus* from Sumatra; **Maximiliana regia* from Brazil; *Seaforthia elegans,* which may be either of horticultural origin or

of the genus *Archontophoenix*; *Oreodoxa regia,* the Royal Palm from Cuba and Antigua; **Morenia Lindeniana* from South America; *Arenga saccharifera* from Malaya; and **Thrinax ferruginea,* one of the Thatch palms.

Of the Cycads there are *Dioon edule* from Mexico; **Encephalartos grandis, E. horridus, *E. Lehmanii,* and *E. villosus* from Africa; *Zamia integrifolia* from the West Indies, and *Ceratozamia* **Kuesteriana* and *C. Miqueliana* from Mexico.

FIGURE 2. A view in the gardens of Schönbrunn, near Vienna, showing avenue bordered by unilaterally trimmed lindens.

In a fine collection of Aroids *Philodendron Selloum* and *P. giganteum* from tropical America are especially noteworthy, and of the Pandaneae there are six species.

Much to my chagrin I was deprived of seeing these collections at Schönbrunn and had to be contented merely with a visit to the flower gardens behind the palace. Long paths lined by converging trees lead to the area from many points. But the feature about the garden that attracted my attention in particular was the rich

*Note: An asterisk marks those not in the collections of The New York Botanical Garden.

green wall twenty feet high that surrounded it along two sides, a wall fashioned from linden trees, densely grown together and trimmed to form a perpendicular facing the length of the garden. The effect was perfect and gave that impression of long straight lines which is so characteristic and so admirable in the French style of gardens.

Statuary and other man-made ornamentation, equally characteristic of these gardens of Europe, are present here. But their presence is truly an added attraction and not an eye-sore, as one so frequently feels about the pseudo-art exhibited in many places in this country. Upon a knoll at the farther end of the garden at Schönbrunn stands the beautiful Gloriette, a colonnade in Rococo built in 1775 by the architect Hohenberg. And at the foot of the knoll, nestled against an arborescent background, lies one of those charming fountain arrangements, bedecked with figures.

EDMUND H. FULLING.

PLANTS THAT ARE ATTRACTIVE IN FRUIT[1]

To provide food for birds, to decorate the landscape or winter garden, and to secure dry bouquets for the home, we plant things with showy or attractive or edible fruits. What happens when the birds secure the bright red berries of some of the best fruiting plants, and that several days before the lecturer wishes to exhibit them? He must show the fruits on the screen by means of lantern slides, and wait for another autumn. Despite the unexpected feast afforded to certain robins and other birds, many fruits in bouquet arrangement were displayed on the stage and many more on the screen.

Showy-berried branches of Dwarf Spindle Tree, Red Chokeberry, Purple Chokeberry, Rock Cotoneaster, Japanese Bittersweet, Beautyberry, Japanese Prickly Ash and the Thunberg Viburnum are now (November 12) to be found in various parts of the park. The last-named is one of the most striking of the newer shrubs, with fruit lasting very late into the winter. The Beautyberry, or *Callicarpa,* is the most unusual, with its clusters of lavender-purple berries. Another rare and striking shrub, one

[1] Abstract of an illustrated lecture given at The New York Botanical Garden on Saturday afternoon, November 12, 1927.

of the deciduous group of hollies, *Ilex serrata argutidens,* the Fine-tooth Holly, was exhibited. This is being propagated by the Garden as part of the work in plant conservation, the use of this plant as a Christmas berry being considered feasible.

These are some of the more prominent of our fruiting shrubs. Many of the herbs and shrubs of the woodlands are more attractive in fruit than in flower. In the Hemlock Grove are the Checkerberry, the Wintergreen, and the False Solomon's Seal or Spikenard. These plants are accompanied by one of the most valuable of wood plants, the Maple-leaved Viburnum or Arrowwood, which thrives in shade, beautifies the banks of the Bronx River, and ripens great clusters of black berries in August. These may be seen in October, but some time during that month they begin to disappear. This excellent underbrush plant is now often accompanied by a Japanese cousin, the Doublefile Viburnum. This is the counterpart of the well-known Japanese Snowball bush, in which the central florets are fertile, without the showy white petals of the Snowball. This shrub is perhaps the first in the garden to ripen fruit. In late June one may see a rich combination of green, red, and black-blue fruits on the bushes, in various stages of ripening. In July the fruits are ripe, and form the earliest berry food of the year. Soon after ripening all of the fruits disappear. In the past ten years vigorous seedlings have sprung up, in the Hemlock Grove, and in various parts of the park where the birds have carried the seeds. Near this foreign acquisition in our woodlands may be seen the humble poke-weed. There is no plant quite so royal in fruit and autumnal foliage color as this.

Another immigrant, the Seven Sisters or Multiflora Rose makes the tangled thickets of the Garden bright in winter, and the fruits being rather dry, they persist nearly through the winter. The Coralberry and the Snowberry—the latter, when in good condition, plump and crystal-white, furnish long-enduring winter garden decorations.

KENNETH R. BOYNTON.

A NATIONAL FEDERATION OF HORTICULTURAL INTERESTS PROJECTED

On November 28, 1927, the Pennsylvania Horticultural Society the oldest organization of its kind in the country—celebrated its one hundredth anniversary. Notable as the event was in itself, it was made even more significant by being the occasion of the first public announcement of a new project for horticultural advancement almost unlimited in scope and possibilities. The broad objectives of the plan now under consideration as "United Horticulture" are given as—"A more adequate representation of horticulture in national affairs; a more general appreciation of the value of plants to humanity; a more beautiful and more fruitful America."

Already this proposal has received much thoughtful consideration at the hands of a number of leaders in the industrial, professional and amateur branches of the broad field of horticulture. Several informal meetings have been held during recent conventions of national horticultural organizations, at the last of which a Survey Committee was named and authorized to make a complete systematic study of modern American horticulture, its needs, its opportunities, its difficulties, and the possibilities of developing its opportunities for greater usefulness and effectiveness by means of centralized, coördinated effort on the part of all existing organizations and interests.

The Survey Committee consists of Robert Pyle, West Grove, Pa., chairman; Mrs. Francis B. Crowinshield, Montchanin, Del.; Paul C. Stark, Louisiana, Mo.; John C. Wister, Philadelphia, Pa.; Professor Alfred C. Hottes, Columbus, Ohio, and David Burpee, Philadelphia, Pa. Under its direction the survey or investigation is being made by E. L. D. Seymour, Hempstead, N. Y., as executive secretary. Based on the results of this study a report will be prepared, with recommendations, for submission, first to a Committee of Consultation made up of a number of the most eminent horticulturists of America, representing both amateur and professional ranks; and, secondly, to the many horticultural interests and organizations that United Horticulture would exist to represent and to serve. Among those who have already agreed to coöperate in an advisory capacity is Dr. L. H. Bailey, of

Ithaca, N. Y., the dean of American horticulture and its most commanding figure, who has expressed his keen and sympathetic interest in the tentative program thus far outlined.

It is interesting to note that, according to Dr. Bailey, at least three attempts have been made during the last half century to consolidate or amalgamate horticultural interests on a national basis. Despite the fact that these attempts failed of permanent results, he feels that the continued, insistent conviction that such a federation is vitally needed is convincing evidence of the importance, desirability, and fundamental soundness of the idea. He believes, moreover, that at no time has the need been greater or the conditions more favorable than at the present for the carrying out of the idea.

Further developments in the program of United Horticulture, as these are announced from time to time, can well be watched for with interest by all who have a common interest in " A more beautiful and more fruitful America."

NOTES, NEWS, AND COMMENT

Dr. B. O. Dodge, who has been for the past eight years pathologist of the Bureau of Plant Industry of the United States Department of Agriculture, has accepted an appointment as plant pathologist of The New York Botanical Garden and will begin work at the Garden on May 1. Dr. Dodge was assistant and instructor in the Department of Botany of Columbia University from 1909 to 1920.

The Botanical Garden has recently received another collection of herbarium specimens from J. S. de la Cruz, of British Guiana, which contains one species new to science and several hitherto unknown from this colony. Among the latter the most interesting is *Utricularia Benjaminiana* Oliver, represented by hundreds of specimens in full flower. This species has been known previously only from two old collections from Surinam and French Guiana, both in poor condition.

Meteorology for January. The total precipitation for the month was 1.425 inches, .025 inches of which was a 2½-inch

snow. The maximum temperatures recorded at the Garden for each week or part of a week were: *60° on the 8th*; 57° on the 15th; 52° on the 17th; and 54° on the 25th. The minimum temperatures were 11° on the 3rd; 19° on the 16th; 14½° on the 21st; and *7° on the 30th.*

Meteorology for February. The total precipitation for the month was 4.275 inches, .105 inches of which was snow. The maximum temperatures recorded at the Garden for each week or part of a week were: 55½° on the 4th; 53° on the 9th; 50° on the 14th; *59½° on the 23rd;* and 52½° on the 29th. The minimum temperatures were: 12° on the 6th; 17° on the 13th; 13° on the 19th; and *5½° on the 27th.*

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THE AWARDS AND PRIZE-WINNING PLANS IN THE 1928 SMALL GARDEN COMPETITION

The "Small Garden Competition, under auspices of The New York Botanical Garden, 1928," closed at noon on March first The Jury of Award consisted of Mary Rutherfurd Jay, Garden Architect, nominated by The Garden Club of America; George William Beatty, Landscape Architect, nominated by The Federated Garden Clubs of New York State; and Kenneth R. Boynton, Head Gardener, The New York Botanical Garden, nominated by The New York Botanical Garden.

This Jury met on March second and opened the one hundred and eighteen plans submitted; several plans could not be considered because they came in after the time set for the close of the contest; several were eliminated because the identity of the contestant was placed on the plan rather than in a sealed envelope and because other conditions of the contest were not complied with.

Rather a goodly number of plans were executed in an indifferent manner and on paper quite inappropriate for the purpose. While neatness did not enter into the marking by the Jury, still it is more than likely that this point had some influence in deciding between plans of about equal merit. One design submitted received careful consideration because of the originality and merit shown. This plan calls for architectural features requiring skilled labor, which made it impossible for the Jury to consider it for one of the prize awards. To this design, showing a very daring treatment in the so-called "modern manner," was given the award of Special Honorable Mention. This plan, in which the treatment

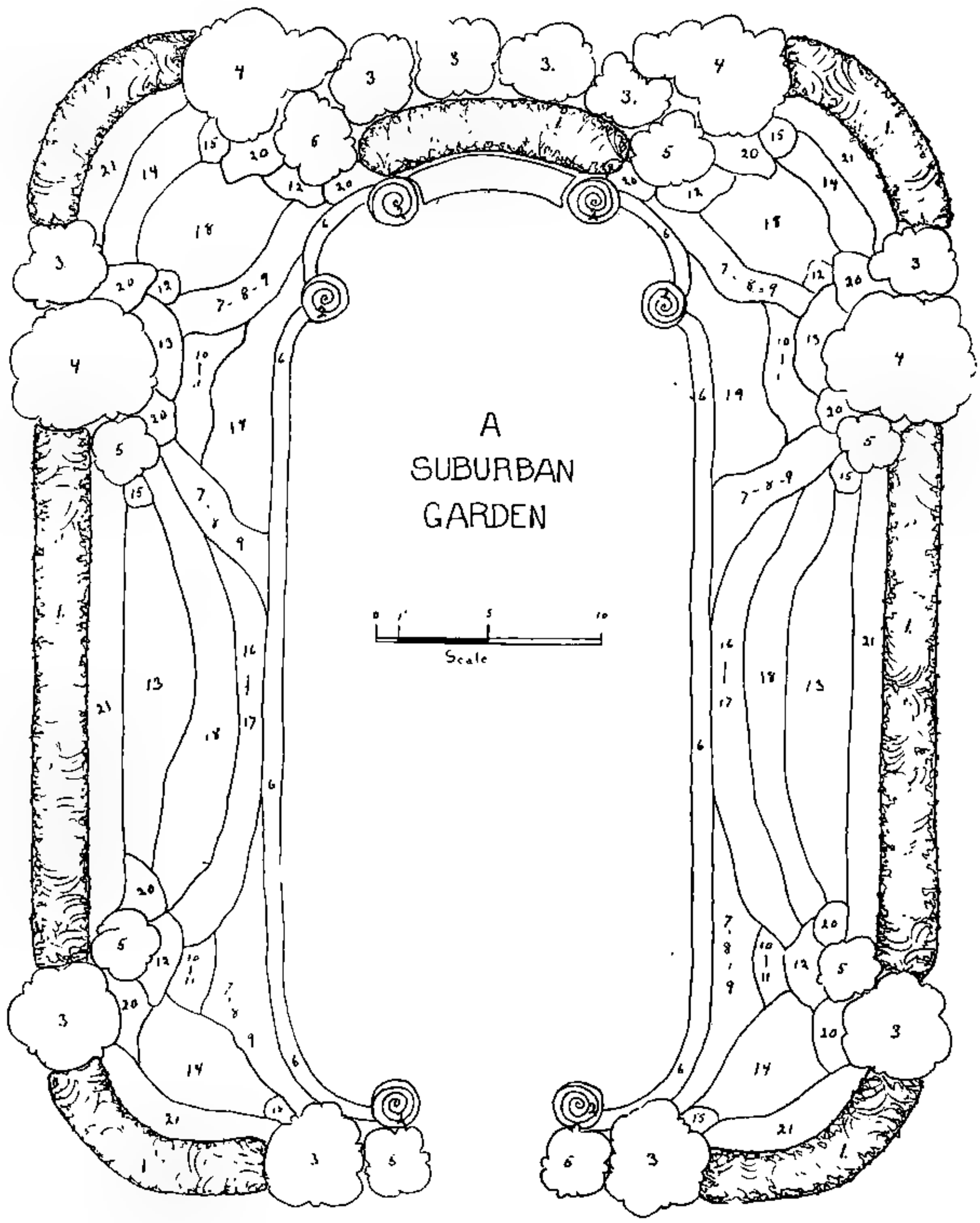

FIGURE 1. The first-prize plan, submitted by Miss Margaret F. Shaw, Vassar College, Poughkeepsie, N. Y. (As here reduced, the scale is ¼ inch to approximately 2.6 feet.)

of paths and lawn areas is a bit extreme, might be used in certain places as a part of a larger garden, if carefully handled and made to fit in. A great many plans which received no prize are worthy of mention but fell just a little below the prize winners, from the standpoint of the conditions governing this contest. Out of the

many excellent designs the Jury had no easy task in making the awards as listed below:

The first prize of One Hundred Dollars to—

(No. 48) Miss Margaret F. Shaw,
Vassar College, Poughkeepsie, New York

The second prize of Seventy-five Dollars to—

(No. 20) Miss Margaret P. Smith,
235 West Britannia Street, Taunton, Massachusetts.
(Present address, 21 Lincoln Avenue, Amherst, Massachusetts.)

The third prize of Twenty-five Dollars to—

(No. 5) Mr. James D. Graham,
157 Winthrop Road, Brookline, Massachusetts.

Special Honorable Mention to-

(No. 71) Mrs. George A. Robbins,
109 West Willow Grove Avenue, Chestnut Hill, Philadelphia, Pennsylvania.

(Signed) MARY RUTHERFURD JAY,
(Signed) GEORGE WILLIAM BEATTY,
(Signed) KENNETH R. BOYNTON.

THE FIRST-PRIZE PLAN

Submitted by Miss Margaret F. Shaw, Vassar College, Poughkeepsie, New York.

Key No.	Name	No. of Plants
1.	*Ligustrum vulgare*—Privet	108
2.	*Juniperus chinensis* var. *columnaris*	6
3.	*Syringa vulgaris*—Purple Lilac	10
4.	*Philadelphus coronarius*—Mock Orange	4
5.	*Weigela florida*	8
6.	*Viola cornuta* and	150
	Crocus susianus	200
7.	Tulip—Golden Queen	200
	Bouton d'Or	200
8.	*Myosotis sylvestris*—Forget-me-not	300
9.	*Lupinus polyphyllus* Blue Lupine	80
10.	*Narcissus poeticus*	100
11.	*Dryopteris spinulosa*—Spiny Wood Fern	50

12. *Iris germanica* Lohengrin 13
Rembrandt 13
13. *Delphinium hybridum*—Larkspur 48
14. *Digitalis purpurea*—Foxglove 40
15. *Lilium candidum*—Madonna Lily 24
16. *Chrysanthemum maximum*—Shasta Daisy 40
17. *Pyrethrum roseum* (shaded) 40
18. *Phlox paniculata* (white to rose) 65
19. Hardy chrysanthemums (white to rose) 60
20. *Heuchera sanguinea* var. *alba* 60
21. *Anemone japonica* (pink and white) 72
A. Bench.

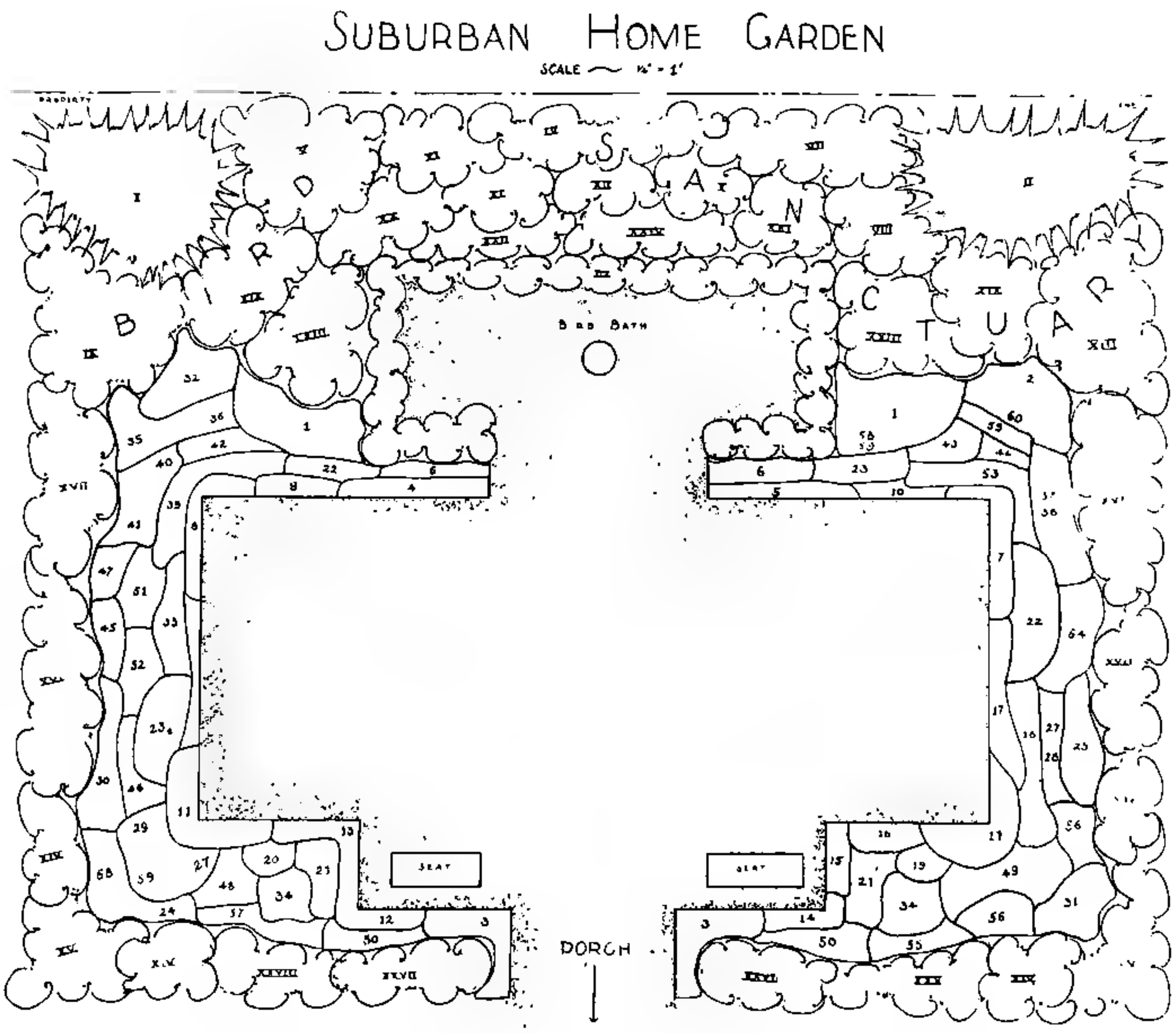

FIGURE 2. The second-prize plan, submitted by Miss Margaret P. Smith, 235 West Britannia Street, Taunton, Massachusetts. (As here reduced, the scale is ¼ inch to approximately 2.8 feet.)

The second-prize plan

Submitted by Miss Margaret P. Smith, 235 West Britannia Street, Taunton, Massachusetts. (Present address, 21 Lincoln Avenue, Amherst, Massachusetts.)

Key No.	Name	No. of Plants	Color
I.	*Juniperus virginiana*	2	
II.	*Juniperus virginiana*	3	
III.	*Berberis Thunbergi*	100	
IV.	*Cornus florida*	2	white
V.	*Crataegus cordata*	2	white
VI.	*Pyrus floribunda*	1	pink
VII.	*Viburnum Opulus*	3	white
VIII.	*Amelanchier canadensis*	3	white
IX.	*Lonicera tatarica*	2	pink
X.	*Viburnum dentatum*	1	white
XI.	*Sambucus canadensis*	2	white
XII.	*Rhus Cotinus*	2	purple
XIII.	*Philadelphus coronarius*	2	white
XIV.	*Syringa persica*	2	white
XV.	*Syringa persica*	2	lavender
XVI.	*Philadelphus coronarius*	3	white
XVII.	*Forsythia intermedia spectabilis*	2	yellow
XVIII.	*Deutzia* Pride of Rochester	2	blush
XIX.	*Cornus Mas*	3	yellow
XX.	*Viburnum dilatatum*	2	white
XXI.	*Rhus typhina*	4	red
XXII.	*Rhus copallina*	4	white
XXIII.	*Rhus Cotinus*	4	purple
XXIV.	*Spiraea Veitchi*	3	white
XXV.	*Rosa Hugonis*	2	yellow
XXVI.	*Deutzia crenata rosea plena*	2	white
XXVII.	*Deutzia Lemoinei*	2	white
XXVIII.	*Spiraea Vanhouttei*	2	white

Key No.	Name	No. of Plants	Color
1.	*Yucca filamentosa*	4	white
2.	*Cimicifuga racemosa*	3	white
3.	*Daphne cneorum*	6	pink
4.	*Bellis perennis alba*	12	white
5.	*Bellis perennis rosea*	12	pink
6.	*Cerastium tomentosum*	6	white

Key No.	Name	No. of Plants	Color
7.	*Armeria maritima splendens*	16	pink
8.	*Armeria maritima alba*	16	white
9.	*Phlox subulata rosea*	6	pink
10.	*Phlox subulata alba*	6	white
11.	*Sedum spectabile*	5	rose
12.	*Viola cornuta* White Perfection	12	white
13.	*Viola cornuta* Admiration	12	purple
14.	*Phlox divaricata alba grandiflora*	8	white
15.	*Phlox divaricata canadensis*	6	lavender
16.	*Primula polyantha*	4	yellow
17.	*Primula japonica*	12	yellow
18.	*Phlox amoena*	12	pink
19.	*Paeonia* Festiva Maxima	1	white
20.	*Paeonia* Duchess de Nemours	1	sul. white
21.	*Alyssum saxatile compactum*	3	yellow
22.	*Gypsophila paniculata*	3	white
23.	*Gypsophila paniculata flore-plena*	3	white
24.	*Thalictrum aquilegifolium*	4	yel. white
25.	*Thalictrum dipterocarpum*	3	violet
26.	*Anemone japonica* Queen Charlotte	5	pink
27.	*Delphinium* Belladonna	2	blue
28.	*Delphinium* Bellamosum	1	dk. blue
29.	*Delphinium formosum*	2	dk. blue
30.	*Boltonia asteroides*	4	white
31.	*Boltonia latisquama*	3	pink
32.	*Boltonia latisquama*	2	pink
33.	*Eupatorium coelestinus*	7	blue
34	*Phlox* Miss Lingard	2	white
35.	*Salvia sclarea*	3	lav. pink
36.	*Lilium candidum*	5	white
37.	*Delphinium* Belladonna	4	blue
38.	*Lilium candidum*	3	white
39.	*Stokesia cyanea*	12	blue
40.	*Lilium regale*	3	white
41.	*Phlox* L'Esperance	2	lav. pink
42.	*Aquilegia chrysantha*	3	yellow
43.	*Hemerocallis flava*	4	yellow
44.	*Phlox* Mrs. Jenkins	2	white
45.	*Phlox* Mrs. Milly van Hoboken	2	pink
46.	*Phlox* Elizabeth Campbell	3	pink
47.	*Aster Novi-Belgii* White Climax	2	white
48.	*Aconitum Wilsoni*	2	blue
49.	*Aconitum Wilsoni*	4	blue
50.	*Spiraea ulmaria flore-plena*	5	white
51.	*Coreopsis lanceolata grandiflora*	4	yellow

Key No.	Name	No. of Plants	Color
52.	*Dicentra spectabilis*	3	red
53.	*Trollius europaeus*	6	yellow
54.	*Helenium* Riverton Beauty	5	yellow
55.	*Aquilegia alpina*	6	blue
56.	*Dictamnus fraxinella alba*	3	white
57.	*Hemerocallis Thunbergi*	6	yellow
58.	*Narcissus* Golden Spur	12	yellow
59.	*Mertensia virginica*	6	blue
60.	*Tulipa* Le Rève (Hobbema) (Cottage)	12	rose

The bird bath is to be of very simple construction and approximately two and one-half feet in height.

The garden seats are to be of simple wooden construction.

The third-prize plan

Submitted by Mr. James D. Graham, 157 Winthrop Road, Brookline, Massachusetts.

Key No.	Name	No. of plants
1.	*Delphinium* hybrids	18
2.	*Bocconia cordata* Pink Plume Poppy	6
3.	*Phlox* Bridesmaid	4
4.	*Phlox* G. A. Stroehlein	4
5.	*Aconitum Napellus*	6
6.	*Helenium autumnale*	6
7.	*Lilium auratum*	8
8.	*Chrysanthemum uliginosum*	8
9.	*Althaea rosea*	24
10.	*Paeonia* Festiva Maxima	6
11.	*Paeonia* Fulgida	5
12.	*Chrysanthemum coccineum*	10
13.	*Oenothera macrocarpa*	7
14.	*Gypsophila paniculata*	12
15.	*Rudbeckia speciosa*	8
16.	*Scabiosa caucasica*	14
17.	*Aster* Feltham Blue	4
18.	*Salvia azurea grandiflora*	12
19.	*Linum perenne*	5
20.	*Limonium elatum*	11
21.	*Astilbe Arendsi* Gloria	7
22.	*Campanula Medium*	9
23.	*Aquilegia chrysantha*	8
24.	*Iris germanica* blue	8
25.	*Iris germanica* yellow	8
26.	*Gaillardia grandiflora*	8
27.	*Coreopsis lanceolata*	12
28.	*Alyssum saxatile compactum*	21
29.	*Achillea ptarmica*	13
30.	*Cerastium tomentosum*	16
31.	*Armeria maritima alba*	18
32.	*Dianthus plumarius*	20
33.	*Ceratostigma plumbaginoides* Leadwort, blue	21
34.	Pansies	12
35.	*Calendula* Orange King	10
36.	*Papaver nudicaule*	21
37.	*Verbena venosa* blue	48
38.	*Erigeron glabellus*	12
39.	*Hosta grandiflora*	7
40.	*Convallaria majalis*	30
41.	*Campanula persicifolia* blue and white	16
42.	*Lupinus polyphyllus* blue and white	9
43.	*Digitalis purpurea*	7
44.	*Pachysandra terminalis*	100
45.	*Echinops exaltatus*	13

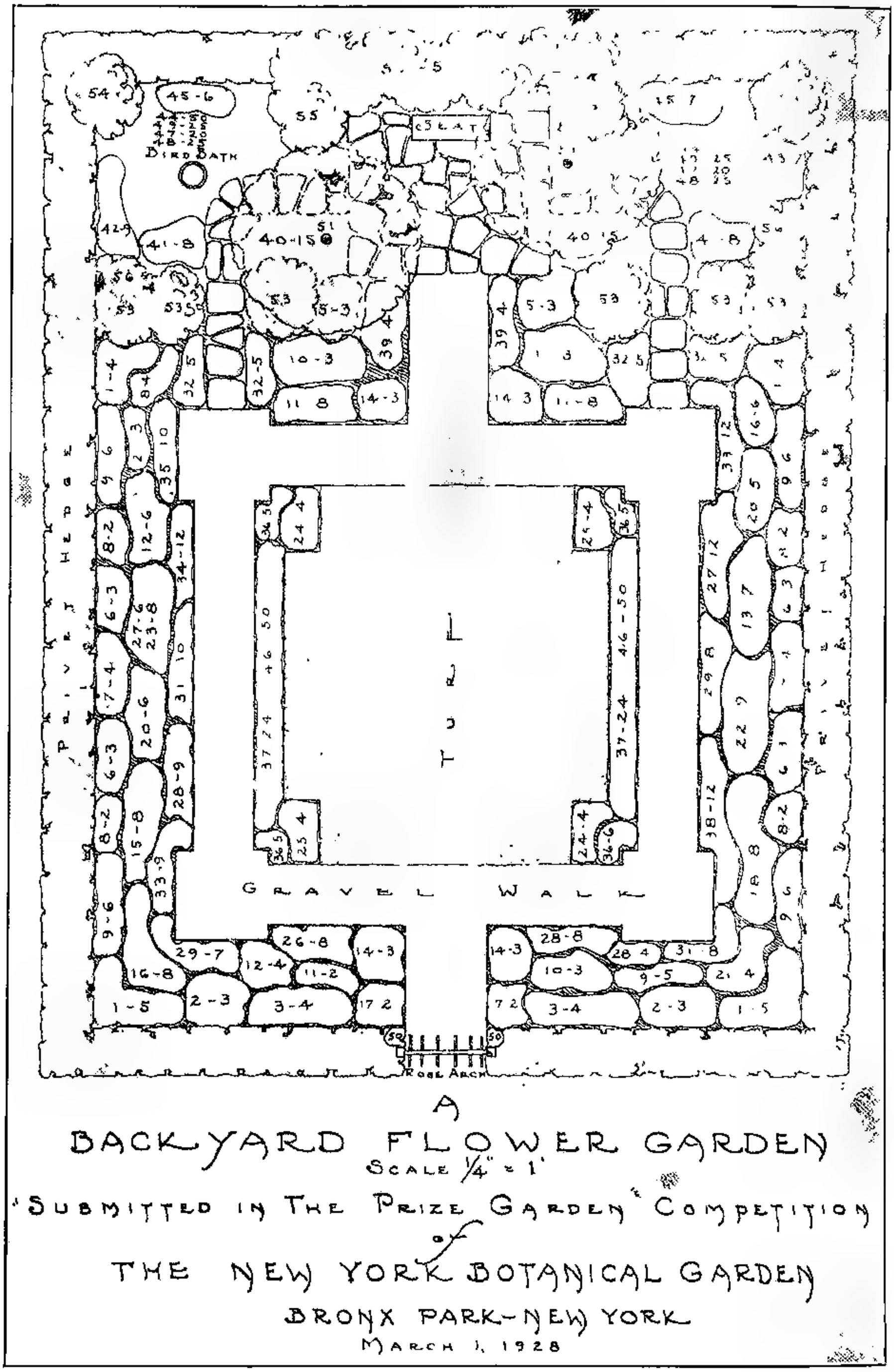

FIGURE 3. The third prize plan, submitted by Mr. James D. Graham, 157 Winthrop Road, Brookline, Massachusetts. (As here reduced, the scale is ¼ inch to approximately 2.5 feet.)

Key No.	Name	No. of plants
46.	Tulips, Darwin and Cottage, as desired	100
47.	Daffodils and Narcissus, as desired	40
48.	*Muscari botryoides*	50
49.	Ferns, native varieties	50
50.	Rose, Dr. Van Fleet	2
51.	Apple tree	2
52.	*Syringa vulgaris*	5
53.	*Syringa persica*	6
54.	*Cornus florida*	2
55.	*Viburnum Lentago*	2
56.	*Forsythia intermedia*	2

The New York Botanical Garden "undertakes, during the spring or early summer of 1928, to layout and plant, in a prominent location in its grounds, a garden on the lines of the winning design, and maintain the same as a public exhibition prize garden for at least one year." Such a garden, on the line of the first-prize plan, will be planted a little to the northwest of Conservatory Range No. 1, near the reproduction of Mr. Blundell's first-prize garden of the 1927 Small Garden Competition.

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DOCTOR SMALL'S COÖPERATION WITH MR. EDISON

Dr. John K. Small, Head Curator of the Museums and Herbarium, spent several weeks during January and February in southern Florida, in association with Mr. Thomas A. Edison in connection with his search for rubber-producing plants.

Several detours were made across the southern part of the peninsula, both by way of the northern end of Lake Okeechobee and the southern end; the upper Keys and Cape Sable were visited several times. Although the climax of the winter season and three or four spells of unusually cold weather had reduced growing vegetation to a minimum, there was sufficient of botanical interest to occupy his attention at all times. A large collection of the seeds of native shrubs and trees was secured for distribution to botanical gardens, collections of living plants and of

FIGURE 4. A photograph taken at Fort Myers, Florida, February 11, 1928, on the occasion of the 81st birthday of Mr. Thomas A. Edison. Left to right: Harvey S. Firestone, Thomas A. Edison, and John K. Small.

herbarium and museum specimens were made, both on the mainland and on the Keys. Specimens of rare species or species new to both these regions were thus added to the Garden collections. Among these may be mentioned on Old World braken from deep cypress swamps along the lower eastern coast and fruiting specimens of the rarest eastern mistletoe, which were found in abundance on the prairies of the interior of the peninsula.

A letter from Mr. and Mrs. Edison to Doctor Britton expresses their high appreciation of Doctor Small's assistance.

MARSHALL A. HOWE

CONFERENCE NOTES FOR JANUARY AND FEBRUARY

The regular monthly conference of the Scientific Staff and Registered Students of the Garden was held on January 4th. Dr. Mel T. Cook was present and spoke concerning his studies in Porto Rico, of the diseases of the sugar cane. Dr. R. P. Wodehouse and Dr. A. B. Stout gave reports of the various botanical papers presented at Nashville during the recent meeting of the A. A. A. S.

At the February conference held on the afternoon of February 1st, Dr. P. A. Rydberg presented the results of his studies on the "Segregates of the genus *Astragalus*," which will be published in detail in the near future.

A. B. STOUT,
Secretary of the Conference.

NOTES, NEWS, AND COMMENT

Dr. A. P. Kelley, recently assistant professor of botany at Rutgers University, has joined the staff of the Allegheny Forest Experiment Station, of the Forest Service, United States Department of Agriculture, with the title of associate ecologist. The Allegheny Station has established headquarters at the University of Pennsylvania, Philadelphia. Its work in forest research covers the states of New Jersey, Pennsylvania, Delaware and Maryland.

After a nine-months absence on "a quest for grass," L. W. Kephart and R. L. Piemeisel, plant explorers of the United States Department of Agriculture, have returned from Africa with more than 160 lots of seed of different grasses and forage plants. It is stated that while past experiences lead the Department to hope for valuable additions to the pasture and meadow forage of the United States, no definite values can be assigned to any of the new material until it has been thoroughly tested under our conditions of soil and climate. Many of the specimens came from high elevations in Kenya and Tanganyika.

Among the visitors to the library during the winter were the following botanists: Prof. John G. Jack, East Walpole, Mass.; Dr. Ivan M. Johnston, Gray Herbarium, Cambridge, Mass.; Mr. Al. Gershoy, Burlington, Vt.; Prof. H. M. Fitzpatrick, Ithaca, N. Y.; Prof. A. P. Saunders, Clinton, N. Y.; Mr. Frank W. Johnson, Buffalo, N. Y.; Mr. John C. Wister, Philadelphia, Pa.; Dr. Edgar T. Wherry, Washington, D. C.; Prof. H. M. Hall, Berkeley, Cal.; Sr. Oton Jiménez, San José, Costa Rica; Dr. Mel T. Cook, Rio Piedras, Porto Rico; Prof. A. C. Seward, Botany School, Cambridge, England; Dr. Yoshinori Takezaki, Kyoto University, Japan.

Dr. H. A. Gleason sailed March 22 for Europe, where he will devote the ensuing six months to a continuation of his studies on the plant life of British Guiana. His special problem at the present time is the preparation of manuscript for the first part of a proposed flora of the colony. His work will be done mainly at the Royal Botanic Gardens, Kew, England, where the most important collections of Guiana plants are conserved, but will also necessitate shorter trips to Berlin and other continental cities.

The New York Botanical Garden has recently received from the American Museum of Natural History a collection of more than 500 herbarium specimens from Mount Roraima, collected in 1927 by Mr. G. H. H. Tate, of the Museum staff. Roraima stands at the boundary corner between Brazil, Venezuela, and British Guiana, and rises to a height of more than 8000 feet. Its flora is still imperfectly known, chiefly because of the difficulty involved in reaching it, but has long been noted for an extraordinarily large proportion of endemic species. Mr. Tate was able to spend two weeks on the actual summit of Roraima and collected specimens of every observed species, so that the gift is a very important addition to the Garden's South American material. A report on the species included will be prepared by Dr. H. A. Gleason.

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

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

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

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

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

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

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

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

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

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

A library of botanical literature, comprising more than 35,000 books and numerous pamphlets.

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

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

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

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

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BRONX PARK, NEW YORK CITY

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FORESTRY AND AGRICULTURE IN PORTO RICO

TO THE SCIENTIFIC DIRECTORS OF THE NEW YORK BOTANICAL GARDEN:

Gentlemen: By permission of the Board of Managers, I was absent from the Garden from January 26 until April 2, 1928, with Mrs. Britton, engaged in further botanical studies in Porto Rico.

The progress of tree-planting and reforestation in Porto Rico is of great interest and importance, not alone to the island, but of much wider significance, as the requirements for tropical forest-products increase. From the nurseries of the Forest Service under the administration of Mr. W. P. Kramer and his assistants, Messrs. Bates and Brush, over 900,000 young trees are now annually distributed for planting on private lands and in the government forests, and this replenishment of trees will soon be materially increased. Farsighted citizens are recognizing trees as a valuable long-time investment on lands not available for agriculture, for the regulation of the flow of rivers and streams and for the decrease of destructive washing of soil from mountain sides. Large areas of such lands are in evidence in many parts of Porto Rico, for deforestation has been extreme; the need for more abundant firewood is acute. That means have come to be taken to repair this damage to the country is a noteworthy contribution to the future welfare of the colony. The local forest officials have the cordial coöperation and highly valued advice of the Federal Forest Service. During our visit an important examination of existing conditions was made by Messrs. Sherman and Kelley of the Washington office, from which noteworthy results will ensue.

At present there is a Federal Forest Reserve of about 12,000 acres in the Luquillo Mountains, in eastern Porto Rico, a typical

rain-forest; insular government reserves of about 6,000 acres, near Maricao, toward the western end of the Central Cordillera, also a region of relatively high rainfall; the Guanica Forest of about 5,000 acres, at low elevations, along the dry southern coast; small isolated areas elsewhere, and the extensive coastal mangrove swamps are also controlled by the Forest Service. It is probable that nearly all the mountain area above about 2,000 feet, aggregating over 150,000 acres, now mostly bare of trees, would be valuable in forest; coffee plantations reach profitably only to about that elevation, and the upper slopes furnish only indifferent grazing.

Careful consideration is now being given to the material increase in area of both the Federal forests and those of the insular government. Valuable information about the development of many kinds of exotic trees has been obtained during the past few years, and this study is being continued, as well as observations upon the growth of native species. The diverse rainfall, ranging from over 150 inches annually where the trade-winds impinge upon the higher mountains, to 20 inches or less along the southwestern coast, requires the use of different trees. Important additions to dendrology would result from the proposed establishment of a Federal Forest Experiment Station.

The proposal by Dr. J. W. Harris, President of the Polytechnic Institute of Porto Rico, to establish and maintain an arboretum on the grounds of that Institute at San German was further studied, and in consultation with him and with Mr. Kramer a tentative plan for such a collection of trees has been outlined, in coöperation with the Forest Service and with the Porto Rico Agricultural Experiment Station at Mayaguez.

Porto Rico is primarily an agricultural island; the recent proposal for the establishment there of a Graduate School of Tropical Agriculture is therefore attracting wide attention, it having already been endorsed by the National Research Council, and given preliminary approval by the insular government. During our visit an examination of the agricultural areas and of local conditions was made by President Farrand and Professors Mann and Knudson, of Cornell University, under the guidance of Hon. Carlos E. Chardon, Commissioner of Agriculture and Labor, and Assistant Commissioner Jaime Bagué; it was with

pleasure that we took part in this study. The plan contemplates affiliation with Cornell University similar to that in operation for the School of Tropical Medicine with Columbia University, already doing invaluable work under the direction of Dr. Lambert and his colleagues in elegant and commodious buildings erected and maintained by the insular government. The investigations of human mycology long prosecuted by Dr. Bailey K. Ashford, who first advocated this noteworthy medical institution and promoted its establishment, are being continued there by him.

We visited several areas of botanical interest with Mrs. Frances W. Horne, talented wife of Professor Horne, of the University of Porto Rico, to aid her in obtaining and selecting native plants for water-color illustrations, resulting in the addition of some twenty studies to her already large series of beautiful and accurate paintings. A number of her paintings have already been reproduced in our journal *Addisonia* and she will supply some of those recently delineated for subsequent publication. One of these excursions was made to the large fresh-water lake Laguna Tortuguero, on the northern coast, nearly enclosed by extensive areas of white sand, a Mecca for botanists, where numerous rare and characteristic plants occur; on this occasion we were accompanied by Dr. Mel T. Cook, botanist and plant pathologist of the Insular Agricultural Experiment Station, and Mrs. Cook; by Professor Williams, of the University, and Mrs. Williams, keen students of the Porto Rico flora, and by Miss Leake, expert photographer; on a memorably perfect West Indian day, signalized by finding two specimens of the rare and little-known yellow milkweed.

The Insular Agricultural Experiment Station at Rio Piedras has accumulated a large and important herbarium of plants of the West Indies; I gave much time to the study of this collection and its arrangement with reference to the "Descriptive Flora" published by the New York Academy of Sciences in the "Scientific Survey of Porto Rico and the Virgin Islands." This study added some information for a supplement to the "Descriptive Flora." Additional data for this supplement were obtained by the study and collection of specimens of native plants of especial interest, and of cultivated plants recently introduced by the Forest Service, through Mr. Otis W. Barrett, Agricultural Director, and

by others. In the collection at the Porto Rico Agricultural Experiment Station at Mayaguez, additional specimens were obtained from the rubber-yielding tree *Lanugia latifolia,* native of tropical Africa, the type of the genus *Lanugia* recently described by Mr. N. E. Brown, of the Royal Gardens at Kew, from specimens supplied by Mr. D. W. May, Director, and Mr. T. B. McClelland, Horticulturist, who have sent seeds of this tree to Mr. Edison for experimental cultivation in Florida.

To aid the important investigations of tropical woods by Professor Record, of the Yale Forest School, specimens of a number of kinds, including some endemic in Porto Rico, were obtained, accompanied by herbarium specimens of foliage, flowers, and fruits, in coöperation with forest officer Kramer, who retains duplicates for the Forest Service collection.

The Tulipan, or African Tulip-tree, *Spathodea campanulata,* of the Bignonia Family, introduced into Porto Rico some twenty-five years ago, is remarkable for rapidity of growth, and elegant when in bloom, with clusters of large, scarlet flowers at the ends of its branches. It has been much planted recently for shade and ornament along roads and in the plazas of towns; young trees are being widely distributed by the Forest Service. The largest one seen by us, which must be one of the first planted, standing on the roadside west of Bayamon, is now about eighty feet high with a trunk nearly four feet in diameter near the base. Don Andrés Oliver, of Arecibo, has recently called attention to its wood and this is being studied by the Forest Service.

Pursuant to requests received from Dr. Burton E. Livingston, Secretary of the American Association for the Advancement of Science, and from Dr. T. H. Morgan, President of the National Academy of Sciences, I attended, as delegate from both organizations, the twenty-fifth anniversary of the establishment of the University of Porto Rico, March 10–14, 1928.

Our studies were facilitated by His Excellency, Governor Horace M. Towner, who is greatly interested in every observation upon the plant life of Porto Rico, and to him and to Mrs. Towner, as well as to many citizens, we are indebted for aid, information, and hospitality.

Respectfully submitted,

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

AZALEAS AT THE FLOWER SHOW

Visitors to the New York spring Flower Show this year saw a greater display of azaleas than at any time for some years. The number offered in florists' establishments in this city during the present season seems also to have been larger than formerly. Slowly the greenhouse azalea is again returning to our markets and flower shows, after a partial absence of some ten years following its enforced retirement under the federal plant quarantine. Whether this is a permanent return or merely a transitory reappearance will depend, in large degree, upon the economic aspects of growing them commercially in this country.

But the display at the Flower Show demonstrated, at least, that a noteworthy effort is now being made to grow and market greenhouse azaleas in America. Formerly the florists' azalea, along with most of the hardy hybrid azaleas and rhododendrons, was a European product, raised in Holland, Belgium, or England and shipped to this country to be forced and sold. The plants at the Flower Show and those in the local floral shops today are American products, raised in this country from cuttings or grafted on seedling stock. Besides this, and significant of future development, a number of the azaleas shown were new hybrid varieties —and good ones too, raised by plant-breeders in this country.

The azaleas at the Flower Show this year made a wonderful and spectacular display. For sheer gorgeousness of coloring, grace of flower form, and quantity of bloom a well-grown azalea plant is hard to excel. Perhaps, in this case, the spectacular effect was overdone, for the charm and beauty of the individual plant was lost in the mass of bloom which carpeted the areas where they were displayed. This, however, was somewhat of a necessary consequence, because many of the plants were too small and too young to show up well as individual specimens. An azalea plant, like many another thing, does not exhibit its true character in early youth, but must grow up into a rugged and mature individual before its real personality asserts itself. A mass of young plants, therefore, appears merely like a sheet of color.

The exhibits this year comprised mainly greenhouse azaleas. The backbone of the collections consisted of the so-called Indian azaleas and Kurume azaleas. The Indian azaleas are entirely

tender here, while the Kurume group has not, to date, become reliable for outdoor planting in this region. Regarding the Kurume varieties, there is some evidence that certain strains are hardier than others and that some of these may prove to be as hardy as their relatives, the well-known varieties *amoena* and *Hinodigiri.*

Another plant which occupied an important place in the exhibits was the true rhododendron variety "Pink Pearl," which bore trusses of light pink flowers, each flower some four inches across. This is an excellent variety for show purposes, but is not adapted for outdoor culture in New York.

There were, however, a number of hardy azaleas on display. The best of these was the variety "Miss Louisa Hunnewell," a first-generation cross between *Azalea japonica* and *A. mollis.* It bears a good-sized yellow or pale-orange flower. A number of *mollis* hybrids were also in evidence, as well as a few native azaleas of the *nudiflora* type.

It was interesting to note the range of variation in the Indian and Kurume azaleas. Doubling was either of the hose-in-hose type, giving a semi-double effect, or else the multiplication of petals extended to a point where the flower became as double as a *Camellia.* Some of the double white Indian varieties resembled gardenias in their flower forms. Red and white striping of the petals was another common variation, while in some there were white margins and a definite color pattern. Spotting or blotching of the upper corolla lobe was another character which appeared in various forms and intensities.

A number of distinctly new tendencies were displayed in the hybrid seedlings, which indicate that we may be starting on the road to some valuable new races of azaleas. One of these tendencies is exemplified in the increasing use of the Kurume azaleas for hybridizing purposes. Perhaps this comes partly as a result of American economic conditions. The old azaleas of the florist, which he used to buy abroad and which he sold for a couple of dollars each, required four or five years to produce. That is, the stock had to be grown from seed and the plants grafted and cultivated intensively for several seasons before they were large enough to be sent to this country for sale. If they were grown on their own roots from cuttings, the time required might be even

longer and results less certain. Now, such a method, under present-day labor costs in America, would tend to make the plants so costly that they would be unmarketable at a profit. The Kurume azaleas, on the other hand, while not particularly fast growers, bloom very quickly from seed or cuttings, and they are miniature in their whole habit of growth, thereby attaining bushiness at a small size and requiring less greenhouse space per plant. Moreover, they root from cuttings with extreme readiness, a quality which few azaleas possess. It is plain, therefore, that if the early-blooming, bushy habit, and ready rooting characteristics of the Kurume type could be combined with the Indian azalea's large flower and showiness, the resulting plant might be a valuable commercial acquisition. Such an effort in breeding is not new. A series of hybrids of this nature was started some thirty years ago by Mr. Charles Sander, of Brookline, Mass., but only within a short time has the work apparently been resumed on a more comprehensive scale by other hybridists, following the comparatively recent introduction of many Kurume varieties from Japan by Mr. E. H. Wilson. Whether this work is resulting in forms that will be more economical to grow I am not in a position to state, but it is evident that the Kurume azaleas are being used in many crosses and that a large number of interesting new forms are being produced.

Another promising new variation is the tendency of some seedlings to show salmon-pink or apricot coloration. Up to recent times the colors of Indian azaleas have been confined to the magenta-crimson-rose-white range, typically an anthocyanin pigmentation, with no trace of yellow. Now, however, some seedlings have appeared which show unmistakable signs of yellow pigmentation and which have strong evidences in foliage and habit of an influx of the "blood" of *Azalea mollis,* a yellow species. This is a big step in advance.

These seedlings and others were exhibited by Mr. Baardse, propagator for Messrs. Bobbink and Atkins, who deserves much praise for his crosses. In the same exhibit there were two hybrids from unusually wide crosses, presumably azaleodendrons. One, named "Lone Eagle," was stated to be a cross between a Kurume azalea and the rhododendron "Pink Pearl." The hybrid was of intermediate type in many characters, although the leaves closely

resembled an azalea. The flower was a clear blush pink, about one and one-half inches across.

Another hybrid which attracted considerable attention was one which appeared as a seedling after a cross between the Indian azalea variety " Mme. Petrick Superba " and the hardy red hybrid rhododendron variety " Mrs. Charles Sargent." Azaleodendron crosses of this nature are not unheard of, indeed I have personally obtained seeds from such crosses made under carefully controlled conditions, but such results are exceedingly rare and generally produce weak seedlings. Those which have survived and are recorded in botanical literature are usually described as intermediate between their parents in nearly all characters. In the present case, there is little or no indication of rhododendron parentage except in form of flower. This really does resemble rhododendron " Mrs. Charles Sargent " strikingly, although the hybrid has deep purplish-red markings while those of the rhododendron variety are brownish-yellow. A perusal of the old botanical literature, however, discloses numerous Indian azaleas having a form of flower similar to that of this hybrid. If it were demonstrated that the seed-parent in this case was Rhododendron "Mrs. Charles Sargent," then the hybrid nature of this plant would be clearly established. But lacking this, the authenticity of the plant as an azaleodendron might well be questioned, although its value as a new variety is beyond criticism. It was of a deep, clear red color and was unquestionably one of the best azaleas in the show.

CLEMENT GRAY BOWERS.

THE MRS. A. SHERMAN HOYT COLLECTION OF LIVING DESERT PLANTS

A collection of living plants from the Mojave Desert of Southern California was an exhibit that attracted wide and favorable attention at the International Flower Show held at the Grand Central Palace in New York, March 19–24. The plants, together with sand and rocks of their native habitat, were brought across the continent at a considerable expense by Mrs. A. Sherman Hoyt, of the Pasadena Garden Club, and were staged by her in artistic and naturalistic groupings to illustrate the "beauty and charm of the desert." It was done primarily in behalf of the

Conservation Committee of the Garden Club of America to stimulate sentiment in favor of doing something to preserve the natural beauties of the American " deserts " before it is too late, for even the deserts, it would appear, are being encroached upon and transformed by those who would make the deserts blossom in other ways than those that have been established by tens of thou-

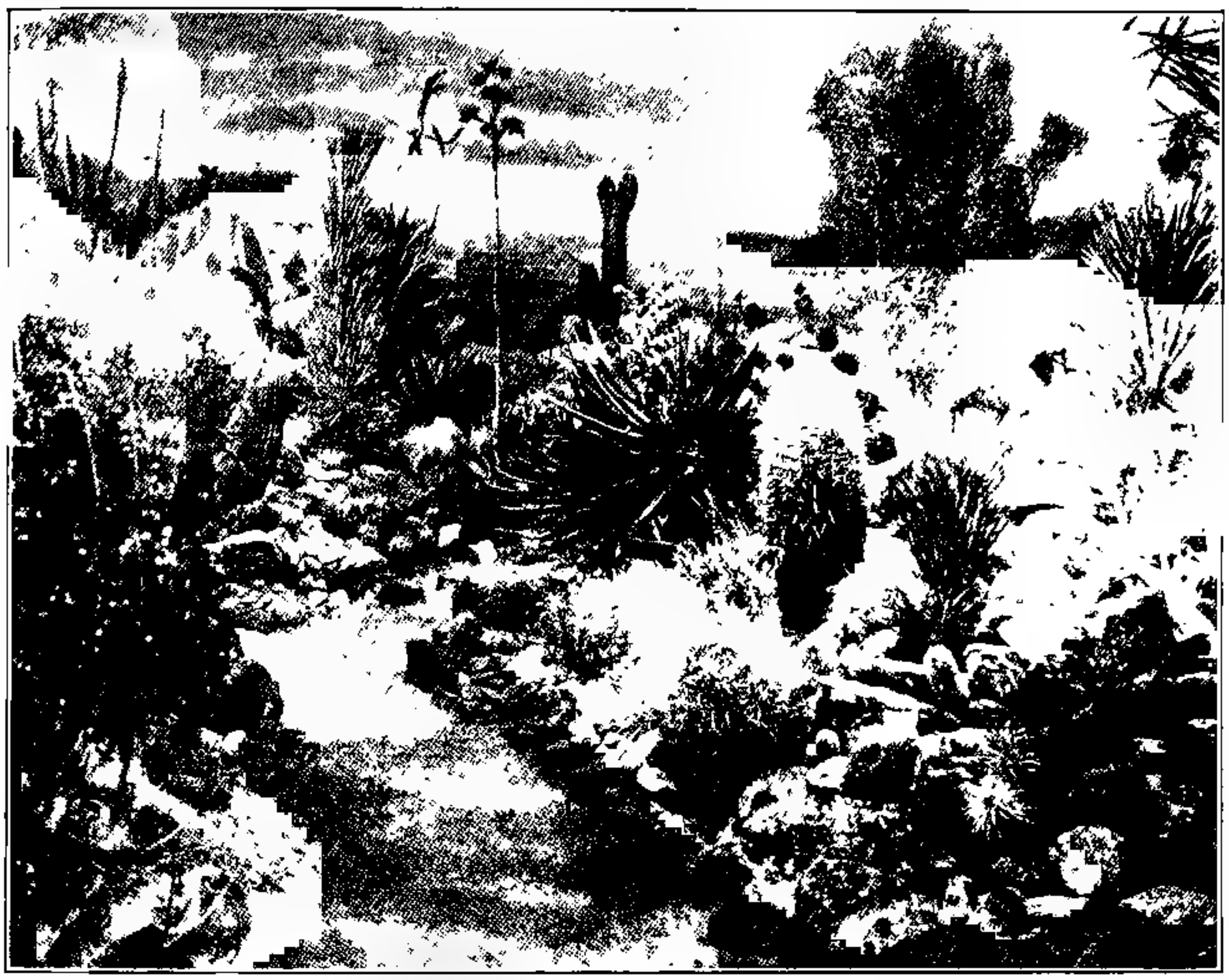

FIGURE 1. A part of the collection of plants of the Mojave Desert, as exhibited by Mrs. A. Sherman Hoyt at the International Flower Show, March, 1928.

sands of years of adaptation to an arid environment. And some of the desert plants, like the " Desert Holly " (*Atriplex hymenelytra*) have a commercial value and are in possible danger of extermination.

The collection included about fifty species of characteristic desert plants of southern California and Arizona. Prominent among them were the stately Saguaro Cactus (*Carnegiea gigantea*), the Organ Cactus (*Lemaireocereus Thurberi*), the Barrel

FIGURE 2. Plants of the Mojave Desert, as exhibited by Mrs. A. Sherman Hoyt, of Pasadena, California, at the International Flower Show, March, 1928; afterwards presented to The New York Botanical Garden by Mrs. Hoyt. Gold medals were awarded to this exhibit by the International Flower Show and by the Gar-

Cactus (*Ferocactus Wizlizeni*), Bigelow's Prickly-pear (*Opuntia Bigelovii*), the Joshua Tree (*Cleistoyucca arborescens*), The *Lord's Candle* (*Yucca Whipplei*), the Ocotillo (*Fouquieria splendens*), the Palo Verde (*Parkinsonia microphylla*), the Grease Wood (*Covillea glutinosa*), and numerous cacti other than those already mentioned. (See FIGURES 1 and 2.) Several of the commoner representatives of the animal life of the desert, such as the Jack Rabbit, Burrowing Owl, and Gila Woodpecker (with its nests) added a touch of naturalness to this striking habitat group and the general effect was enhanced by a painted background of desert mountains.

At the close of the Flower Show this remarkable collection of desert plants was presented by Mrs. Hoyt to The New York Botanical Garden. It has been installed in the central area of House 6 of Conservatory Range No. 1, where an effort has been made to stage it as nearly as possible as it was exhibited at the Grand Central Palace. Mrs. Hoyt has kindly offered to replace any of the plants that may fail to survive their transportation across the continent and the somewhat rigorous conditions of their week of exhibition at the Flower Show. Thus, through the generosity of Mrs. Hoyt, The New York Botanical Garden hopes to be able to show the public a characteristically American association of plants about as they look when growing in their native environment—possibly the beginning of a series of habitat groups under glass.

MARSHALL A. HOWE.

THE PRESENT STATUS OF ORGANIC EVOLUTION[1]

The meaning of evolution is probably more misunderstood than any other doctrine of science. The misunderstanding has arisen chiefly from ignorance of the subject, and from misrepresentation of the statements of scientific men.

Probably the simplest definition of organic evolution is that it means that plants and animals have developed in a continuous, orderly way, under the guidance of natural laws, just as the solar system has developed in obedience to natural laws.

[1] Abstract of a lecture given at The New York Botanical Garden on Saturday afternoon, March 31, 1928.

To appreciate the present status of organic evolution, one should know at least the outline of its history. There have been three distinct periods in the history of evolution, based upon the method of attack. These three methods may be spoken of in general as speculation (ancient), observation and inference (mediaeval), and experimentation (modern).

1. Speculation.—The idea of organic evolution is as old as our record of men's thoughts. No modern man, therefore, is responsible for the idea. Until 1790, however, organic evolution was a pure speculation, with no basis of scientific work.

2. Observation and inference.—This period extends from 1790 to 1900. Men had begun to observe plants and animals as they occurred in nature. They saw how species often intergrade, how they are modified by environment, how their structures are full of evidence of previous structures that have been abandoned. Then there came the revelations of geology, showing the wonderful succession of plants and animals from the earliest geological periods to the present time. This accumulation of facts began to suggest to certain men the serious study of evolution. A succession of explanations appeared, the most conspicuous being those of Lamarck and Darwin. As facts continued to multiply, the various explanations offered were found to be inadequate to explain some of the facts. The men who offered these explanations were not at all convinced that they had reached the ultimate truth. Their explanations were given as suggestions, rather than as necessary conclusions.

3. Experimentation.—This represents the modern period. It was ushered in chiefly by the work of de Vries, who introduced the experimental study of evolution. By means of carefully controlled cultures, he discovered a plant in the actual performance of producing occasionally a new form. Many such observations have now been made, so that evolution is no longer something merely inferred, but is demonstrated repeatedly. It is quite a different question whether the proposed explanations are adequate.

The problem that faces us today is not to discover whether evolution is true, but to explain the fact of evolution. Increasing work has shown that no single explanation is adequate for all the phenomena of evolution. It may be said that all of the classic

explanations explain some things, but no one of them can explain all things.

At present we are developing the technique of demonstration, by opening up the great field of heredity, which is not only vast in extent, but also extremely complex. The present status of evolution, as a body of doctrine, may be said to be in a state of flux, out of which the truth will emerge eventually. When evolution is discussed at scientific meetings, there is shown considerable diversity of opinion, not as to the fact of evolution, but as to some attempt to explain the process.

To summarize the present situation in reference to evolution, the following statements may be made. Biologists are testing the earlier conclusions by means of the multiplying facts. They are continually discovering factors that complicate the situation. They must learn the influence of factors by experimental work. As a result, the problem of evolution has been found to be very complex, not to be explained so simply as had been supposed, and therefore is still " in the melting pot," as a distinguished scientist has remarked.

JOHN M. COULTER.

CONFERENCE NOTES FOR MARCH

A monthly conference of the Scientific Staff and Registered Students of the Garden was held on the afternoon of March 7th.

Dr. M. A. Howe spoke under the title of " Notes on Marine Algae from Brazil and Hudson Bay."

The Brazilian algae discussed were collected by Dr. J. N. Rose and Mr. P. G. Russell in the summer of 1915, while they were engaged primarily in collecting Cactaceae. Only forty species of algae were obtained, but two of them, representing the genera *Porphyra* and *Cottoniella* of the red algae, appear to be new to science, and nine others have apparently not before been reported from Brazil. Twelve species were picked up at Barbados on the return voyage and seven of these are additions to the list of 215 species attributed to Barbados by the late Miss Vickers. The report on the Brazilian and Barbados algae, the speaker said, was on the point of being published by the Journal of the Washington Academy of Sciences.

The report on a collection of marine algae made in Hudson Bay by Mr. F. Johansen has recently been published in Ottawa as a part of the botanical reports of the Canadian Arctic Expedition. The list includes forty-four species, thirty-three of them being additions to a list of twenty-eight species and varieties of Hudson Bay, published by Setchell and Collins in 1908. *Peyssonnelia Johanseni* is described as new. In addition, fifty-nine species of Diatomaceae, determined by Professor C. S. Boyer, are listed.

Dr. R. P. Wodehouse discussed "Pollen-grain Morphology in Relation to the Classification of Species of *Barnadesia*." The following is an abstract of his presentation:

The pollen-grains of *Barnadesia* are approximately spherical with three bulging germinal apertures situated in three more or less conspicuous germinal furrows; in these respects the grains of *Barnadesia* conform to the general ground plan of the Compositae. They are distinctive in the possession of an elaborate system of smooth ridges and lacunae. This character, however, is partly shared with the two tribes Cichorieae and Vernonieae, from which the grains of *Barnadesia* may be distinguished by the entire lack of lattice structure, which is a prominent character of the ridges of the grains of the two latter groups, and also from the Cichorieae by the possession of two or more times as many lacunae and in the absence of spines which are characteristic of the ridges of the grains of the Cichorieae.

Included in the genus *Barnadesia* were two species, *B. inermis* Rusby and *B. divaricata* Griseb., which have simple tricolpate pollen-grains devoid of all crests and lacunae. The latter of these two species has been removed from the genus by Baker and there is ample evidence, apart from the pollen-grain structure, that the former was misplaced.

The pollen-grains of *Barnadesia* bear no resemblance to those of the Mutisieae, in which tribe the genus was placed, nor to any other groups of the Compositae except the Vernonieae and, to a certain extent, those of the Cichorieae, so that there is no doubt that the affinities of *Barnadesia* are closest to the Vernonieae. This view is substantiated by similarities of floral structure and other characters. Thus it appears that *Barnadesia* should be regarded as a subtribe of the Vernonieae.

A. B. STOUT,
Secretary of the Conference.

CONFERENCE NOTES FOR APRIL

The regular monthly conference of the Scientific Staff and Registered Students of The New York Botanical Garden was held on the afternoon of April 4. The program, with brief abstracts of the discussions, was as follows:

"Recent Exploration in Florida," by Dr. J. K. Small:

Accompanying some remarks on recent exploration in Florida and neighboring territory, specimens illustrating (I) an addition to the flora of North America, in *Pteris,* (II) rediscoveries in *Parnassia* and *Phoradendron,* and new species in *Iris, Cardiospermum, Eugenia, Eryngium, Azalea, Osmanthus,* and *Solidago* were exhibited. Also, a collection of paintings of the epiphytic bromeliads of the United States, made by Miss Eaton from specimens in the collection sent from the Gulf region last year and now installed in Conservatory number two, was exhibited. The specimens of the sixteen species of *Tillandsia* and as well as five related genera, all native to the United States, flowered at the Garden under glass last year. The paintings will ultimately be published in *Addisonia.*

"Pleistocene Plant Remains from Cuba" and "A New Method of Illustrating Identifications of Fossil Leaf Remains," by Dr. Arthur Hollick:

A collection of Pleistocene plant remains from the province of Santa Clara, Cuba, was exhibited and commented upon. The specimens were collected by Mr. Barnum Brown, of the American Museum of Natural History, and transmitted to the Botanical Garden for identification. They included lignitic and semi-lignitic wood, cones, and fruit. One specimen of the wood was identified as a *Juniperus,* and other specimens as belonging to the Combretaceae. The cones were identified as those of *Pinus caribaea* Moulet, and the fruit as a *Mimusops,* probably *M. emarginata* (L.) Britton. The remains evidently represent a flora that was generically and apparently specifically identical with that of today in the same region, and an interesting factor in connection with it is that it was found associated in the same deposit with bones of extinct mammals.

Plates of a forthcoming work on the fossil flora of Porto Rico, now nearly ready for the press, were exhibited. About fifty new

species were represented and the method was explained and demonstrated by means of which tracings of existing leaves were figured for comparison with the fossil specimens. The flora is of lower or lower middle Tertiary age. Generically it is, apparently, identical with the existing flora of the region, and many of the species are difficult to differentiate from those of today.

A. B. STOUT,
Secretary of the Conference.

PUBLIC LECTURES DURING APRIL AND MAY

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

April 7. "Beauties from the Flower Shows,"
Mr. Kenneth R. Boynton.
April 14. "On the Long's Peak Trail," Mr. Howard H. Cleaves.
April 21. "Gladiolus, Wild and Cultivated,"
Dr. Forman T. McLean.
April 28. "Insects of Shade Trees and Ornamentals,"
Dr. E. P. Felt.
May 5. "Daffodils," Mr. B. Y. Morrison.
May 12. "Farming for Bouquets on the Côte d'Azur,"
Mrs. Wheeler H. Peckham.
May 19. "How to Study Ferns," Prof. Henry J. Fry.
May 26. "Chinese Asters," Prof. Roland H. Patch.

NOTES, NEWS, AND COMMENT

Howard H. Cleaves, naturalist, explorer, and wild-life photographer, who spent more than three months along the coast of the Canadian Labrador last summer, was the lecturer Saturday afternoon, April 14th, in the course offered by The New York Botanical Garden. The subject selected, however, was not Labrador, but "On the Long's Peak Trail," Mr. Cleaves telling of two months spent in the Rockies of northern central Colorado re-

cently, encamped at the base of Mt. Meeker. The talk was fully illustrated with hand-tinted lantern views from original photographs by the speaker, the slides numbering more than seventy-five. Camp was located at an elevation of 9,000 feet above sea level and frequent climbs were made to much higher levels, including an ascent of Long's Peak, the summit of which is listed at 14,255 feet. With Guy C. Caldwell, guide of the Rocky Mountain National Park, as companion, Mr. Cleaves visited the alpine meadows above timber-line, the region of the world's "hanging gardens" of Enos A. Mills. On two occasions the party penetrated to the head of the Wild Basin and once crossed the continental divide. Photographs were included in the lecture showing beaver works, Rocky Mountain wild flowers, pools at 12,000 feet, where the fairy shrimp lives; of the far-famed pack rat or trade rat, an animal that will come into your camp at night, stealing a safety razor and leaving in its place a pine cone or a piece of bark. Mr. Cleaves also introduced his audience to another star performer of the western mountains, the rock rabbit or coney. Living among rock slides, far above timber line, this curious little rodent, smaller than a guinea pig, gathers a hay crop, like a New England farmer, and stores it away, after drying, among crevices in the great boulders where the coney makes his home.

Contrary to the general opinion, eastern gardeners have less to contend with than those in California, Miss Hilda Loines, chairman of the governing committee of the Brooklyn Botanic Garden, declared when she spoke on "California Gardens" at The New York Botanical Garden, on Saturday afternoon, February 25. "There are certain difficulties in California gardening with which eastern gardeners do not have to contend. For instance," she explained, "one friend found that she had literally boiled her new rose plants, because she had watered them too long in the sunshine. Another planted rows of seeds outdoors only to have the tender seedlings snatched like morsels of lettuce by keen-sighted birds. Herbaceous borders are difficult to maintain. Lawns are luxuries owing to the high cost of watering and upkeep and there is a growing feeling that expanses of green lawn are foreign and unnatural in a California

landscape." In her lecture Miss Loines stressed the influence of the Spanish missions on both the gardening and architecture. She traced the history of the two back to the Spanish missions and told how many of the trees and plants now associated with California were brought there from Mexico and South America by the padres. "Twenty-five years ago," Miss Loines said, "landscape gardening was in a very chaotic state and it was not until the San Diego Exposition in 1914 that the revival of the Spanish style of architecture resulted in firmly establishing a type of gardening suited to it. Landscape architects are now making much more use of the native materials and achieving distinctive types of gardens much better suited to the climatic conditions. In this way there is being developed an original and delightful type of American garden." Miss Loines, who has made an intensive study of the gardens of California at first hand, showed a series of beautiful hand-colored slides of some of the old mission gardens, which have been restored, and many pictures of small gardens in the cities as well as some of the large show places.

On Saturday, March 17, 1928, Professor Tracy E. Hazen, of Barnard College, Columbia University, gave an illustrated lecture under the title "Botanizing in Trinidad" in the spring course at The New York Botanical Garden. The lecture was an account of experiences during one of the Garden expeditions connected with its large project of the botanical exploration of northern South America and adjacent islands in coöoperation with the Gray Herbarium of Harvard University and the Smithsonian Institution of Washington. Sailing from New York in the midst of arctic conditions of unusually cold winter, in eight days the expedition enjoyed the tropical warmth of the island of Trinidad, dedicated by Columbus to the Holy Trinity in commemoration of his first sight of land on his third voyage in 1498. On arriving at the capital city, Port of Spain, in the latter part of February, the many cocoa plantations in the vicinity are conspicuous in the landscape because of their colorful skyline, due to the great masses of orange-scarlet flowers of the *bois immortel* (*madre de cacao* in Colombia) planted to shade the young cocoa trees. With headquarters at Port of Spain, the excellent roads

enabled the party to visit representative parts of the island by motor trips. Several of these excursions were described by the lecturer. Especially noteworthy were visits to the Piarco and Aripo savannas, the latter distinguished with groves of majestic Moriche palms, one of the floristic remnants linking the island with the Oronocan region of South America; to the rain forest of Mount Tocuche in the northern range; to the Pitch Lake and sugar plantations in the south. The small islands forming a chain from the northeast corner of Trinidad almost to the coast of Venezuela were visited by means of a motor boat, and furnished an extremely interesting flora of cacti and other plants growing under practically desert conditions.

Mr. Oliver Perry Medsger, head of the department of biology of the Lincoln High School in Jersey City, lectured at The New York Botanical Garden on Saturday afternoon, October 29, on "The Flora of the Catskill Mountains." For more than ten years Mr. Medsger has devoted a month or two each season to a study of the flora of that interesting region, from the deepest valleys to the summits of the highest peaks. He described the succession of plant life in going from the lowlands to the summits. The plant life on the peaks is much the same as that found in Maine and southern Canada. The tops of the higher mountains are covered with trees of the red spruce and balsam fir. Eighty years ago, the prevailing trees of the mountain slopes were hemlocks and white pines. Along about Civil War days the hemlocks were cut for tanbark and the trunks allowed to decay on the ground. A little later the white pines were cut for lumber. As these conifers do not sprout at the roots, the pine forests have been replaced by other trees, chiefly by the yellow birch. As late as 1917, there were thousands of trees of the American chestnut growing in the lowlands and on the slopes up to an elevation of 1600 feet. These have all been killed by the chestnut blight and their places are now being taken by other species. Mr. Medsger finds the Catskills one of the very best places in the country for ferns, 40 species being found within three miles of Woodland, New York, which probably equals any other place in the United States. Mr. Medsger illustrated his talk with nearly a hundred lantern slides, many of them in color.

of Catskill Mountain scenery and of the native flora, including grasses, sedges, and flowering plants taken on his rambles through the mountains. Pictures of some interesting native orchids were shown. For many years, Mr. Medsger visited John Burroughs at Woodchuck Lodge in the northern Catskills and he spoke of the plant life around the Burroughs' homestead.

Meteorology for March. The total precipitation for the month was 1.93 inches, .07 of which was from 7 inches of snow. The maximum temperatures recorded for each week or part of a week were: 50° on the 8th; 62° on the 12th; *71° on the 25th;* and 57½° on the 26th. The minimum temperatures were *15½° on the 6th;* 28° on the 19th; 29° on the 20th; and 26° on the 31st. Ice melted in the middle lake on March 13th.

ACCESSIONS

Museums and Herbarium

66 specimens of marine algae from Brazil. (By exchange with the United States National Herbarium.)

14 specimens of marine algae from Barbados. (By exchange with the United States National Herbarium.)

1 specimen of *Chara Kenoyeri,* part of type, from Canal Zone. (By exchange with the United States National Herbarium.)

13 specimens of marine algae from Baffin Bay and the Gulf of St. Lawrence. (Given by National Museum of Canada.)

5 specimens of marine algae from Cuba. (Given by Bro. León.)

42 specimens of marine algae from Denmark. (By exchange with Universitetets Botaniske Museum, Copenhagen.)

1 specimen of *Riccia Sullivantii* from The New York Botanical Garden. (Given by Dr. A. B. Stout.)

1 specimen of *Halimeda Opuntia* from Costa Rica. (By exchange with the United States National Museum.)

7 specimens of marine algae from Maine. (Given by Miss Rosalie Weikert.)

12 specimens of Hepaticae from Costa Rica. (By exchange with the United States National Museum.)

5 specimens of marine algae from Port Limón, Costa Rica. (By exchange with the United States National Museum.)

1 specimen of *Laminaria Agardhii* from Connecticut. (Given by Miss Rosalie Weikert.)

7,000 specimens of mosses, being the herbarium of the late Dr. G. N. Best.

1 specimen of *Cladophora crispata* from Brooklyn. (Given by Mr. Harrison Elliott.)

1 specimen of *Riccia trichocarpa* from Oregon. (By exchange with Yale University.

9 specimens of Hepaticae from southern California. (Given by Miss Caroline C. Haynes.)

1 specimen of *Porphyra perforata* from Japan. (Given by the United States National Museum.)

1 specimen of *Euchema isiforme* from Cuba. (Given by Brother León.)

2 specimens of Riccia from Wisconsin. (Given by Dr. George H. Conklin.)

870 specimens of flowering plants from Haiti. (Collected by Mr. E. C. Leonard.)

2 photographs of the type specimen of *Lupinus candicans* and *L. cyaneus*. (By exchange with the United States National Museum.)

139 specimens of flowering plants from Cuba. (Collected by Mr. J. G. Jack.)

874 plants from Europe. (By exchange with the University of Geneva.)

1 specimen of *Oncoba echinata* from Porto Rico. (Given by Mr. T. B. McClelland.)

118 specimens of orchids from Cuba and Kamtschatka. (By exchange with the Riksmuseum, Stockholm, Sweden.)

9 photographs of *Rubiaceae*. (By exchange with United States National Museum.)

60 specimens of flowering plants from eastern North America. (Given by Dr. H. M. Denslow.)

450 specimens of flowering plants from Wisconsin and Iowa. (By exchange with the University of Wisconsin.)

10 specimens of *Solidago* from Texas. (Given by Mr. E. R. Bogusch.)

10 specimens of Solidago from the local flora range. (Given by Mr. W. C. Ferguson.)

3 colored plates of flowers. (Given by Mrs. N. L. Britton.)

1 specimen of *Capnoides sempervirens*. (Given by Miss A. Halsey.)

14 specimens of flowering plants. (Given by Dr. Arthur Hollick.)

1 specimen of *Eleocharis* from Long Island, New York. (Given by Mr. W. C. Ferguson.)

1 specimen of *Lythrum*. (Given by Dr. Arthur Hollick.)

1 specimen of *Pogonia* from the local flora range. (Given by Mrs. Arabella O. McKee.)

1 specimen of *Sonchus arvensis* from Pennsylvania. (Given by Professor C. L. Gruber.)

1 specimen of *Phytolacca* from New York. (Given by Mr. Percy Wilson.)

2 specimens of *Convolvulus* from Staten Island, New York. (Given by Miss Mary E. Eaton.)

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

22 specimens of flowering plants from Hawaii. (Given by Mr. Otto Degener.)

20 specimens of flowering plants from the eastern United States. (Given by Dr. H. M. Denslow.)

13 specimens of mimosaceous plants from North America. (By exchange with the United States National Museum.)

7 photographs of plants of the Mimosa family. (By exchange with the United States National Museum.)

6 specimens of flowering plants from Staten Island, New York. (Given by Dr. Arthur Hollick.)

1 specimen of Asclepias. (Given by Mr. Otto Bern.)

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

5 specimens of flowering plants from New York. (Givn by Dr. Arthur Hollick.)

1 specimen of *Plantago*. (Given by Dr. N. L. Britton.)

1 specimen of *Antirrhinium Orontium*. (Given by Dr. N. L. Britton.)

1 specimen of *Allionia*. (Given by Dr. N. L. Britton.)

29 specimens of flowering plants from New York. (Given by Dr. H. M. Denslow.)

10 specimens of flowering plants from Tobago and Trinidad, West Indies. (By exchange with the Department of Agriculture, Trinidad.)

221 specimens of flowering plants mostly from Newfoundland and Labrador. (By exchange with Harvard University.)

120 specimens of ferns from Mexico and Hispaniola. (By exchange with the United States National Museum.)

363 specimens of flowering plants from Iowa. (By exchange with the Agricultural College, Ames, Iowa.)

260 specimens of flowering plants from Europe. (By exchange with Professor Hugo Glück.)

142 specimens of flowering plants from Cuba. (By exchange with the Riksmuseum, Stockholm, Sweden.)

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

95 specimens of miscellaneous flowering plants from North America. (By exchange with the United States National Museum.)

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THE NEW YORK BOTANICAL GARDEN
Bronx Park, New York City

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

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

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

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

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

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

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

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

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

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

A library of botanical literature, comprising more than 37,000 books and numerous pamphlets.

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

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

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

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

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

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GLADIOLUS, WILD AND CULTIVATED[1]

Of all of the hosts of flowers which grace our gardens in midsummer, none has richer or more varied coloring and few have as great a range of attractive forms as has the gladiolus. This is rather surprising when we realize that as a garden subject the gladiolus is a comparatively new flower. While the genus was known to the ancients, and wild forms of it occur in the Holy Land and in southern Europe, it only began to gain the favor of gardeners during the middle of the last century, and even then it was the primitive forms, collected directly from the wilderness of South Africa, and not improved garden sorts, which first caught the gardeners' interest. The rose, the aster, the chrysanthemum, and our own American dahlia all came to us with a background of centuries of culture in their native homes. But the only evidence of interest in the gladiolus shown by the Bushman of South Africa is that he used the fleshy corms of one species for food!

But the Dutch and the English, when they explored South Africa, found there a wealth of wild flowers, and none of these were so diverse nor so colorful as the species of Gladiolus. This is the largest genus in the Iris family, comprising 250 known species. New ones are continually being described, and there is a great variety in coloring among the local forms of some of the species. Often a species described as blue will have varieties with lavender, bronze, purple, and other shades. So it is not surprising that our garden sorts are so diverse in color and markings. The wild species are valuable in themselves, in addition to their interesting contributions to the cultivated strains; many of them, like the Blue Bells, the Kalkoenjes or Little Turkeys, the dainty

[1] Abstract of an illustrated lecture given at The New York Botanical Garden on Saturday afternoon, April 21, 1928.

Painted Ladies—much more tastefully pencilled than their name might imply—and the sweet-scented Afrikanders, are valuable in themselves as plants for rockeries and garden borders.

The Gladiolus is not confined to South Africa, though 130 of the 250 species are found there. It also extends in the grass lands throughout tropical and northern Africa, Asia Minor, and into central Europe, and though preferring the open places, its habitats are most varied. Some, like the yellow swamp Afrikander, are found in bogs; the Superb Gladiolus, *G. cardinalis,* frequents damp, mossy cliffs of the mountainsides; the Klip Lily, *G. carmineus,* grows beside the sea; and the Maid of the Mist, *G. primulinus,* is so named because it grows beneath the spray of the majestic Victoria Falls. They are on mountain, plateau, and plain, in the desert and in the swamp.

The first to be described were the European species, the Common Corn Flag, *G. communis,* and the Italian Corn Flag, *G. segetum.* These European and Asiatic species are for the most part purple or magenta in color, and rather small. One of the showiest of these is the Byzantine Corn Flag, *G. byzantinus.* It grows about two feet tall, with an upright spike of bright purplish-red flowers, and is an attractive flower for the garden border, being almost hardy in the latitude of New York. I winter it outdoors in Rhode Island, and it is also grown outdoors with little winter protection in Ontario. More graceful and earlier blooming is the Violet Gladiolus, *G. atroviolaceus,* the drooping bells of which would make attractive clumps in the rockery. But the eye of the gardener has been more attracted by the more brilliant and varied species from South Africa, and these European species have not received the notice that they deserve.

The real foundation stock of our garden hybrids is the Parrot Gladiolus, *G. psittacinus,* which is found wild in the eastern part of South Africa. It is a tall-growing and handsome plant. Coming from a region of moist summers and dry, cool winters, it adapts itself easily to summer planting in the garden, and the storage of its corms in the cool cellar in winter. The Parrot Gladiolus, intercrossed with the still taller and more vigorous white opposite-flowered Gladiolus species, and with *Gladiolus floribundus,* gave rise to the Ghent strain or so-called Gandavensis race, which flourished from about 1850 to 1880. They were tall

growers, with long spikes of many open blooms, closely spaced. Some of the bright red varieties of this race are still grown in some of the old cottage gardens.

In 1875, Victor Lemoine, of Nancy, France, began breeding gladiolus, and in 1880 he introduced the first of his Lemoinei strain. These were aptly called the Butterfly Gladiolus. Their velvety dark blotches on the lower segments and brilliant coloring made them immediately popular. This strain, like every other important novelty among the garden gladiolus, arose from the introduction of a new species, the Purple-spotted Gladiolus, *G. purpureo-auratus,* and its close relative, *Gladiolus Papilio.* Progress in plant breeding is usually slow and halting, but in the gladiolus each forward step has been a broad one, and marked by the introduction of a new wild strain each time; man's part in it has simply been to choose a promising new species, then select the best of the hybrid seedlings from it! The blotched-throated and all of the blue- and violet-colored varieties even today trace their heritage from Lemoine's hybrids. Mrs. Frank Pendleton, Sweet Lavender, Henry C. Goehl, Mrs. F. C. Peters, and Sunnymede all get their dark blotched throats from this. The deep maroon-colored varieties, such as Anna Eberius and Purple Glory, also obtained their deep coloring from this strain, apparently by the spread of the dark throat blotch to cover the entire flower!

Up to this time, the garden gladiolus, while handsome and popular, was comparatively small-flowered. An American, John Lewis Childs, of Long Island, was responsible for the introduction of the first really giant flowered Gladiolus, which he brought out under his own name as the Childsii race in 1893. The Saunders Gladiolus species, *G. Saundersii,* which gave rise to this new race, is a dainty little thing, but there is no indication in it that it would be the mother of giants. Its wide, recurved segments tended to open out the flower and expand it to the fullest, and it also bequeathed to its descendants its dark-dotted white throat. All of our largest and finest gladiolus of today trace their pedigrees to this species—Crimson Glow, Mrs. Dr. Norton, Minuet, E. J. Shaylor, and all of Kunderd's best introductions—show Childsii traits. The first crosses with this species were in reality made in Europe, by Max Leichtlin and later by Victor

Lemoine, but the credit for the first recognition of the value of the hybrids and their real development belongs to America, and we still hold first place in the introduction of new large-flowered varieties.

The efforts of the gardeners have always been toward bigger and bigger flowers, more and more on the spikes, and toward taller and stronger stalks. So when each new species was incorporated into the garden strain of gladiolus the first care was to suppress among its progeny all tendencies toward its slender waywardness of the wild. The result has been strong but rather stiff flowers.

For those who prefer slender graceful flower and stalk, the progeny of the latest accession from the wild will be pleasing. The Maid of the Mist, *G. primulinus,* from the moist slopes at the foot of the Victoria Falls in Northern Rhodesia, has conferred on all of its descendants its hooded upper segment, slenderness and a soft tinting which persist most stubbornly. As a result, the Primulinus hybrids are admirable for artistic decorations, where graceful poise and beauty of form take precedence over mass effect.

Several more wild species have contributed toward the mixed heritage of the garden gladiolus, in addition to the ones mentioned. One of the oddest of these is the Dragon's Head Gladiolus, *G. dracocephalus,* which is likewise native to the eastern part of South Africa and takes kindly to our usual garden culture.

But when we go farther afield, and begin to try out the many charming little species from the western side of South Africa, from the neighborhood of the Cape of Good Hope, then our notions about gladiolus culture receive a rude shock! In the Cape Town region the storms come from the west and in winter, as they do here. So the winters are mild and moist, but the summers are dry, as on our own Pacific Coast in California. Accordingly the plants of that region make their growth in the cool season and flower in early spring—when transplanted to our climate they refuse to change their habits. We all know the Freesia as a winter bloomer. It is from the Cape and the Gladioli from there have the same habits.

Gladiolus recurvus is the violet-scented Gladiolus, the Mauves Afrikander of the Boers. It is deliciously sweet-scented, is hardy

enough to winter outdoors on Long Island with good mulching, but does not take kindly to our climate. Some of its near relatives are more complacent, however, and the Yellow Swamp Afrikander, which is strongly sweet-scented in the evening, may be easily managed, if it is kept out of the ground until November, to prevent it from sprouting up in the fall.

Among the tenderer species, suited only to greenhouse culture or to the out-of-doors in the South, are the Painted Ladies, of which *Gladiolus cuspidatus* is an example. These owe their quaint name to the the small boys of South Africa, who so named them because of their sharply painted markings on the lower segments. I never knew any lady to use paint in quite that manner, but perhaps the South Africans had in mind the more pagan tastes of the Indians!

These winter-blooming wildlings of the Cape region have given rise to races of interesting little winter-bloomers—to so-called Baby Gladiolus, which include the Nanus, Colvillei, Herald, and Tubergeni strains. These are dainty little winter-bloomers and useful for the greenhouse or for rockeries and borders in milder climates, as are many of the wild species.

These are but a few of the scores of interesting forms that are little known in cultivation. New species are continually being discovered in Africa. One of the most recent is the Stanford Gladiolus, described for the first time during the past summer, and introduced as seed into this country before it had even received a name in its native home. It is a prettily frilled little summer-blooming dwarf, and may prove of value in hybridizing, to develop a race suitable for borders and edgings.

Among the hundreds of untried wild species of gladiolus there are undoubtedly forms destined to play as important a part in the making of the gladiolus of the future as have the older species in the past. There is probably more variety in the forms of the gladiolus than occurs in any other single genus of plants, and the prospect of getting new and attractive flowers by intercrossing them is surely an enticing one. No other flower is more thoroughly satisfying in its multiplicity of forms than the gladiolus, and surely none holds forth a brighter promise for the future.

About forty-five autochrome slides, showing the flowers in their natural colors, besides hand-colored and black-and-white slides,

and flowers of some of the newer garden varieties of Gladiolus were used to illustrate the talk. Pictures of several of the odd and strange wild forms of Asia and Africa, and of their descendants among the garden sorts showed the process of evolution as it is now going on with the Gladiolus.

FORMAN T. MCLEAN.

FARMING FOR BOUQUETS ON THE CÔTE D'AZUR[1]

There are three types of farming practised on the "Blue Coast"; first, to produce the staples of life, so the farmer may exist self-supporting; second, raising flowers for the cut-flower market; and, third, growing flowers for the perfume industry. While we are to consider the two last, we should have no real idea of the farmer, or his occupation, if we did not look into the first, and we should lose much too, for, to understand the difficult conditions under which these French farmers labor, it is essential to steep oneself in some "local color."

The country is a very different one from anything we have in the United States; mountains which rise abruptly from the sea to no mean height, a climate rarely, on the lower levels, reaching freezing, but with snow on the mountain-tops, and hot, dry summers in the valleys. There is such varied soil that sometimes within a few miles there will be three distinct sets of plants, and, with the exception of a very few river margins and deltas, there is no level ground.

The farms are a series of terraces, one above the other, built up of stones, often hacked out of the mountain-side. The spaces behind the walls are filled with soil and steps lead from one ledge to the next. Trees are planted at intervals, the kind varying with the district, for the good farmer studies his exposure and soil and grows whatever does best. Thus, lemons will be at a higher altitude than oranges, and olives will appear wherever the ground is deep and rich enough to support them.

The staples of life constitute, in the main, grain, fruit, vegetables, grapes, and oil and of them all the last is the most impor-

[1] Abstract of an illustrated lecture given at The New York Botanical Garden on Saturday afternoon, May 12, 1928.

tant. There are practically no cattle, milk coming from goats. Oil, then, must provide the necessary fats. Olive oil made in the Alpes Maritimes and just over the border in Italy is the best in the world and the system by which it is made is a simple and sensible one. It is the same as practised by the Romans in the identical districts two thousand years ago. Some of the olive-trees are supposed to date from then and it is quite possible, as they attain a great age. The trees are pruned in such a way that young growth is encouraged every three years, as the fruit comes on the second- and third-year wood. Old, neglected trees can be cut back drastically and none of the wood is wasted, for it may be

FIGURE 1. Lavender farm, St. André, Méouilles, France. (Photograph by E. A. S. Peckham.)

used for bric-a-brac, firewood, charcoal, and the sawdust (in the form of a cake) for kindling. Olive trees are subject to disease and to pests, so the farmer sprays diligently. He fertilizes if he has manure and if not, he turns in the sod. Beans and leguminous crops are grown under the trees, the haulm being dug in. Grain and fruit, such as apricots, peaches, almonds, and figs are combined. Artichokes and grapes are companion crops. There is usually a cistern to collect rain-water or to warm the water that comes, perhaps, in a narrow watercourse from a distant brook. Every farm with a stream or damp place has a grove of the giant reed (*Arundo Donax*), called locally "Cannes de Provence," and used for a hundred purposes from supports to basket-making.

Crops must be brought to market on the heads of the farmer and his family, or where the trail is wide enough, on donkey-back, and the farmer (male or female) always walks! There are motor-roads part way up some of the valleys nowadays, so, from the head of the road carts or busses may lend their aid.

The tools used are primitive but suitable for the cramped quarters, grub-hoes, rakes, sickles, knives, and secateurs being the most in evidence. However, instead of scoffing at the "old-fashioned" methods, we live to admire, for the resulting crops

FIGURE 2. Mountains covered with wild Thyme, Gourdon, France, chateau garden in foreground. (Photograph by E. A. S. Peckham.)

per acre are far heavier than anything we can produce here in any place which has not actual virgin soil.

The people are very industrious and seem rarely to sleep except in the two-hour siesta of the middle of the day. They rise at dawn and work till late. There is little money, transactions being mostly made in kind, and labor is poorly paid. These farmers are thrifty but not mean and they are devoted to their land.

The majority of the farms are tiny, often comprising only two terraces and the owner confines himself during the year to two or, at the most, six sorts of plants. A proper rotation of crops is practised—a bean or clover following a root crop and a rotation is in evidence in the cut-flower farming, too. If a man grows carnations on a terrace for one year, he is apt to have stocks there

the next and he will raise young plants from his carnations to exchange with a neighbor for stocks. Some of the flowers used for cutting are marguerites, carnations, stocks, violets, Mimosa (Acacia), Narcissi, and anemones.

Nearly all the principal towns have a well-kept municipal flower-market and, of course, there are florists' shops; but the bulk of the flowers goes to London, Paris, and Berlin. The great market at Ventimiglia is celebrated. All flowers must be in regulation bunches and no selling can be done except when the market is officially declared open. All is quiet and orderly and the flowers are packed as soon as sold, being put on the special trains that

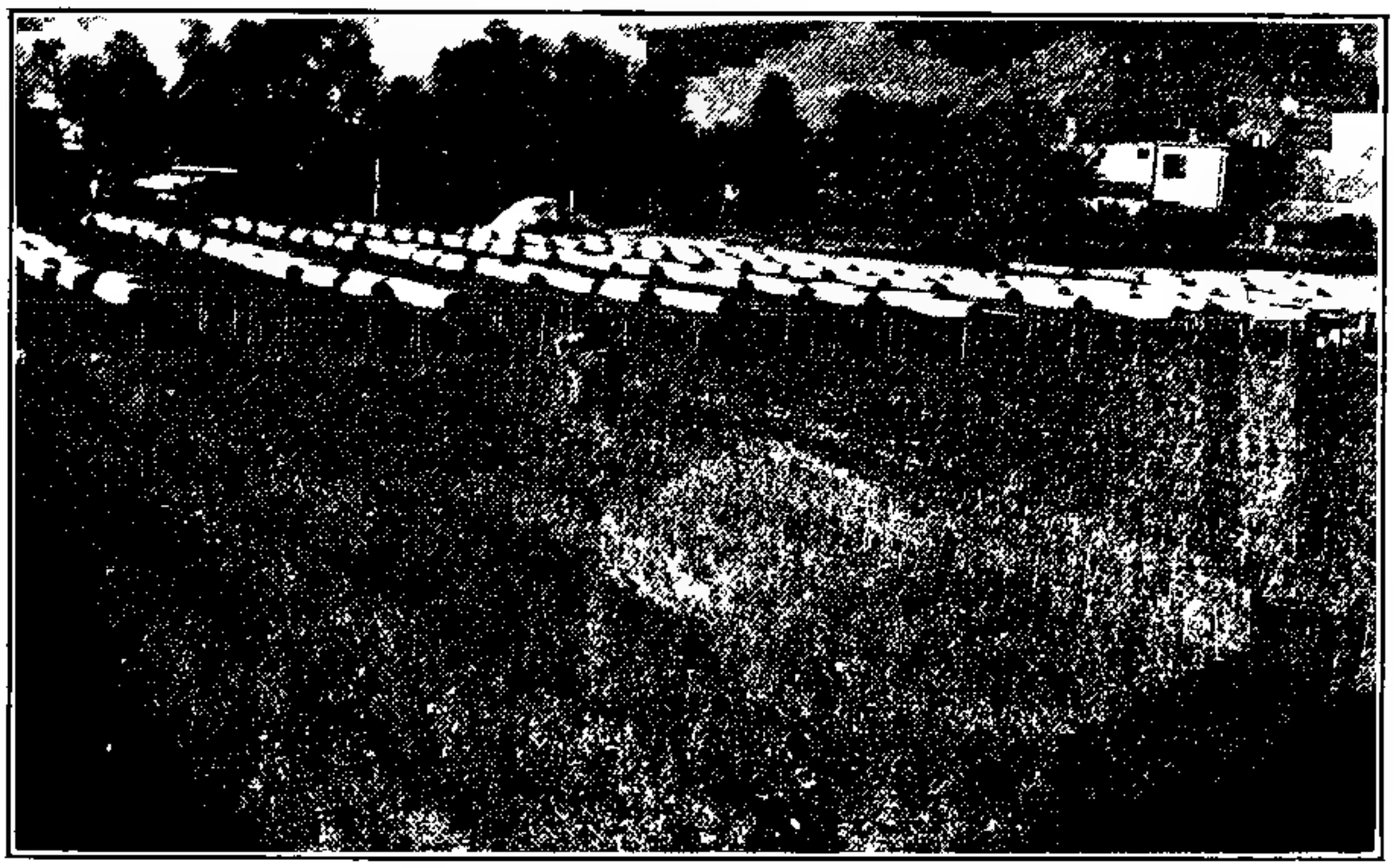

FIGURE 3. Carnation farm near Ventimiglia, Italy, rolled shades in background. (Photograph by E. A. S. Peckham.)

carry them to their destination. Marketed in Ventimiglia one afternoon they are for sale in Paris by seven o'clock the next morning.

The centre of the perfume industry is Grasse, the country nearby being admirably constituted for growing most of the flowers needed. Unfortunately this industry is suffering from the increased manufacture of "synthetic" perfumes but the finest are made directly from the flowers. Again, the character of the soil decides the farmer what he shall raise and, because of this, whole districts are devoted to one or two flowers or to one flower and a

fruit. Violets and olives are a favorite combination or it may be roses and olives. After three years the violets will be dug out and beans or clover will take their place. Flowers used for perfume are roses, violets, jasmine, jonquils, tuberoses, Mimosa, orange, and some sweet-smelling herbs such as rosemary, lavender, sage, and thyme, which are of value in the blends technically known as "bouquets." Rosemary, lavender, and thyme are native to France and are collected but they are also planted in patches in many districts where they grow wild and given some cultivation with the idea of producing an improved crop. This is particularly the case with lavender. The main part of the world's

FIGURE 4. Flower market at Menton, France. (Photograph by Sophie B. Steel.)

lavender comes from these mountains of France and the industry is an unique and interesting one. To speak of lavender makes one think of a side crop which may well be considered as having a "bouquet." This is honey! Bee-hives congregate on the mountains for "alpine honey," in the rose district for "rose honey," etc. Perfumes must be put in bottles, honey in jars, stoppers are needed, and they grow on the Côte d'Azur in the form of cork oaks. The industry is an important one and segregated to districts where the trees flourish. The principal one is in the mountains of the Maures, centering around Bormes. No part of the cork bark is wasted, the shavings go to fill upholstery, the sawdust

makes linoleum, a valuable black dye is another product, and we know the ancients stoppered their amphorae with corks, used olive- and rosemary-oil, adorned themselves with laurel and Narcissi, used quantities of flowers for their religious and secular processions, and put a drop of lavender-oil on their bait when fishing "of a holiday," just as the farmer of the "Littoral" does to this day.

Following is a list of the plants referred to above:

Cork Oak	(*Quercus Suber*)	Plants and trees used in the perfume industry.
Lavender	(*Lavandula vera*)	
Rosemary	(*Rosmarinus officinalis*)	
Thyme	(*Thymus vulgaris*)	
Rose	(*Rosa centifolia*)	
Tuberose	(*Polianthes tuberosa*)	
Violet	(*Viola odorata*)	
Jasmine	(*Jasminum grandiflorum*)	
Sage	(*Salvia Sclaria*)	
Orange	(*Citrus Bigaradia*)	
Cassier	(*Acacia Farnesiana*)	
Geranium	(*Pelargonium capitatum*)	
Mint	(*Mentha piperita*)	
Eucalyptus	(*Eucalyptus Globulus*)	

Olive	(*Olea europaea*)	Trees found on farms.
Orange	(*Citrus Aurantium*)	
Lemon	(*Citrus Limonium*)	
Figs	(*Ficus Carica*)	
Almond	(*Amygdalus communis*)	
Caroub	(*Ceratonia Siliqua*)	
Pistache	(*Pistacia vera*)	
Pomegranate	(*Punica Granatum*)	
Bergamot	(*Citrus Bergamia*)	
Lime	(*Citrus Limetta*)	
Mandarin	(*Citrus deliciosa*)	

ETHEL ANSON S. PECKHAM.

ORNAMENTAL PLANTS OF THE SEA[1]

Sea-bathers, boatmen, and fishermen commonly look upon the plants of the sea as more or less of a nuisance, and it must be admitted that the slippery brownish rockweeds left exposed along the shore at ebb tide have little in the way of beauty to commend them to the casual observer. However, the more delicate, bright green, red or rose-colored "sea-mosses," growing in the tide-pools or cast ashore from deeper water rival in beauty the choicest treasures of the land flora. But they are so different from the ordinary conceptions of plant life that direct comparisons are difficult or impossible.

Among the ornamental sea plants of the vicinity of New York is *Grinnellia americana,* an attractively ruffled pink ribbon that adheres so firmly to paper when dried under pressure that it appears like a painting. This was named in honor of Henry Grinnell, a New York merchant of nearly a century ago—the man who fitted out expeditions for the relief of Sir John Franklin, the Arctic explorer. A species of *Delesseria,* occasionally found along our coast but more common northward, resembles the scarlet autumn foliage of certain oak trees. A more filamentous purple plant, much in demand for ornamenting Christmas cards and souvenirs of the sea, belongs to the genus *Dasya.*

On the Pacific coast of the United States are very many different kinds of sea plants that are exquisitely beautiful, whether suspended like jewels in their native waters or floated out and pressed on paper. In the mounted form they are sometimes displayed as works of art in the seaside resorts of California. Their elegant symmetries and their wondrously diversified contours may well suggest designs for wall paper or for silken brocades.

In our warmer seas, such as those that bathe the shores of southern Florida and the West Indian Islands, are many interesting and beautiful forms of marine plants that are never found in northern waters. One species of *Caulerpa* suggests bunches of green grapes, while another kind of sea plant, belonging to the red group, looks like a cluster of translucent light-purple or rose-

[1] Abstract of a lecture and demonstration given in the Central Display Greenhouse of Conservatory Range 2 of The New York Botanical Garden on Saturday afternoon, December 18, 1926.

colored grapes. Then there are green seaweeds that are coated with lime and more or less rigid. Some of these are strikingly like brushes and have received fanciful names, such as "merman's shaving-brush" and "mermaid's powder-puff." Another is the "mermaid's fan," and there are others that take the form of exquisite little green and white cups—dainty chalices from which mermaids may, perhaps, be supposed to quaff beverages more inspiriting than salt water! Then there is another kind that suggests little fir trees or old-fashioned toy Christmas trees growing up from the ocean bottom. A rare species of pink seaweed that occurs in southern Florida consists of a delicate gelatinous membrane that is naturally perforated in a lace-like fashion.

Bermuda, which is further north than Florida and the West Indies, nevertheless lies in the path of the Gulf Stream and its shores harbor a great variety of marine plants, many of which are characteristic of the West Indian region. Beautiful sea plants are, however, not confined to the Western Hemisphere. The British Isles, France, and the shores of the Mediterranean have seaweeds that are well known for their attractive qualities. Australia, too, has forms of remarkable beauty.

The lecture was illustrated by many beautifully prepared specimens from various parts of the world, especially from California, whose coast is famous, not only for its great kelps, seaweeds that are sometimes more than a hundred feet long, but also for its smaller attractively formed and beautifully colored sea-plants of the highly ornamental sorts.

MARSHALL A. HOWE.

PROFESSOR HERBERT M. RICHARDS

The Scientific Directors of The New York Botanical Garden lament the passing of their late associate, Professor Herbert Maule Richards, whose untimely death occurred on January 9, 1928.

Professor Richards was born in Philadelphia (Germantown) on October 6, 1871, the son of a distinguished artist. He studied at Harvard University, receiving therefrom the degrees of B. S. in 1891 and Sc. D. in 1895. In 1897, after a period of study in Leipzig, he accepted the position of tutor in botany in Barnard

College, while Dr. Emily L. Gregory held the professorship in that institution. After the death of Professor Gregory in the same year, he became instructor, later adjunct professor, and, in 1906, professor. Much of his time was devoted to teaching and to the administrative duties of his department, but he found time to complete several important researches, the results of which were published. His chief personal interests were in the physiological aspects of the plant sciences, and in this field he was often able to offer suggestions of much value in connection with the development of The New York Botanical Garden, one of whose Scientific Directors and Managers he became by virtue of his election to the presidency of the Torrey Botanical Club in 1917.

Professor Richards' associates in the scientific direction of The New York Botanical Garden mourn the loss of an efficient advisor and a generous friend.

R. A. HARPER,
N. L. BRITTON,
M. A. HOWE.

PUBLIC LECTURES DURING JUNE AND JULY

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

June 2. "Japanese and Siberian Irises," Dr. George M. Reed.
June 9. "A Naturalist in India, Kashmir, and Burma," Mrs. Barnum Brown.
June 16. "Life Zones of the Rocky Mountains," Dr. P. A. Rydberg.
June 23. "Roses," Mr. F. L. Atkins.
June 30. "Botanical Rambles in Panama," Dr. Marshall A. Howe.
July 7. "The Story of the Redwoods," Dr. Arthur Hollick.
July 14. "Wild Flowers," Mrs. N. L. Britton.
July 21. "Selecting a National Flower," Dr. Edgar T. Wherry.
July 28. "Fungous Diseases of Plants," Dr. B. O. Dodge.

NOTES, NEWS, AND COMMENT

Dr. Arthur Hollick, Paleobotanist of the Garden staff, attended the annual meeting of the American Museums Association, which was held in Washington, D. C., May 16–19.

Dr. John K. Small, Head Curator of the Museums and Herbariums, went to southern Florida on May 4, to resume his coöperation with Mr. Thomas A. Edison in search of native rubber-producing plants.

Dr. Marshall A. Howe, Assistant Director, spent several days in Washington, D. C., in the latter part of April, in attendance upon annual meetings of the National Academy of Sciences and of the Division of Biology and Agriculture of the National Research Council.

Dr. L. H. Pennington, of Syracuse University, recently spent a day at The New York Botanical Garden, where he has worked for longer or shorter periods in the past. Dr. Pennington has prepared considerable manuscript on fungi which has been used in North American Flora.

Members of the Civic Bureau of the Bronx Board of Trade visited the Garden on the afternoon of May 2 in the course of a tour of the parks of the Borough of the Bronx in company with Commissioner Hennessy and his engineers. They were escorted through the grounds by members of the Garden staff.

North American Flora, Volume 23, Part 1, Mimosaceae, by Dr. N. L. Britton and Dr. J. N. Rose, was issued February 11, 1928; Part 2 is in publication. This volume is planned to contain the two families Mimosaceae and Caesalpiniaceae, to be complete in about seven parts. The descriptions for the volume are largely written. The deeply lamented death of Dr. Rose on May 4, 1928, will delay the publication of some of this work.

The numerous friends of Dr. J. N. Rose at The New York Botanical Garden were much grieved to learn of his death, which

occurred in Washington on May 4. Dr. Rose, who was in his 67th year, had been connected with the United States National Herbarium since 1888 and was in actual charge of it for a considerable part of this time. He was associated with Dr. N. L. Britton in the authorship of a four-volume monograph on "The Cactaceae," published by the Carnegie Institution of Washington, and in preparing systematic accounts of the Crassulaceae and the Mimosaceae for North American Flora.

During May, Dr. A. B. Stout, of the Garden staff, spent two weeks at the New York State Experiment Station at Geneva, N. Y., continuing his coöperation with the Department of Horticulture in studies of the pollination requirements of various fruits. In this project special attention is being directed to the principal varieties of peaches, cherries, plums, pears, and apples recommended for culture in New York State.

Mr. E. J. Schreiner and Mr. Maurice Condon spent most of the month of May in Maine in connection with investigations with poplars. Some 14,000 hybrid poplars previously grown at The New York Botanical Garden and at Strathglass Farm have now been planted on the Oxford Nursery Farm for further study and propagation. Dr. A. B. Stout spent a few days at the Oxford Nursery for consultation and inspection of the work under way.

Saturday afternoon, May 19, Professor Henry J. Fry, of the Biology Department of Washington Square College, New York University, delivered an illustrated lecture entitled "How to Study Ferns," in the Museum Building of The New York Botanical Garden. The lecture was illustrated by seventy-five colored lantern slides made from original photographs taken by Dr. Fry. Chief emphasis was placed upon methods of identifying the common eastern ferns. The presentation was popular in nature so that those unaccustomed to scientific botanical methods were given a non-technical introduction to fern study. Each species was shown in its natural haunt followed by a group of illustrations picturing the details of frond structure and the location of the fruiting bodies. Dr. Fry included in his discussion brief ac-

counts of such topics as the ancestry of ferns in past times, and a simple description of their complicated methods of self-perpetuation.

Dr. E. P. Felt, who was for over thirty years State Entomologist of New York, gave an illustrated lecture in the Museum Building of The New York Botanical Garden, Bronx Park, April 28, on "Insects of Shade Trees and Ornamentals." In the pursuit of his studies on the dissemination of insects by winds last summer, he collected approximately one thousand different species in a very unusual place, namely, the gutters of the State Education Building, Albany, some one hundred and twenty-five feet above the sidewalk. He also collected insects on the roofs of high buildings in New York City and vicinity. The trees in the metropolitan area suffer greatly each season from insect attack and in no section of the world are trees more needed or more valuable. Dead or dying branches, wilting or brown leaves, and other evidences of unhealthy conditions are due to definite causes, not a few of them to insect attack. The lecturer discussed in a practical way a number of the more important of the many insects attacking shade trees and ornamentals, including such common pests as tent caterpillars, the notorious Japanese beetle, the destructive Leopard moth, and such elusive plagues as plant lice and scale insects. About fifty slides, some colored, were used to illustrate the talk, there being an excellent series of the Japanese beetle, now well established in a number of localities in Greater New York, and of the very remarkable seventeen-year Cicada, due to appear shortly by the million in many eastern localities, especially in the Hudson valley. There is no question, in the speaker's estimation, as to the feasibility of keeping shade-tree insects within bounds, provided there is first of all a general appreciation of their destructive potentialities, a realization of the value of trees and the utilization of known control measures.

Dr. H. A. Gleason, Curator of The New York Botanical Garden, gave an illustrated lecture at the Garden on Saturday afternoon, September 3, on "The Big Trees of California." The Big Trees of California, said Dr. Gleason, occupy a unique place

among the living things of the world as the largest existing organisms. It is possible that they may be exceeded in height by the gum trees of Australia and they are certainly exceeded in diameter by the chestnut trees of Sicily, but for actual bulk they are far greater than either of these. Authenticated measurements show that they may reach a diameter of over thirty-six feet, heights of over three hundred and fifty feet, and ages well over three thousand years. The big trees, known to the botanist as *Sequoia gigantea,* have had a long history in the past. Far back in geologic times various species of Sequoia were scattered throughout the entire North Temperate Zone and their fossil remains have been discovered in New Jersey. They even extended south as far as Australia and Chile. For unknown reasons they have been unable to stand the vicissitudes of time, and now exist only in California, where one species, the redwood, is common along the coast from San Francisco northward, and the second is found in groves in the Sierra Nevada, mostly in parks set apart for their preservation. They are extremely resistant to fire and have no known fungus or insect enemies. They are frequently damaged but probably not killed by lightning, as a result of which the crowns of the older trees are usually very irregular. If it were not for the damage by lightning it is quite probable that they might exceed four hundred feet in height. Since they do not suffer from diseases and are not seriously injured either by fire or lightning, and since trees apparently do not die of old age, the usual cause of death among the big trees is by the undermining of the root-system through the gradual removal of the soil by water. Then the trees topple to the earth and their huge trunks may remain on the ground for more than one thousand years before they are eventually destroyed by fire.

Meteorology for April. The total precipitation for the month was 3.92 inches. The maximum temperatures recorded at the Garden for each week or part of a week were: 76° on the 6th; 68° on the 13th; *78° on the 19th;* and 62° on the 24th. The minimum temperatures were: 31° on the 3rd; *27° on the 16th;* 30° on the 17th; and 36° on the 27th.

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

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

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

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

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

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

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

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

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

A library of botanical literature, comprising more than 37,000 books and numerous pamphlets.

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

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

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

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

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

Contributions to the Garden may be deducted from taxable incomes.

The following is an approved form of bequest:

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

All requests for further information should be sent to

THE NEW YORK BOTANICAL GARDEN
BRONX PARK, NEW YORK CITY

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JOURNAL
OF
THE NEW YORK BOTANICAL GARDEN

BOTANICAL FIELDS, HISTORIC AND PREHISTORIC

JOHN K. SMALL

A WHITE OAK KILLED BY LIGHTNING

ARTHUR HOLLICK

NOTES, NEWS, AND COMMENT

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BOTANICAL FIELDS, HISTORIC AND PREHISTORIC

A RECORD OF EXPLORATION IN THE SOUTHEASTERN COASTAL PLAIN IN THE SPRING OF 1923

It was in our southeastern Coastal Plain that the foundations of North American botany—*economic, illustrative, systematic,* and *horticultural* were laid.

As it happened Charlestown, in the colony or province of South Carolina, became an early intellectual center. The colony served both as a headquarters for the botanical author Thomas Walter[1] and the artist Mark Catesby[2] and also as a gateway to a

[1] Thomas Walter, who was born in Hampshire, England, about 1740, 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. He died in St. John's Parish, South Carolina, 18 January, 1789; his grave, in what was once his garden, the second botanical garden established in America, is now in a forest wilderness. The British National Museum contains a collection of plants made by Walter, presumably several years before the publication of his Flora.—J. H. BARNHART.

[2] Mark Catesby was born at Sudbury, Suffolk, England, in 1679. He spent seven years in Virginia before he was forty years old and 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 in 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, which occurred in London, 23 December, 1749. His collections are represented in the Sherard herbarium at Oxford and the Sloane herbarium. —J. H. B.

virgin field for the early collectors, for example, Edmund Bohun,[3] John Bartram,[4] John Fraser,[5] and André Michaux.[6] On the other

[3] Edmund Bohun, son of the famous English writer of the same name, was born 25 March, 1672, at Westhall, Suffolk, England, and died there, 13 October, 1734. He 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). Several of his letters, written from Charleston to Petiver, are also preserved there.—J. H. B.

[4] John Bartram was born 23 March, 1699, at Marple, near Darby, Pennsylvania. He had been a farmer for several years before he became interested in botany, and was then for the most part, and of necessity, as he knew no one else interested in the science, self-taught. He traveled widely, from New York to Florida, and corresponded with various eminent naturalists abroad, especially with Collinson, of London, who was, like himself, a member of the Society of Friends. About 1729 Bartram established at Kingsessing, then a suburb but now a part of the city of Philadelphia, the first botanic garden in America. For nearly fifty years an almost continuous stream of American seeds and plants sent by Bartram, poured into the gardens of Europe. In 1765 he was appointed King's Botanist, and the modest salary accompanying this appointment enabled him, in spite of advancing age, to extend his scientific travels. In that year and the next, accompanied by his son, he explored the St. Johns River, Florida, and several of its tributaries. He died at Kingsessing, 22 September, 1777.—J. H. B.

[5] John Fraser was born in 1750, at Tomnacloich, Inverness, Scotland. He became 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, crossing 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, which occurred at Chelsea, London, 26 April, 1811.—J. H. B.

[6] André Michaux was born 7 March, 1746, at Satory, near Versailles, France. After his reputation as a botanical explorer had been established by his work in Persia from 1782–1785, he 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

hand, the early records about the uses of our native plants focus largely on Florida. These records date back almost to the time of the discovery of the mainland. They contain much fascinating information about the herbs, shrubs, and trees that were used by the aborigines as *foods, fibers, utensils, beverages,* and *ecclesiastical adjuncts,* and thus give us an insight into the aboriginal domestic life for generations back in prehistoric time. In the accounts of travel left us by Hernando de Soto,[7] Ponce de Leon,[8]

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 both living and dried 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 Louis Claude Marie Richard (1754–1821). Michaux, who had accompanied the French exploring expedition of 1800–05, died in Madagascar, 13 November, 1802. His herbarium is carefully preserved at the Jardin des Plantes in Paris.—J. H. B.

[7] Hernando de Soto was born about 1496, at Jerez de los Caballeros, Badajoz (Lower Estremadura), Spain. He was of a noble but impoverished family, and received a university education at the expense of de Avila, with whom he afterward served in Central America from 1519 to 1528, often opposing the execution of the atrocities planned by his chief. After a few years of Central American exploration on his own account, he joined Pizarro in 1532, took an important part in the conquest of Peru, and returned to Spain in 1536 as a man of great wealth. In 1537 he was appointed governor of Cuba and authorized to explore and conquer Florida at his own expense, and set out from Spain in April, 1538. With a force of nearly a thousand men, fully equipped in every way, he landed at Tampa Bay, 25 May, 1539, hoping to reap greater rewards in Florida than had Cortez in Mexico and Pizarro in Peru. For three years he traversed the interior, communicating several times with his base in Cuba, but refusing to return, insisting "I will not turn back until I have seen the poverty of the country with my own eyes." In the spring of 1541 he first came in sight of the Mississippi, never before seen by a white man except near its mouth. Crossing the river, he spent a year in exploration westward, returning to the Mississippi and following its course southward. In June, 1542, he died, and his body was lowered into the waters of the great river whose discovery contributed more to his fame than could the discovery of the gold he sought. Such of his followers as had survived, perhaps half the original number, remained in the vicinity for another winter, then built boats in which they floated down the Mississippi and followed the Gulf coast to Pamico (Tampico), Mexico, where they disbanded.—J. H. B.

FIGURE 1. On a sandhill in the lake region of Florida. These vast dune-like sandhills, often desert-like in their flora and floristics, maintain a large endemic flora. Both endemic genera and species of herbs, shrubs, and trees abound there. The shrub shown in such copious growth is the Florida-rosemary (*Ceratiola ericoides*), a relative of the northern crowberry (*Empetrum*) and the broom-crowberry (*Corema*), which three represent all the genera of the family Empetraceae.

Hernando de Escalante Fontaneda,[9] Alvar Nunez Cabeza de Vaca,[10] and Jonathan Dickenson[11] much information about the vegetation of Florida and its uses is recorded.

[8] Juan Ponce de Leon was born about 1460, in León, Spain. In his youth he became a soldier, engaged in wars against the Moors; in 1493 he accompanied Columbus on his second voyage, visiting Hispaniola; in 1502 he returned to Hispaniola with Ovando, and became governor of the eastern part of the island; in 1510 he was appointed governor of Porto Rico, which he had visited two years before; it was there that he heard from the natives of the fabulous island of Bimini, to the northward, with its wonderful fountain of youth. Sailing in search of this fountain, he left Porto Rico 3 March, 1512; 24 days later, 27 March, 1513 (25 March was then New Year's Day), he sighted the coast of Florida. Sailing along the coast, he landed 8 April, a short distance north of the present site of St. Augustine, and took possession in the name of the king and queen of Spain. He then sailed southward along the coast returning to Porto Rico, and thence to Spain. In 1514 he was appointed governor of Bimini and Florida, but made no further attempt at exploration in that direction until early in 1521; in that year he set sail from Porto Rico with a large number of colonists and attempted a settlement on the coast of the "island" (which he always supposed it to be) of Florida, but was driven off by the natives. In the conflict he was wounded by an arrow, and as a result of this wound he died soon afterward, in July, 1521, in Cuba.—J. H. B.

[9] Hernando de Escalante Fontaneda was born about 1538, at Cartagena, Colombia, where his father was one of the earliest settlers. In 1551, at the age of thirteen, he was put on board a vessel bound for Spain, there to receive his education; but the vessel was wrecked on the west coast of Florida, and most of the passengers and crew were murdered by the Indians. The boy, however, was held as a captive for fifteen years or more, learning several Indian languages, visiting various parts of the peninsula, and serving at times as interpreter between the Indians and Spanish castaways. It was probably in 1566 or 1567, when the governor, Pedro Menendez Aviles, visited the Tampa Bay region, that Escalante Fontaneda was released from his captivity. He subsequently returned to Spain, where, in 1575, he wrote an account of Florida and its inhabitants; this, however, contains few details of his own life while there. His subsequent history seems to be unrecorded. —J. H. B.

[10] Alvar Nunez Cabeza de Vaca was born at Jerez de la Frontera, near Cadiz, Spain, about 1490. He was treasurer of the expedition under Narvaez for the conquest of Florida. This expedition left Spain in June, 1527, and arrived on the west coast of Florida in April of the following year. On the first of May they set out on their journey in-

land, leaving instructions for their vessels to meet them at a supposed harbor that neither they nor the vessels ever found. The small fleet, after continuing its search for the land party for about a year proceeded to Mexico. After many privations those on land reached a shallow bay on the coast somewhere west of Apalachicola, built five barges with the aid of stirrups, spears, palmettos, horsehair, shirts, and other miscellaneous supplies, and toward the end of September launched out into the gulf of Mexico, without a man on any of the barges who understood navigation. They followed the coast to the mouth of the Mississippi, where the swift current dispersed them, the barge of Narvaez drifting out into the gulf, and the others being wrecked at various points along the coast to the westward. The few survivors were killed by the Indians or by each other, or died of disease or exposure, until only four were left. These joined their fortunes, escaped from the Indians who had enslaved them, and amid almost incredible hardships made their way across Texas and northern Mexico to the Spanish settlements which they reached in May, 1536, eight years after their landing in Florida, and seven and a half years after the wreck of the barges. The narrative of the journey, written by Cabeza de Vaca, who was one of the four, is among the most amazing in the annals of adventure. Cabeza de Vaca returned to Spain; a few years later he was in South America, where he explored and governed Paraguay from 1541 to 1544. In his later years he was a judge at Seville, where he died about 1564.—J. H. B.

[11] Jonathan Dickenson was born in England about 1654. He became a Quaker in early life, and in consequence suffered much persecution and many imprisonments, although he was a man of considerable wealth. Driven from England by these conditions, he settled in the island of Jamaica. In 1696, with his wife and infant child, he took passage for the new Quaker settlement at Philadelphia. They left Jamaica 23 August, but proceeded slowly, partly on account of the reported presence of a hostile French fleet, hugging the coasts, first of Jamaica, then of Cuba, then of Florida. On 23 September they were wrecked on the east coast of Florida, near St. Lucie Inlet. All hands landed safely, but fell almost immediately into the hands of the native savages. Gradually they worked their way northward, from settlement to settlement, suffering greatly from exposure and hunger, and in constant fear for their lives, until 15 November, when they reached the Spanish headquarters at St. Augustine, where they were kindly received and cared for. They left St. Augustine on the last day of November, going overland and by canoe to Charleston, where they arrived 26 December. They finally landed safely at Philadelphia about the first of February, 1696/7. Dickenson was among the most important of the early settlers of Philadelphia, owning much land; acting as chief justice several times; Mayor of Philadelphia, 1712; a judge of the supreme court, 1715–18; and a judge of the court of com-

Circumstances ordained that Mrs. Small and the writer should spend several weeks in April and May, 1923, in further exploration in the southeastern Coastal Plain.

Three days were spent at Charleston in connection with the meetings of the American Association of Museums. Between meetings excursions were made to the justly celebrated Magnolia Gardens, to Middleton Gardens, and to Summerville. The close plantings at Magnolia and the more open plantings at Middleton are both works of art. These two gardens comprise formal plantings, while at Summerville the showy plants have been set out at random, as it were. The native pine trees have determined the position of most of the showy exotics. Aside from rhododendrons and azaleas the wonderful bloomers are two Chinese plants —a wisteria—*Krauhnia sinensis* and a rose—*Rosa laevigata.* The great majority of the pine trees are arbors for one or the other of these plants. They have in most cases climbed to the very tops of the tall pines, and all the way up the trunks and in the high branches prodigious masses of bloom are produced—clouds, as it were. Our visit was timed, fortunately, to catch this unique exhibition of myriad clusters of wisteria flowers and roses at its best. Azaleas and rhododendrons also entered largely into the showy color scheme of the many gardens.

The last two days of the meeting were devoted to the old rice plantations along the South Santee River and its vicinity.

After crossing the harbor we paralleled the coast for forty miles. The season was late and the weather still cool. The pinelands harbored considerable hardwood growth. Shrubs and trees were widely scattered or in colonies. In some places the two classes of vegetation were so mixed that it was difficult to refer to them as pineland or hammock growth.

In the pinelands the flowers of woody plants held the eye, the so-called wild honeysuckle (*Azalea canescens*) with bright pink flowers, was at the apex of its glory. This shrub was described from that region in 1803 by André Michaux and then almost lost

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mon pleas from 1718 until his death in 1722. He wrote an account of his shipwreck which was published by the Philadelphia monthly meeting of the Society of Friends in 1699, and has been many times reprinted. He revisited Jamaica in 1699 and 1702, but seems to have had uneventful voyages.—J. H. B.

FIGURE 2. Needle-palm (*Rhapidophyllum Hystrix*) in swamp of Little River, Gadsden County, Florida. This specimen has a short trunk, which indicates great age as the plant grows very slowly. The porcupine-palm, as it is sometimes called on account of the peculiar armament, grows well within the limits of its minimum temperature requirements in cultivation.

sight of for nearly a century, notwithstanding the fact that it is common in the southern Coastal Plain. The immaculate bracts of the flowering dogwood (*Cynoxylum floridum*) were emphasized against the various backgrounds of the greens of the pines and the hardwoods. In addition to these there were numerous thickets gaily adorned with the golden flowers of the yellow-jessamine (*Gelsemium sempervirens*) and the white flowers of the blackberries (*Rubi*). Herbs were not to be outdone by the woody plants and colonies of yellow-trumpets (*Sarracenia flava*) were frequently conspicuous by their yellow trumpet-like leaves and yellow flowers.

We paused at several old plantation headquarters where the negro women were busily engaged in weaving fancy baskets from switch-grass (*Spartina*) and palm leaves (*Sabal*). At these places, as well as at others, we found the finest specimens of oak-trees to be those whose roots had been tramped on by both man and stock for many years—a condition the reverse of what we are accustomed to consider good for the health of a tree! Our headquarters for a day was the reservation of the South Santee Gun Club on the South Santee River four or five miles from its mouth. This reservation contains all manner of natural habitats —aquatic to terrestrial, and in addition the modified old rice fields, ditches, and embankments.

Rather exceptional is a great cypress swamp and a heron rookery. On its edges vegetation is rampant, and frequently the trailing-blackberry (*Rubus trivialis*) and the poison-ivy (*Toxicodendron radicans*) strive for supremacy. Shrubs and trees of very different types also question the right of each other to occupy the land. Thus we found the flowering-dogwood (*Cynoxylum floridum*) and the holly (*Ilex opaca*) with thoroughly tangled branches, and even dogwood and the cypress (*Taxodium distichum*) thus associated. Five kinds of holly were abundant—white-holly (*Ilex opaca*), dahoon-holly (*Ilex Cassine*), cassena (*Ilex vomitoria*), inkberry (*Ilex glabra*), and swamp-holly (*Ilex decidua*). The oaks showed great variety in leaf-form, for there were representatives comprising species with leaf-blades ranging in pattern from entire to lyrate and pinnatifid. The more evident associates of these trees were shrubs whose genera were repre-

sented by only one species each—red-buckeye (*Aesculus Pavia*), sugarberry (*Celtis Smallii*), burning-bush (*Euonymus americanus*), witch-hazel (*Hamamelis virginiana*), and its rarer and diminutive relative dwarf-alder (*Fothergilla Gardeni*), the latter shrub named to commemorate the botanical activities of Alexander Garden, a resident of Charleston in pre-revolutionary times.

The wet ground was occupied mainly by two kinds of ferns—bracken (*Pteris aquilina*) and netted-chainfern (*Lorinseria areolata*). A bladderwort (*Utricularia macrorhiza*) occupied the water about the edges of the cypress swamp and seemed to be the only herbaceous plant that ventured to send out flowers in the exceptionally cool spring season. Even the cypress trees still maintained their winter undress and the gray trunks and branches were very prominent when silhouetted against the surrounding lively green bank of the hardwoods and the somber green of the more remote pines.

The banks and ditches of the abandoned rice-fields were prolific collecting grounds. The aquatics were familiar plants, golden-club (*Orontium*) and arrow-arum (*Peltandra*), both of which range nearly or quite the length of our eastern seaboard. Herbaceous plants—some of them widespread weeds—crowded on the embankments.

Two dozen, then in flower, were promptly noted. They ranged from the grasses to the sunflowers, representing sixteen natural families. The growth was often luxuriant. One violet plant bore forty-odd flowers. A half dozen erect shrubs colonized the banks. Prominent among them were blackberries (*Rubi*), French-mulberry (*Callicarpa*), elder (*Sambucus*), and withe-rod (*Viburnum*). Woody climbers were much in evidence by a dozen twiners or climbers, all of these native plants except the ubiquitous Japanese-honeysuckle (*Nintooa*). Grapes—four genera (*Vitis, Ameplopsis, Muscadinia,* and *Parthenocissus*) and greenbriers—four species (*Smilax Beyrichii, S. lanceolata, S. laurifolia,* and *S. Bona-nox*) constituted the great majority of the kinds. The homely poison-ivy (*Toxicodendron radicans*) and the elegant native wisteria (*Kraulnia frutescens*) should be mentioned. Trees, to the number of a dozen kinds decked the old embankments—nine natives, among them red cedar (*Sabina*), willow

FIGURE 3. Old plant of the needle-palm with the leaves cut off, showing (I) the armament-needles; (II) a young leaf from the bud at top; and (III) particularly the underground shoots from the base of the plant. Each shoot makes a new plant when detached from the parent and is the vegetative method of reproduction, which seems quite necessary in the case of this plant, as the following figures illustrate.

(*Salix*), birch (*Betula*), sugarberry (*Celtis*), wild-cherry (*Padus*), red-maple (*Acer*), and three Old World exotics, all economic plants, the China-tree (*Melia Azedarach*), whose wood was formerly much used in cabinet work, the white mulberry (*Morus alba*) and the peach (*Amygdalus Persica*), both food plants. The peach was more abundantly naturalized there than we have seen it elsewhere. Herbaceous twiners were not wanting—a bindweed (*Convolvulus*) and a parasite, love-vine (*Cuscuta*), which grew on the willows just as it does on the willows along the Gulf Coast of Florida.

An addition to our immigrant flora was found at South Santee. The large periwinkle (*Vinca major*) was naturalized at several localities in the pinewoods. The plant is a native of Europe and should not be confounded with the tropical periwinkle (*Catharanthus rosea*) which is so abundantly naturalized in Florida.

After a night on the South Santee we moved over to Hampton —a plantation that figured much in Revolutionary history. There the vegetation differed materially from that along the South Santee. The ground is higher. Shallow ditches were often lined with a fern, the ebony-spleenwort (*Asplenium platyneuron*). Old fields were spangled with the starry flowers of the false garlic (*Nothoscordium*) and grassy slopes with the golden-sorrel (*Xanthoxalis recurva*), which was discovered in the Charleston region early in the last century and apparently not collected there for over a century.

The vines there bore showy flowers—the cross-vine (*Anisostichus crucigera*), (so-called because the transverse section of the stem shows a cross), whose tubular corollas are red without and orange within, and the leather-flower (*Viorna crispa*), whose magenta urns with their spread-out crisped tips often measured three inches across. Both these vines are spread by the wind, the former by its light-winged seeds, the latter by its plume-tailed fruits.

Another method of plant dispersal was much in evidence there —the scattering of seeds by birds. Three examples were prominent. The fence rows harbored colonies of prickly-pears (*Opuntia Pollardi*) derived from seeds dropped by birds resting on the fence-rails. Two other cases were even more evident. There were clumps of cedar-trees and groups of live-oaks with widely

spreading branches. Under the periphery of the spread of these oaks one finds a circle of small red-cedars which are the progeny of the clumps of cedar-trees referred to above whose seeds were dropped by birds resting on or near the ends of the oak limbs after eating of the fruits of the cedars.

Large trees on the plantation had been cut down or blown over by storms. These once stood in the open like their associates. In pastures the ground under the standing trees was kept clear of brush by the grazing cattle. Where trees had lain prostrate for one, two, or three years and where cattle could not get in among the branches, dense thickets had sprung up. An examination of several thickets soon showed the reason for their existence. The composition of one thicket comprised twenty-two kinds of herbs, shrubs, and trees, and everyone a plant with baccate fruits such as are eaten by birds.

We happened on what we thought might be a botanical "melting pot." Two related species of clover with the same habit of growth, the one an aboriginal native (*Trifolium carolinianum*) with depressed heads of nodding flowers and pinkish or reddish corollas, the other a Eurasian immigrant (*T. repens*) with high heads of spreading or erect flowers and white corollas. The two kinds grew in extensive patches as a result of their creeping stems. The patches were often dovetailed into each other, but curiously enough, there were no signs of hybridization.

After luncheon in the mansion where George Washington, General Marion, and Generals Charles and Thomas Pinckney were accustomed to stay, we returned to Charleston and in the night ran down to Florida for a month's further explorations in the flora and floristics of the peninsula.

A day in Jacksonville was devoted to botanical reminiscences with Arthur D. Huger, naturalist and poet of the southern mountains, and to collecting and observing plants within the city limits. There were two plants very common and equally interesting thereabouts. The one is a carpet plant, a species of *Houstonia,* related to *H. rotundifolia,* but with bright-green leaves and immaculate flowers, only about one fourth the size of that well-known species. The other is an erect bushy plant, an *Aeschynomene,* a form of *A. virginica* or a plant introduced from the tropics, but as yet not specifically determined.

In the evening we moved on to Daytona where the "weed-wagon" was waiting for us to initiate our field-work in the Florida peninsula. The following morning we set out for the Crystal River region on the Gulf Coast. The flower of the day in the maritime region was "blue-sailors," as the spiderwort (*Tradescantia reflexa*) is locally known. The great-bay (*Magnolia foetida*) of the hammocks and the oleander (*Nerium Oleander*) were in full flower, whereas they were in bud when we left the Charleston region two days earlier. The weather had been rather dry for a long period, consequently the vast savannahs west of Daytona were not conspicuously decked with flowers. Still, blue-flowered plants were scattered over the higher parts of the savannahs and were often associated with the yellow ragwort (*Senecio*) and hawkweed (*Hieracium*). Field-like patches of lemon-drops (*Sitilias caroliniana*) were sometimes in evidence. The colorless *Lobelia paludosa,* true to its specific name, grew in the marshy places, while the ditches of the swamps were crowded with colonies of lancehead (*Sagittaria lancifolia*), lizard's-tail (*Saururus cernuus*), bladderwort (*Utricularia inflata*), and wampee (*Pontederia cordata*), with myriads of flowers both white and colored—yellow and purple. As we rose on the water-shed which separates the Saint John's River (interior lagoon) from the Halifax River (coastal lagoon), smoke-like patches among the dense growth of saw-palmetto (*Serenoa repens*) proved, upon investigation to be large colonies of sensitive-brier (*Morongia angustata*) with myriad heads of still more myriad rose-purple flowers. Before we reached the higher ground we passed meadows decked with colonies of the spotted trumpet leaf (*Sarracenia minor*) which were conspicuous, not only because of the peculiar shade of green of the tubular leaves, but particularly on account of the white and green pattern on the circinate hood-like top of the leaf.

When the black-jack ridges of the water-shed were achieved all signs of the lowland plants disappeared, and in the dry woods *Berlandiera humilis* was the sole conspicuous native flowering plant, a condition made possible in the parched soil by its large underground food-reservoir. On the other hand roadsides and fields in and out of settlements were often a blaze of color on account of a naturalized annual, *Phlox Drummondii,* whose an-

cestors originally came from a more or less arid region of Texas.

We descended the western side of the divide at Fort Volusia, where we secured our first supply of several hundred oranges from a tree which was bearing since before the Civil War. Oranges are an excellent ration in the field. A dozen fruits answer as well as a meal in the middle of the day when one is remote from settlements. The orange groves there are planted on and about kitchen-middens built up of shells from the Saint John's River by the aborigines. At Fort Volusia there are the remains of ten kitchen-middens, five on the eastern bank and five on the western. These have suffered the usual fate of such monuments. Losing in altitude, the false fly-poison (*Tracyanthus*) and the false aster (*Doellingeria reticulata*) appeared in the pinewoods. In the river-swamp, greenbrier (*Smilax*) simulated the moonvine, which further south overruns and smothers shrubbery. In some places the new shoots charged with water and nourishment from the remarkable underground reservoirs sent up hundreds of whip-like succulent stems which ultimately become greatly elongated, exceedingly hard, and tough. From the food reservoirs the aborigines and the Seminoles manufactured the red-flour or *Conti Chatee*.

After crossing the Saint John's River on the ferry at Astor we forsook the highway and struck into the desert on a sand trail. These desert-like sandhills, largely comprising the Ocala National Forest, have already been described with their summer regalia.[12] Their appearance was quite different in the spring. Our entrance into this ancient dune region was through classic botanical ground[13]—midway between Lake George and Dexter Lake where early observations on our palms and other plants were made by the Bartrams.[14] Many thousand acres of this region had been swept by fire a year previous as described in a preceding paper.[15] Shortly after the conflagration, vines of the butterfly-pea (*Bradburya virginiana*) and the milk-pea (*Galactia regularis*) had sprung up in astonishing abundance and luxuri-

[12] Journal of The New York Botanical Garden **26**: 253–257. 1925.

[13] Journal of The New York Botanical Garden **21**: 28–32. 1920.

[14] Travels in North and South Carolina, Georgia, East and West Florida, 113–114. 1792.

[15] Journal of The New York Botanical Garden **26**: 256. 1925.

vines had been replaced by the sensitive-brier (*Morongia angustata*), which also grew with unusual luxuriance and bore countless myriads of rose-purple and gold-spangled heads of flowers. These ornate decorations were particularly conspicuous, as they were usually borne amongst or against the rich green new foliage of the shrubbery that had survived the fire. Naturally the spruce-pine (*Pinus clausa*) suffered more destruction than the broad-leaved woody vegetation.

Before reaching the main ranges of sand ridges, we crossed several spurs which were separated from each other by streams, tributaries of the Saint John's, which were flanked by hammock growth and sometimes by meadow-like stretches. Here clumps of tall cabbage-trees broke the monotonous level on which low vegetation prevailed. The yellow bachelor's-button (*Polygala lutea*) and the Saint Peter's-wort (*Ascyrum tetrapetalum*) were overtopped by the large plumes of the false fly-poison (*Tracyanthus*) and the spiral spikes of the ladies tresses (*Ibidium cernuum*). The gopherberry (*Gaylussocia dumosa*), about six inches tall and thus true to its common name, bore myriads of immaculate honey-scented flowers.

In the hammocks bordering streams besides the shrubs and trees there were at least eight kinds of woody vines, which, when intertwined, made an impassable barrier. Thus grapes and grape relatives, yams, green-briers, supple-jack, and poison-ivy were often intimately intertwined. In addition the well-known Indian-food, the ground nut (*Glycine Apios*) was often in evidence by its peculiar fragrant and chocolate-colored flowers. Palms, the usual associates, cabbage trees[16] (*Sabal*) and saw-palmetto[17] (*Serenoa*) were frequent, often plentiful along some of the streams. Occasionally they were augmented by a third kind, the needle-palm or blue-palmetto (*Rhapidophyllum*)[18] which is not only unusual in technical character but also in the habit and the color of the foliage.

The floristics of the two species of pine there are striking. The pine of the low parts and the meadow-like areas, already referred to, is the pond-pine (*Pinus serotina*). That of the ridges is the

[16] Journal of The New York Botanical Garden **24**: 145–158. 1923.
[17] Journal of The New York Botanical Garden **27**: 193–202. 1926.
[18] Journal of The New York Botanical Garden **24**: 105–114. 1923

spruce-pine (*P. clausa*). The pond-pine ascends the base of the ridges to a certain point, while the spruce-pine descends the slopes to meet it. This line of separation between the two provinces is evidently some hidden—subterranean—condition in the structure of the soil. When the main sand ridges were achieved, our course lay north, paralleling the ridges as far as Juniper Spring. The deep basin of the spring with boiling limpid water is surrounded by a fernery and a hammock. At Juniper Spring we turned westward and drove over many succeeding gigantic billows of sand. The protracted drought had retarded the floral advent of spring. Few plants were in bloom. On the backbone ridge the silvery-leaved lupine (*Lupinus diffusus*), with sky-blue flowers, spread out on the dry sand, and, strange to say, the coontie[19] (*Zamia integrifolia*), so stunted that the larger leaves were less than a foot long, grew on the very summits. One other plant saved the day for the flowering plants—a labiate (*Clinopodium Ashei*) of uncertain relationship. It is a desert annual, or more often, a diffuse perennial, with woody stems and branches and tightly inrolled leaves, thus preventing too rapid transpiration of water from its tissues. Fortunately, we met with it in season, and acre after acre of the desert-like sands were blue with myriads of flowers. In spite of its color and abundance, the corollas individually, by a peculiar drooping of the lower lip, as in the case of *Lobelia paludosa,* suggest sadness.

After descending the western series of sandy billows, we emerged into the drainage basin of the Oklawaha River in the lime-sink region. The swamp of the Oklawaha River is a natural palmetum. The three kinds of palms mentioned on a preceding page occur there with the addition of a fourth one. The two more abundant kinds were the needle-palm or blue-palmetto (*Rhapidophyllum Hystrix*), which dominated the eastward swamp, and the blue-stem or dwarf-palmetto[20] (*Sabal minor*) which dominated the westward swamp. The dwarf-palmetto was in both flower and fruit. About the rootstocks of the palm were two diminutive herbs in flower. The one, the partridge berry (*Mitchella repens*) of wide geographic range—from the Nova Scotian peninsula to the Florida peninsula—and then a pink-root

[19] Journal of The New York Botanical Garden **22**: 121–137. 1921.
[20] Journal of The New York Botanical Garden **23**: 161–168. 1922.

FIGURE 4. The inflorescence of the dioecious needle-palm—staminate above, pistillate below. Both panicles are very short-stalked on top of the crown of the plant and are well protected from larger animals by the armament, although easily accessible to flying insects, which are necessary for the accomplishment of pollination.

(*Coelostylis loganioides*), whose distribution is confined to northern peninsular Florida. The roadsides on the black-jack ridges west of the Oklawaha basin were lined on either side with salt-bush (*Baccharis halimifolia*), thriving there high and dry and far away from its natural saline habitat. Although its fruits are wind-transported, it is too far removed from the coastal parts to account thus for its presence there. Lining the road-sides, as it does, leads one to suspect that the fruits were brought there by stock or by motor-cars.

One very conspicuous shrub stood out in the dusk on the dry ridges on account of its peculiar flowers—the wild-pawpaw (*Asimina obovata*). The corollas resemble the dipper of an orange-peel dipper dredge, which has played such an important part in dredging in Florida, in making land where there was water and making water where there was land. The dredge has been such an important factor in developing Florida that, as the age of symbolism still holds, this pawpaw might well be adopted as the state flower!

In the morning we drove down to Homosassa. The beauty and the solitude of the primeval hammock thereabouts was very impressive. The lower tier of woody growth, in addition to shrubbery, is conspicuously palmaceous. Four kinds of palms make a sea of four shades of green—the yellowish-green of the saw-palmetto (*Serenoa repens*), the bright-green of the blue-stem (*Sabal minor*), the deep-green of the cabbage-palm (*Sabal Palmetto*), and the dark-green of the needle-palm (*Rhapidophyllum Hystrix*). Out of this palmaceous sea rose the column-like trunks of the magnolia (*Magnolia foetida*), elm (*Ulmus floridana*), the basewood (*Tilia*), and the oaks (*Quercus*), all clothed with lichens, hepatics, and mosses, and sometimes fringed at the base with the whisp-moss (*Psilotum nudum*).

The needle-palm is in a class by itself from several standpoints. Its armament and its inflorescence are prominent features of distinctiveness. Its fan-leaved associates have clean crowns and long-stemmed inflorescences. The needle-palm, as a result of its armament comprising numerous needle-like structures standing up in the crown, holds the leaves and twigs that fall from the associated broad-leaved shrubs and herbs. This débris gradually turns to humus and persists in the crown for years. The needle-

palm is dioecious; that is, the flowers with stamens only or with pistils only are borne on individual plants, and the flower-clusters are so short that they protrude little, if at all, above the collection of humus in the crown. The palms in this region had not yet come into flower, but we found the fruit-clusters of former years nesting in the humus in the crowns. The fruit of the year was unchanged except for drying out of the fleshy coat. Those of preceding years had either rotted and augmented the humus or sprouted—viviparous, as it were—and clusters of a dozen or two seedlings were seated in the crown of leaves, the cluster firmly held in place by the bristling cluster of needles.

As a result of two canopies of shade, the high crowns of the forest trees and the low crown of the palms, flowering herbs were mostly wanting on the hammock floor. A long wedge of open land is flanked on both sides by the hammock, where flowering herbs were numerous, and showy as well. A dozen or two kinds were in view along the road. Shades of blue and pink and yellow were dominant. The brightest of all was the pineland phlox —*Phlox Hentzii*—a species described over a century ago and then lost sight of for nearly a century. Two interesting plants were those with colorless flowers. The one a candy-weed—*Polygala Boykinii*—from whose wintergreen-scented hard root numerous stems arise; the other a colic-root (*Aletris obovata*) from whose hard caudex a single stem arises and bears granulose flowers at the top. The flowers do not open, the converging lobes of the perianth remaining sealed together.

In the afternoon, the tide being high, we went down Crystal River and followed up Salt River[21] to its headwaters. In going down the river, we were struck by the difference in the growth of the cabbage-trees (*Sabal Palmetto*) in the hammocks and those in the pinelands. In the hammocks they are tall and luxuriant; in the pinelands they are low and stunted. Why? The reason is at once evident. In the hammock the palm has more moisture and nutriment from the humus stored up in the soil for ages. In the pineland there is less moisture, to be sure, but the main desideratum is the humus which has been burned out of the soil. In going up Salt River the foundations of wet hammocks and of

[21] Journal of The New York Botanical Garden **26**: 265–266. 1925.

kitchen-middens were observed. Small rock-reefs supported clumps of cabbage trees and other shrubbery. Perhaps all these hammocks are on a rock foundation. Small kitchen-middens that had been partly washed away during storms also exposed a rock foundation. The aborigines made kitchen-middens on river-

FIGURE 5. A fruiting plant of the needle-palm, in the Turnbull hammock, growing on a mound of humus formed from its own tissues through years of growth. The leaves and some of the needles removed to show the fruiting panicle, whose stalk is never long enough to carry the fruits beyond the top of the crown. The fruits are further prevented from being scattered by the armament of the clusters of vicious needles. Unlike all our other palms the fruits are hairy.

banks and on islands, often near their village sites. They also made them on rock reefs, convenient to oyster beds and perhaps on shallow oyster bars. When the piles of discarded shells were well above high tide they were more convenient camping and eating places and the Indians continued to build them up, at the same time enlarging their girth. Thus, a dozen of the beautiful

FIGURE 6. A kitchenmidden in Salt River, a saltwater lagoon between Crystal River and Homosassa, Florida. This, like a dozen middens thereabouts, was built up on a rock reef by the more recent Florida aborigines through their methods of living. It is composed of a pure mass of bivalves and univalves. When in use up to about two centuries ago it was probably unpopulated by plants. The present plant covering is the result primarily of seeds carried there by tides and winds, and particularly by birds.

shell islands in Salt River had their origin. These islands vary in size from a few square yards to an acre. On these middens we find a flora almost wholly exotic to the immediate region and almost wholly made up of berry-bearing shrubs and trees largely characteristic of more northern and more southern latitudes. As shown in a former article, these kitchen-middens are continuously warmer than the natural geologic formations about them. Hence, of the various berry-bearing plants introduced by migratory birds, the southern, even tropical kinds, predominate.

These Salt River middens form a group of islands quite unique. They rise abruptly out of the water often with steep, sometimes almost perpendicular sides. It is the gray or white surface of shells contrasted with the greens of the vegetation that makes Salt River so fascinating.

Whether or not these shell mounds were populated by vegetation during the occupancy of the red man we do not know. Perhaps the older or larger ones were. At any rate, some of the economic plants of the aborigines are now on many of the mounds. Very likely they used for food all kinds of berries that were not actually poisonous, at least in times of shortage of the customary foods. The prickly-pear (*Opuntia*) and the coontie (*Zamia*) are common. The latter, one of the starch plants, like the zamias in general, is more or less conventionally reputed to have a simple stem. On one of the mounds we found one that had fourteen branches! In fact, all the older zamias on the shell mounds are much-branched. Besides these well-known food plants there occurs their ceremonial drink-plant, the cassena (*Ilex vomitoria*), which today remains a kind of ceremonial plant along with the other so-called Christmas-berry (*Lycium carolinianum*), with which it grows on the middens, where they are gathered for making decorations at Christmas time.

As we ascended Crystal River, a north breeze wafted the fragrance of the sweet-bay (*Magnolia virginiana*), bull-bay (*M. foetida*), and saffron-plum (*Bumelia angustifolia*) combined across the river and the marshes.

The following morning found us en route to the fern-grottoes of Citrus County, by way of Inverness and Pineola. The intervening country had little to offer in the way of numerous flowers. In the pinelands and blackjack ridges two plants were

ubiquitous, and their presence was due to their storage roots—the tread-softly (*Cnidoscolus stimulosus*) and the green-eyes (*Berlandiera humilis*). In cleared lands these were augmented by a third drought-resisting plant—dewflower (*Commelina angustifolia*). The bare ridges about Inverness were enlivened by frequent colonies of the southern beard-tongue (*Pentstemon australis*), showing numerous magenta corollas streaked with lavender and with a yellow beard. South of Inverness, along Lake Tsala Apopka, the floor of the oak woods, for the most part colorless, was sometimes enlivened by patches of a dog-bane (*Amsonia ciliata*), also with roots stored with food against drought, whose clusters of pale blue starry flowers suggested the clusters of stars from the head of a bursting rocket, diminutive, of course.

The fern grottoes were visited for the purpose of getting specimens of the different kinds of ferns for growing in the Charles Deering reservation south of Miami, Florida.[22] The grottoes had not yet awakened to the call of Spring. Few kinds of flowering plants were in anthesis. The nettle family was well represented, however, by the stinging-nettle (*Urtica chamaedryoides*) and the stingless nettle (*Parietaria floridana*). The dwarf-spiderwort (*Tradescantella floridana*), with its densely matted stems and leaves, was bespangled with the minute white flowers made somewhat conspicuous by the contrasting dark anthers. Two vines, the temperate (*Decumaria barbara*) and the tropical snowberry (*Chiococca alba*) frequently intertwined over the humus-covered rocks. The walls of cliffs and of sink-holes were sometimes draped with the long (four feet) pendant stems of the partridge-berry, whose fragrant flowers could be detected frequently. Here we met with two of the palms already mentioned—the needle-palm and the blue-stem. On this occasion they grew up on the dry rocks instead of in the alluvium of the river-swamps. The plants were considerably stunted, the vegetative parts much smaller than those of the specimens from the alluvium. Specimens were gathered for growing alongside the larger kinds referred to in the Deering reservation. It will be

[22] For notes on the ferns of these grottoes see Journal of The New York Botanical Garden **21**: 34–38. 1920.

interesting to compare the flowers and the fruits of the two forms when they flower and fruit in cultivation.

Thence on to Brooksville. The country travelled lay far to the east of a botanically unknown part of the western coast of Florida. North of Brooksville we came into contact with the Annuttalagga hammock which comprises about forty-one thousand acres. Some notes on the Choochochatte hammock south of Brooksville, comprising about seven thousand acres, and its rare plants appeared in a former number of this Journal.[23] The rare and interesting plants of the Annuttalagga hammock remain to be brought to light. A large part of this hammock is still in its primeval state; but much material has been removed from parts of it. For example, the pine, more or less scattered through parts of it has furnished barrels for shipping rosin; the white oak (*Quercus Michauxii*) has furnished barrels for light oils, turpentine, and spirits; the sour-gum (*Nyssa sylvatica*) is used for barrels for shipping heavy oils; the red-cedar (*Sabina silicicola*) has furnished our lead-pencil wood; bull-bay (*Magnolia foetida*), sour-gum, and pine all enter into the manufacture of fruit crates; ash (*Fraxinus caroliniana*) is turned into base-ball bats; hickory. (*Hicoria* sp.) goes for spokes and rims of wagon wheels; sweet-bay (*Magnolia virginiana*) for furniture; and red-gum (*Liquidambar styraciflua*) is converted into "Circassian walnut" for cabinet work.

Our stay in the Brooksville region was centered about Chincegut Hill, the reservation of Col. and Mrs. Raymond Robins, where Mrs. Robins is developing an extensive botanical garden by introducing plants of more northern and more southern regions into the various parts of the reservation suited to their growth. The great variety in erosion and of exposure furnishes habitats for the growing of plants whose natural distribution ends far from that latitude. The center of Chincegut, so to speak, is the highest hill in Florida—said to be three hundred and sixty-nine feet above the sea. From the top, where the Robins' house and observatory are located, there is a view in a complete circle, with a radius of twenty-five or thirty miles.

Several aged live-oak trees are the most conspicuous vegetable occupants of the top of the hill. The long slopes are occu-

[23] Journal of The New York Botanical Garden **26**: 267–269. 1925.

pied by both hammock and pinewoods. The latter were almost barren of flowers and greenery as a result of the long drought. The hammocks on the western side, however, where springs break out of the exposed rock formation were green, and many plants were in bloom. A southern New Jersey tea (*Ceanothus intermedius*), a low straggling shrub, bore numerous clusters of small white flowers; the Florida phlox (*Phlox floridana*) was a stiff plant with corymbs of rich purple flowers. Two acanthus relatives—*Ruellia* and *Dischoriste*—were in the height of their flowering season. A sedge—(*Carex dasycarpa*)—was in both flower and fruit.

The most decorative plant of the hammocks was the wild easter lily (*Atamosco*), which occurred singly or in large colonies in the brush or in the grass. The plant that really surprised us was the Virginia knotweed (*Tovara virginica*), which had not heretofore been found south of northern Florida.

We visited a limestone cave north of Brooksville. The entrance is a steep incline ninety-six feet long. At the bottom is deep flowing water, which probably finds its way out into the Homosassa River or the Chassahowitzka River. The hillside about the cave was parched, but just around the mouth of the cave the cool damp air furnished sufficient moisture to make an oasis. The rocks and the exposed roots of trees were coated with moss (*Fissidens taxifolius*), while the sand thereabouts was covered with the light green richweed (*Pilea microphylla*) and the dark green partridge-berry (*Mitchella repens*). As we left Chincegut Hill to continue our journey southward, we visited "Blue-Sink"—a small lake in a crater-like depression formed perhaps by the falling in of the roof of a limestone cavern. The sands of surrounding pinewoods were dry and desert-like. The one plant that furnished color and life was the prickly-pear (*Opuntia lata*), which was disposed in numerous colonies with deep green joints, which in turn supported numerous bright yellow flowers. The water in the sink was framed in a hammock-like growth of colonies of saw-palmetto (*Serenoa*), arrow-wood (*Viburnum obovatum*), and lead-plant (*Amorpha* sp. nov.) with its numerous finger-like bluish-purple spikes bespangled with myriad golden dust (anthers).

Late in the afternoon we drove down to Brooksville and thence over the hills of the southern extension of the middle Florida hammock belt to Dade City. The partly dried-up lakes were often brilliant seas of water-hyacinth (*Piaropus*). Conspicuous patches of white in the pinelands were caused by the white-hairy leaves of the gopher-apple (*Geobalanus incanus*). About hammocks there was an often pale-lavender haze occasioned by the color within the white corollas of the myriad flowers of the beard-tongue (*Pentstemon multiflorus*), while in the hammocks, wild roses in bloom, combined with the sweet-bay and the great-magnolia, fill the air with fragrance. The oak-ridges had two immaculate starry flowers—in the higher parts the tread-softly (*Cnidoscolus stimulosus*), in the lower the white marsh-pink (*Sabbatia Elliottii*).

On the steep bank of a stream, a rarity in that region, we were surprised to find a copious growth of the tropical polypody (*Polypodium pectinatum*), with broad leaves up to a meter in length hanging down over the bank like a cataract. The cypress swamps were not only gay with wild-roses and asters among the trees and bushes, but the floor was frequently carpeted with a wonderful growth of either the light green mud-carpet (*Hemianthus*) or the deep green spike-rush (*Eleocharis*). Both these plants were in copious flower, but the flowers are almost microscopic. Night fell as we crossed the south Florida flat-woods and entered the lake region near Lakeland. We continued as far as Sebring among the white sand hills and the sky-blue lakes.

The following forenoon was devoted to the ancient sand-dunes about Lake Nancessowee, south of Sebring. The lake shore being low and damp supported herbs in flower as well as shrubs. Here and there were patches of sunflower (*Helianthus floridanus*), beggar's ticks (*Coreopsis aurea*), cat-tail (*Typha angustifolia*), milkwort (*Polygala Rugelii*), and yellow-butterflies (*Chapmannia floridana*).

However, the two more interesting localities about the lake were the lowest and wettest depression and the highest and dryest elevation. In recent geologic times the lake stood, evidently, at a higher level. Upon falling and consequently receding from the former margins, it left deposits of humus or peat in former depressions of the bottom. The one in question is now

a sphagnum bog with a spongy floor of sphagnum and humus. Its floristics have the appearance of a peat bog. Herbaceous vegetation was not plentiful when we were there. Two monocots —false fly-poison (*Tracyanthus*) with both red and and white racemes and the plumose yellow-eyed-grass (*Xyris fimbriata*), together with numerous tufts of the chain-fern (*Anchistea*), were the more noteworthy elements. Woody vegetation although stunted, was dominant. Acid-soil shrubs predominated and their branches were often irregularly elongated and stringy. Not less than five genera of the heath plants were present, and all were in both flower and fruit. There were capsule-bearing heaths—fetter-bush (*Desmothamnus lucidus*), male berry (*Arsenococcus frondosus*), buckberry (*Xolisma fruticosa*), and two fleshy fruited ones—gopher-berry (*Gaylussacia dumosa*) and a tall blueberry (*Vaccinium*), which in spite of its popular name had red berries. Additional woody vegetation comprised a choke-berry (*Aronia*), with very large leaves and ample clusters of fruits, a persimmon (*Diospyros*) and holly (*Ilex Cassine*), both with a great assortment of leaves, myrtle (*Cerothamnus*), red-bay (*Tamala*), and loblolly bay (*Gordonia*).

On the lower parts of the dunes the scrub prickly-pear was plentiful and often covered with masses of bright yellow flowers, for one of its characteristics is that of producing many flowers and consequently usually many fruits. Two other succulent plants with copious subterranean nutriment storage, both blue-flowered, were frequently in evidence—the dune spiderwort (*Tradescantia longifolia*), with copiously tufted stems and rose-scented flowers, and the southern dew-flower (*Commelina angustifolia*), whose elongate stems often clambered up in the bushes and bore flowers two inches wide. The attractive shrub then copiously blooming was the elephant's-ear pawpaw (*Asimina obovata*), whose numerous creamy flowers with floppy petals often almost hid the stems and the young leaves.

In spite of the drought, many plants on the dune-tops were celebrating their Easter. The spruce-pines (*Pinus clausa*) were not only well yellowed by the myriad staminate aments, but the branches were copiously decorated with clumps of the ball-moss (*Tillandsia recurvata*). An Adam's-needle (*Yucca filamentosa*) and a bear grass (*Nolina Brittoniana*), both of the same plant

family, had sent up their annual flower stems which were then terminated by large stiff plumes of white flowers.

The afternoon was devoted to achieving the eastern coast, with the head of Lake Okeechobee at about the half-way point on the route. The sand-ridges east of Sebring had much vegetation in evidence to cause delay in our progress. On several of the hills we were fortunate enough to find large patches of our new fringe-tree (*Chionanthus pygmaea*) in bloom. The bushes were about a foot tall and bore myriads of white flowers in large clusters. Curiously enough, the flowers of this pygmy tree are much smaller and the fruits much larger than in the common fringe-tree (*Chionanthus virginica*), and the roots, like those of many of the plants adapted to the desert conditions of the scrub, are quite fleshy, instead of hard and woody as we are accustomed to find them in our ordinary shrubs and trees. The scrub-palmetto[24] (*Sabal Etonia*) was coming into bloom. This palm is really a cabbage-palmetto closely related to the cabbage-tree (*Sabal Palmetto*), but the stem is an S-shaped or corkscrew-like structure that never rises above the ground. Its fruits are much larger than those of its relative. The stream at the foot of the sand-ridges was bordered by tangles of blackberries (*Rubi*) and dogwood (*Svida*) both in bloom. Along the trail through the pinelands a lonely-looking stalk of a milkweed (*Asclepiadora Feayi*) with its peculiar flowers appeared here and there.

On approaching the hammock of Little Arbuckle Creek we found that vandals had burned off one end of the bridge. This condition necessitated a detour of several miles southward through the pinewoods until a crossing could be located. Where we crossed the creek, the shrubs of the woody St. John's-wort (*Hypericum fasciculatum*) grew like gigantic brooms as tall as the car with the green brushes covered with thousands of golden flowers. The Istokpoga Prairie showed one color and white. The vast expanse was green mainly as a result of the ubiquitous saw-palmetto (*Serenoa*). The ditches usually appeared as snowdrifts as a result of the countless inflorescence heads of the pipewort (*Syngonanthus*). After many miles of this monotonous

[24] Journal of The New York Botanical Garden 26: 145–151. 1925.

outlook, flashes of purple—large beds of wampee (*Pontederia*) along the hammock of Istokpoga Creek—burst into view. In the creek[25] at this season was a gigantic growth of the Peruvian evening-primrose (*Jussiaea peruviana*), with stems clambering up into the trees to a height of fifteen or twenty feet.

The Okeechobee prairie—a different looking region—although separated from the Istokpoga prairie only by the intermediate Kissimmee River basin, was a vast flower garden. Some kinds of herbs were colonized, so to speak. For example the large thistle, with its purple paint brushes and the marsh-pinks with their purple stars often occupied areas by themselves, the latter often making a vast sea of color. Other herbs, many different kinds, occurred mostly as scattered individuals in the turf. For example, golden heliotrope (*Heliotropium Leavenworthii*), beggar's ticks (*Coreopsis Leavenworthii*), ladies'-tresses (*Ibidium laciniatum*), grass-pink (*Limodorum parviflorum*), prairie-lobelia (*Lobelia paludosa*), three yellow candy-weeds (*Polygala ramosa, P. lutea, P. Rugelii*), and others that would treble this list. The prairie was dry, but Lake Okeechobee was brim full. The flooded and boggy areas beyond the lake beach, occupied by vast vegetable gardens two years ago, were now vast flower gardens, occupied, en masse, by either floating plants such as water-hyacinth (*Piaropus*) with its gay flowers, and water-lettuce (*Pistia*) with its inconspicuous flowers, but of a green all its own, or by stationary plants, among which our native Indian-shot (*Canna flaccida*) was the most conspicuous, forming seas of green (foliage) with small or vast islands of yellow (inflorescence).

Pushing eastward from Okeechobee, darkness and threatening clouds overtook us just as we entered No Man's Land,[26] or the southward (upper) extension of the St. John's drainage basin. We could tell when we reached the higher land on the eastern side of this No Man's Land by the delightful fragrance from the flowers of the citrus groves, which, moreover, were still golden with their persistent and unharvested fruit. As we started down

[25] For a view of the creek, see Journal of The New York Botanical Garden 21: *Frontispiece,* opposite page 25. 1920.

[26] For a partial description of this region see Journal of The New York Botanical Garden 22: 56–57. 1921.

the eastern coast, we ran into heavy rain showers along Saint Lucie Sound. After a night at Stuart, we continued southward and local rain showers accompanied us. The several plant associations along the way furnished us with material for both observing and collecting. The associations most prominent were, (I) the dull flat woods with their quite uniform green carpet and large strictly erect pine trees (*Pinus caribaea*), the brilliant scrub with its almost carpetless floor of white sand, its shrubbery of various shades of green, and its leaning pine trees (*Pinus clausa*), and the level or rolling areas of white sand, in aspect and superficial consistency often resembling granulated sugar, which would frequently be barren deserts were it not for the growth of the introduced periwinkle (*Catheranthus*) which produces a wealth of flowers in many colors and shades.

We were soon in Miami, where our field headquarters were established at the reservations of Mr. Charles Deering and at the laboratory building of the Plant Introduction Garden of the United States Department of Agriculture.

JOHN K. SMALL.

(*To be continued.*)

A WHITE OAK KILLED BY LIGHTNING

Those who recall the natural features of the woodland at the northeastern border of the Economic Gardens of The New York Botanical Garden and the appearance that these features presented a year ago, may now notice that something once familiar is missing from the scene. A large white oak, formerly a conspicuous element in the forest growth, has disappeared, and all that remains as evidence of its former presence is a sawed-off stump in a partly cleared area in the woodland border. The recent removal of this tree represented the climax of an interesting and tragic event in its life history.

It is well known that lightning often acts in what appears to be a freakish manner, and also that it occasionally produces effects that are more or less difficult to explain. The tree under consideration was apparently vigorous and in the prime of life last summer, as far as might have been inferred from its ex-

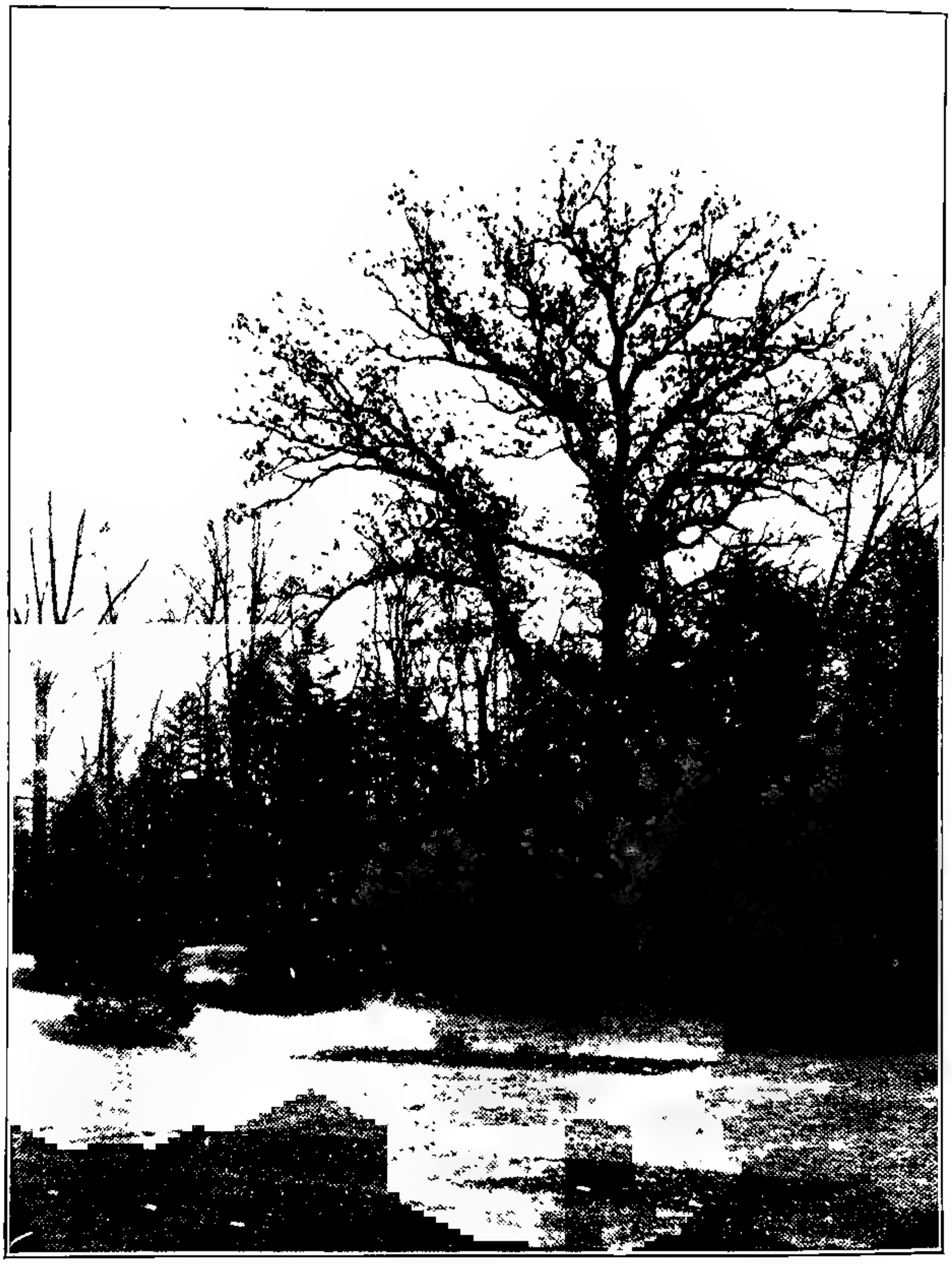

FIGURE 7. White oak, eastern border, north end of Economic Garden. Struck by lightning and killed in the summer of 1927. Photograph by Fleda Griffith, Jan. 18, 1928. [Tree cut down in the spring of 1928.]

ternal features, when it was struck during a thunder storm. It did not appear to be badly injured. No limbs were torn off. The only obvious effect of the stroke was a longitudinal gash in

the bark and sap wood, of relatively insignificant extent, on one side of the trunk. There are several trees within the Garden area that suffered, in past years, much greater external injury from lightning, and they are alive today, although the scars are glaringly conspicuous. This particular tree, however, appeared to have been shocked to death instantaneously. The foliage throughout began to wither at once. Every leaf became wrinkled, and within a month the tree had begun to assume the brown and yellow appearance of autumn, while the surrounding vegetation was yet fresh and green. The contrast in coloration was conspicuous and attracted considerable attention. The tree was also a conspicuous object during the following winter, by reason of the withered foliage, almost intact, still clinging to the twigs and branchlets, while all the other deciduous trees in the vicinity were completely denuded, as may be seen in FIGURE 7, which is a reproduction of a photograph taken January 18, 1928. The explanation of this latter phenomenon is, apparently, that the tree having been suddenly killed, during its season of growth and highest vitality, its leaves were, in consequence, securely attached to their supports and were not subject to the physiological changes that normally result in the weakening of attachment and the ultimate severance of the leaves from the branches in the autumn. And in this connection it is interesting to note, incidentally, that a large number of twigs and branchlets that were broken off during winter storms had leaves securely attached to them. The wood had yielded to the stress, but the leaves had held fast.

The tree was kept under observation during the past spring, in order to determine, definitely, if it showed any evidence of vitality; but not a bud showed any indication of expanding when all other trees had developed their seasonal leafage. It was dead, and its removal was deemed advisable.

The trunk of the tree, at a distance of 2.5 feet from the ground, measured 10.4 feet in circumference; and several countings of the growth rings on the surface of the stump gave an average result of 178 that were more or less distinctly discernible. An area in the center, of about 4 or 5 inches in radius, was more or less decayed, so that the rings were not well defined. This

area probably represented about the first fifteen years of growth. The tree, therefore, may be inferred to have been approximately 190–200 years old at the time when it met its death.

ARTHUR HOLLICK.

NOTES, NEWS AND COMMENT

Mrs. Barnum Brown, lecturer and traveler, gave a vivid and illuminating picture of oriental life in her lecture "A Naturalist in India, Kashmir, and Burma" at The New York Botanical Garden, on June 9. She recently returned from a five years' sojourn in the Far and Near East, and while her husband was unearthing strange skeletons of prehistoric animals for the American Museum of Natural History, Mrs. Brown had unusual opportunities to mingle with the native life; hence her inside story of these fascinating people was of keen interest. She told of their customs, religions, and the natural history surrounding them, the lotus gardens of Kashmir, the teak-bamboo jungles of Burma, sugar-making from the palms of Burma, the pre-historic game of India, etc. One hundred beautifully colored slides, made from original photographs, were used by the lecturer.

The following visiting botanists have enrolled in the library during the spring: Mr. Charles Schweinfurth, Wellesley Farms, Mass.; Dr. Caroline A. Black, New London, Conn.; Mr. C. A. Weatherby, East Hartford, Conn.; Prof. L. H. Bailey, Prof. H. M. Fitzpatrick, Mr. Stuart H. Burnham, Miss Cynthia Westcott, Ithaca, N. Y.; Prof. L. H. Pennington, Prof. Harry P. Brown, Syracuse, N. Y.; Prof. Geo. H. Shull, Princeton, N. J.; Dr. J. M. Fogg, Jr., Philadelphia, Pa.; Mr. Arthur P. Kelley, Allegheny Forest Experiment Station, Philadelphia, Pa.; Dr. Edgar T. Wherry, Dr. Paul C. Standley, Mr. Carl Hartley, Washington, D. C.; Miss C. Audrey Richards, Madison, Wis.; Dr. Cristobal M. Hicken, Buenos Aires, Arg.; Dr. Eduardo Quisumbing, Manila, P. I., and Prof. Tyôzaburó Tanaka, Taiwan, Japan.

Mr. Albert C. Smith (A. B., Columbia, 1926) has been appointed Assistant Curator of The New York Botanical Garden and began his duties on July 1. Mr. Smith gave considerable

attention to the study of ferns in connection with his undergraduate work in Columbia University. In the period between October 20, 1926, and April 15, 1927, he was a member of the Killip-Smith Botanical Expedition to Colombia, a narrative of which appeared in the JOURNAL for September, 1927.

Dr. Forman T. McLean, plant physiologist of the Rhode Island Agricultural Experiment Station since 1923, began his new work as Supervisor of Public Education at The New York Botanical Garden on July 1. Dr. McLean is a graduate of Yale University, 1907, taking also the degree of Master of Forestry there in 1908. He was in the United States Forestry Service from that date until 1913, when he went for special graduate studies to The Johns Hopkins University, from which he received the degree of Ph.D. in 1915. From 1915 to 1921, he taught botany in the University of the Philippines. Dr. McLean is an authority on Gladiolus. He is editor of the *Gladiolus Review,* the official organ of the American Gladiolus Society. With William Edwin Clark and Eugene N. Fischer, Dr. McLean is author of "The Gladiolus Book," published by Doubleday, Page & Company.

Dr. John K. Small, Head Curator of the Museums, spent most of May in Florida in continuation of association with Mr. Thomas A. Edison and his scientific rubber researches. Fort Myers was headquarters. Various excursions from this point totalled nearly six thousand miles. The eastern and the western coast regions and the southern parts of the lake region were covered. A good deal of attention was devoted to the Florida Keys, from Key Largo to Key West, the Everglades, the Big Cypress Swamp, and various interior plant regions up through the peninsula and across northern Florida to the Apalachicola River region. Herbarium and museum specimens and conservatory material, both for the exhibition and study collections, were forwarded to the Garden from the field.

Professor Roland H. Patch, of the Connecticut Agricultural College at Storrs, lectured at The New York Botanical Garden, May 26, on "Chinese Asters." The China Aster, said Professor Patch, is one of the most popular and valuable of all annuals, blooming in the late fall and early winter. It is known in the

trade as an "aster" but it is not an aster at all. Its scientific name is *Callistephus chinensis.* The plant was introduced into Europe about 1731 by R. P. d'Incarville, a Jesuit missionary in China. The improvement which has taken place in the China Aster is one of the examples of specific variation. There is but one species, *C. chinensis,* which is the parent of all the existing types and varieties. Asters will grow in almost any kind of soil. The early varieties do best in light soil, and the late in heavy soils. Soil that is intended for the use of asters should be carefully prepared before they are ready to be planted in it. Use the best seed. Sow seed from February to June 1st. Sow the early varieties first and the later ones in succession. Transplanting makes strong and sturdy plants. Cultivate frequently throughout the summer.

Meteorology for May: The total precipitation for the month was 1.64 inches. The maximum temperatures recorded at the Garden for each week or part of a week were: 79½° on the 3rd; 75° on the 10th; *80° on the 16th,* and 73° on the 21st. The minimum temperatures recorded were: 44½° on the 3rd; *39° on the 13th;* 42° on the 15th; 42° on the 25th, and 49° on the 31st.

Meteorology for June. The total precipitation for the month was 6.33 inches. The maximum temperatures recorded for each week or part of a week were as follows: *85½° on the 2nd;* 82° on the 8th; 84° on the 14th, and 79° on the 25th. The minimum temperatures were 68° on the 8th; *45° on the 16th,* and 54½° on the 23rd.

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Bronx Park, New York City

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BOTANICAL FIELDS, HISTORIC AND PREHISTORIC

To Cape Sable

(*Continued from page 179*)

We made a short excursion into the Cape Sable region. A six or seven months' drought had rendered the pinelands quite green deserts. There were scarcely any flowers to lend other colors. However, the rock embankment of the Ingraham Highway in the Everglade prairie southwest of Royal Palm Hammock furnished beautiful examples of the several methods of seed-dispersal—*Bird, wind,* and *water.* This demonstration was most evident on the glade side of the road, for there is a more or less elevated embankment of broken rock along the edge of the glades where seeds may easily lodge.

On or near the top of this rim, which is only a few years old, where the various kinds of birds of the region are accustomed to alight, one finds scattered at random young berry-bearing shrubs and trees derived from the seeds of fruit eaten by birds in the nearby hammock islands. Among these berry plants, we noticed strangling-fig (*Ficus aurea*), banyan (*F. brevifolia*), wild-muscadine (*Muscadinea Munsoniana*), trema (*Trema floridana*), poison-wood (*Metopium Metopium*), marlberry (*Icacorea paniculata*), myrsine (*Rapanea guianensis*), bustic (*Dipholis salicifolia*), and potato-shrub (*Solanum Blodgettii*). Birds are especially fond of some fruits. That of the poison-wood is very attractive to many. We observed seventeen kinds of birds in a poison-wood tree in the space of two hours. The next in numerical order, less, however, than the bird-distributed kinds, are the wind-distributed plants. These were scattered

over the rock rim and in the roadway itself. More prominent were plants with dust-like seeds, such as rush (*Juncus*) and several ferns, and those with tufts of hairs for easy suspension in the wind, such as milkweed (*Asclepias lanceolata*), native fleabane (*Pluchea purpurasceus*), naturalized fleabane (*Pluchea odorata*), and groundesel-bush (*Baccharis halimifolia*).

FIGURE 7. A leaf and a flower of the largest native pond-lily in North America, grown in a pond on Chinsegut Hill, near Brooksville, Florida. The rootstocks are three to four inches thick, the leaves are up to two feet in diameter and have upturned edges somewhat after the manner of the Victoria, and the white flowers are up to ten inches broad. The surfaces of ponds and small lakes, several acres in extent, are often completely covered with this giant pond-liliy.

Next in diminishing order came the water-distributed plants. In seasons of high water in the Everglades, time and tide, so to speak, being just right, the more or less corky seeds of the coco-plum (*Chrysobalanus pellocarpus*) and the buttonbush (*Cephalanthus occidentalis*) floating on the surface, lodged in the crevices of the rock rim, and later took root. Various heights of the water at different times were indicated by the tiers of shrubs of different sizes.

Thus we see that any land above the high-water level of this Everglade prairie is promptly populated with woody vegetation—incipient hammock! Taking this phenomenon into account and assuming that this land was recently, geologically speaking, much higher,[1] it is interesting to imagine this almost desert prairie, with isolated hammocks and pine-clad islands, to have been a primeval hammock of kinds of trees now largely or wholly lost to us. After a time fire made inroads in the hammock, just as it does now in other parts of the peninsula. The areas depopulated of broad-leaved trees were repopulated with pine trees just as they are now. Then, when the land subsided, most of the hammock trees and pine trees succumbed to the rising water table and the floods of the rainy season, and today we have the descendants, direct or indirect, of some of the former broad-leaved trees and needle-leaved trees only on the small reefs of limestone that have not yet been eroded to the general level of the prairie.

Although the water-level was gradually rising in the Everglades, few flowers were in evidence. Among the four kinds observed, yellow predominated wild-heliotrope (*Heliotropium Leavenworthii*) and piriquita (*Piriquita glabrescens*). The two other plants had brilliant-colored flowers—the red milkweed (*Asclepias lanceolata*) and the rose-purple grass-pink (*Limodorum Simpsonii*).

As we proceeded southward the water-table rose as the land fell. New growth was slight and the long drought had made much of the old wood and foliage into tinder. Down among the marshes and hammocks of the Lossman River limestone area we came upon a criminal setting fire to the dried vegetation. He started fires in a half dozen places and soon the whole region was ablaze. The fire raged all day and night, and no telling how much longer.[2] When we reached the area inhabited by the saw-cabbage palm (*Paurotis Wrightii*), we found young palms springing up in and on the roadside. These, evidently, were from seeds dropped there mainly by the crows, who are particularly fond of the juicy bright-colored fruits of this palm.

[1] Journal of The New York Botanical Garden **22**: 203. 1921.
[2] Journal of The New York Botanical Garden **22**: 39. 1921.

Back of the coastal settlement of Flamingo the numerous epiphytic orchids in the hammocks were coming into bloom. A dozen or more kinds inhabit the trees there. The more showy and larger kinds are two butterfly-orchids—*Oncidium* and *Cyrtopodium*. We secured specimens of all from the vicinity of the aboriginal canal referred to in a former paper for introduction and study in the Deering reservation at Cutler. The gradually rising water back in the Everglades had filled the muck in the aboriginal canal to the surface, so that walking over it was impossible. The growth of pellitory (*Parietaria floridana*) along the edges was astonishingly luxuriant. Two upright mallows—*Kosteletzkya altheaefolia* and *K. pentasperma* were in flower; the former with large rose-colored flowers and innocuous foliage, the latter with small white flowers and stinging foliage similar to that of a nettle.

The royal-palms (*Roystonea*) on the nearby Indian mounds were coming into flower, as were also the colonies of saw-cabbage palm (*Paurotis*) in the swamp near them and in the aboriginal canal.

A Visit to an Aboriginal Ruin

After leaving the remains of aboriginal activities at the Cape, we set out for some reported ruins lying in the wilderness east of Lake Okeechobee. From Stuart to the interior we were accompanied by L. H. Toussaint and H. P. Sands. We drove westward until we met the embankment of the Saint Lucie Canal and then followed a southward route through the pinelands and over prairies and sloughs until we met the old Jupiter trail. We went dry-shod everywhere. The surface of the land was as dry as a desert. Still it was not flowerless, although variety was scant. Low places in the flatwoods sometimes supported a colony of large rose-mallows (*Hibiscus grandiflorus*) with immense pink flowers. At other places there would be snowy areas of the immaculate marsh-pink (*Sabbatia Elliottii*) or deep-pink spider-wort (*Cuthbertia graminea*). Towards the Saint Lucie Slough yellow or golden became the dominant color. It was furnished by several kinds of milkwort (*Polygala*), yelloweyed-grass (*Xyris*), and heliotrope (*Heliotropium*). Cane-slough, usually wet, was perfectly dry. The depressions, usually ponds, were

miniature forests of sand-weed (*Hypericum fasciculatum*), so-called because it is said to indicate a hard sand bottom over which one may drive a car or wagon in wet weather. A tall grass, common-reed (*Phragmites*), marked the slough even if there was no sign of water. This land is somewhat higher than Hungry Land, which lies to the south of it.[3] Between the slough and the ferry two interesting plants appeared in great quantity: the one an albino orchid, the grass-pink (*Limodorum Simpsonii*), and the other a small atamosco-lily (*Atamosco Simpsonii*).

We crossed the Saint Lucie Canal at Indiantown Ferry and pushed westward to the still—not an alcoholic one, but one where turpentine and rosin are separated from the crude resin. There we turned southward and headed again for the canal. Hammocks, pineland, and prairies were traversed. The two former had little to show in the way of flowers, but the prairies, perhaps on account of the nearness of the water-table showed many flowers, all of rose or purple shades—for example, great marsh-pink (*Sabbatia grandiflora*), pine-thistle (*Cirsium Smallii*), pine-hyacinth (*Viorna Baldwinii*), and fox-glove (*Agalinis Harperi*). The land along the canal was covered with a thick coat of raw sand recently pumped from the water-way. No nourishment was visible to the naked eye, but vigorous specimens of four kinds of plants were there—one native, dog-fennel (*Eupatorium capillifolium*) and three immigrants, wormseed (*Chenopodium ambrosioides*), gray-mallow (*Urena lobata*), and guava (*Psidium Guajava*).

Back to the south side of the Canal again we took to the serpentine trail and started for our goal. We were in a region northwest of Hungry Land and the gradual loss of elevation as we went south was shown by an increasing freshness in the vegetation. There were numerous incipient hammocks comprising two palms, saw-palmetto and cabbage-trees, and myrtle (*Cerothamnus ceriferus*) along the trail, but frequently fires prevented them from developing into broad-leaved forests. What the vegetation in the vicinity of the canal, where the water-table has been permanently lowered by a ditch two hundred feet wide, will change to remains to be seen. The present plant-covering will readjust itself in some way.

[3] Journal of The New York Botanical Garden **22**: 205–206. 1921.

We were now in a country that centuries ago was a favorite rendezvous of the aborigines, as we will see on a succeeding page, and within the past century also of the Seminole. We passed abandoned camps of the white man as well as those of the red. The abandoned camps can be identified by the remains of the camp-fire. The Indian always makes his fire by placing several logs radially or like the spokes in a wheel with the fire at the hub, so to speak. In addition wild pumpkin vines were often growing about the Indian camping places, having sprung up from seeds of the so-called Seminole pumpkin. As the land decreased in elevation and the water-table rose, the pine trees increased in size and the flowers became more numerous until it was often possible to count nearly two dozen kinds in sight at one time. Among them may be mentioned:

Heliotropium Leavenworthii
Piriquita glabrescens
Dracocephalum denticulatum
Cirsium Smallii
Agalinis fasciculata
Polygala lutea
" *Rugelii*
" *Carteri*
Polygala cymosa
Aletris lutea
Sabbatia campanulata
" *grandiflora*
Helianthella grandiflora
Rudbeckia floridana
Helenium vernale
Lobelia paludosa

However, the doom of this region is sealed, for a large lumber company has begun the process of deforestation, and we will soon be able to add it to our list of "dead gardens."[4] The lower elevation of the region was also indicated by the appearance of many large cypress heads, some of tall trees, others almost miniature, but all well laden with epiphytes or air-plants—three kinds of wild-pines (*Tillandsiae*)—all of which held tenaciously to the trunks through the agency of the rough bark. In the case of the miniature cypress trees the air plants were often nearly or quite as large, in bulk, as the trees themselves. There were also miniature oak forests, a foot or two high, on the middle ground, composed of a curious little oak—*Quercus minima*—with underground running stems. The upright branches, the oak trees in this case, bear narrow entire leaves below and broad holly-like leaves above.

[4] See Journal of The New York Botanical Garden **24**: 193–247. 1923.

After innumerable turns and twists in the trail, our destination came into view– an aboriginal ruin on the boundary where the eastern Everglade rim of the Lake Okeechobee region, or the saw-grass as it is called, meets the higher land.

This ruin is of sand. Its structure is as follows: There is an oval mound twenty-five or thirty feet high, with the long axis standing east and west. The western exposure slopes abruptly to the level of the plain. The eastern exposure slopes gradually for about a hundred feet. This mound is surrounded by a rectangular rampart six to eight feet high, which is as wide as the base of the mound, about two hundred and fifty feet, and between six hundred and seven hundred feet long. On the south side near the base of the mound there seems to have been an opening in the earthworks and at the western end there is an opening to the south of the median axis of the structure. The only explanation of its use by the aborigines, suggested by the structure, is that it was a place for council meeting and ecclesiastical ceremonies. The opening in the ramparts would permit of its use in both the wet and the dry seasons. In times of low water the assembling audience could enter the amphitheaters on foot; on the other hand, in the wet periods they could enter in their canoes when assembling to witness the performances, perhaps human sacrifices,[5] by the chiefs and the priests, on the stage, the large central mound. Furthermore, the two amphitheaters may have served to separate the "sheep" from the "goats," just as by the center aisle, women and men were separated, left and right, respectively, in the churches of some of our modern ecclesiastical sects not more than a generation ago. Among the aborigines, just as in our ecclesiastical organizations, there were special rules for the women, or, in other words, what was sauce for the goose was by no means sauce for the gander. That this was a place of meeting is further emphasized by the existence of a circular mound in the "saw-grass" several hundred feet from the higher land and westward of the large structure. This mound may have been used as a beacon, with some signal by day and a

[5] It is recorded that they (the Calusas) seem to have practiced human sacrifice of captives upon a wholesale scale, scalped and dismembered their slain enemies, and have repeatedly been accused of being cannibals. Handbook of American Indians 1: 195. 1911.

FIGURE 8. Part of an aboriginal ruin on the edge of the Everglades east of Lake Okeechobee, Florida. Looking along one of the earthworks of the rectangular structure described on accompanying pages. The earthworks and the mound, from the side of which the

fire by night, to locate the place of meeting, which is not visible from the "saw-grass." Of course, permanent trails would locate it from settlements in the higher regions, but where the "saw-grass" was submerged, as it is about half the year, an object to sight from a distance by those coming from the settlements on the eastern shore of Lake Okeechobee would be a necessity. That there were settlements on the narrow sand ridges along the eastern shores of the lake, we know both from the remains and from the fact that about the middle of the sixteenth century Hernando de Escalente Fontaneda, who was a captive among the Indians for seventeen years, records that—

"They are masters of a large district of country, as far as a town they call Guacata, on the Lake of Mayaimi [Okeechobee] which is called Mayaimi because it is very large. On the margins are many little villages which I will name over hereafter."

We could see, from the observation mound mentioned above, the smoke from the recently established settlement of Pohoke on the shore of the lake about six miles to the west of the ruin. The vegetation of the ruin showed nothing of direct interest. The surrounding country has scattered pine trees and a turf of grasses, sedges, and other herbs in season. The water conditions evidently do not permit of the usual growth of saw-palmetto had the land been higher. However, saw-palmetto has taken possession of the rampart about the mound and thus distinctly outlines it among the other vegetation. The vegetation of the mound is mainly woody shrubbery, except the pine trees. Scrub-oaks (*Quercus Chapmanii*), saw-palmetto (*Serenoa repens*) and buck-berry (*Xolisma fruticosa*) are the more conspicuous plants. In the low parts near the ruin, the ground nut (*Glycine Apios*) was plentiful. The tubers of this vine and the berries of the saw-palmetto were standard foods of the aborigines.

Upon reaching the ferry in retracing our course, we turned westward and followed a trail to the shore of Lake Okeechobee, where the Saint Lucie Canal meets the lake. The low land or "saw-grass" between the lake and the high land was filled with sand pumped in by the dredges from the canal ditch. On this, the pioneer plants were dog-fennel (*Eupatorium capillifolium*) and groundsel-bush (*Baccharis glomeruliflora*), with here and there remains of buried willow heads trying to start life anew. Our

FIGURE 9. Aboriginal mound back of Titusville, Florida. A mound similar to this straddles, crosswise, the rectangular structure referred to in the preceding figure. Although there are no earthworks about this mound, it was evidently a ceremonial structure, perhaps of minor importance, for it is not a burial mound. The figure on the mound is that of Lewis A. Coleman, one of the original settlers of the upper Indian River region, having migrated there in 1865.

visit to the lake shore was particularly interesting as it was one of the points where we landed on our first cruise[6] in Okeechobee in 1913, the first year the lake was accessible through the canals from the eastern coast. The flowering herb in season near the beach was the scarlet-sage (*Salvia coccinea*). The remains of the hammock comprised besides the dominant tree, *i.e.*, the cypress: red-maple (*Acer rubrum*), pop-ash (*Fraxinus caroliniana*), strangling-fig (*Ficus aurea*), and the cabbage-tree (*Sabal Palmetto*). The latter are the indicators of maximum high water in modern times. The massive basal cylinders of roots, six to ten feet high about the bases of the trunks, show both the amphibious habit of the palm and maximum height of the water where the trunk emerges. This difference of water-level in the lake is seasonal. There are also indications of other changes of levels that may have been geological. The "saw-grass" frame, so to speak, of the Everglade-area surrounding the lake, with its bordering hammock where it meets the highest land, indicates that the lake may have been larger at one time. On the other hand, a pioneer settler we met on the lake-shore reported the existence of submerged village sites at a shallow point in the lake between Observation Island and Sand Point. At very low stages of the lake he found bones of animals and the charcoal of the fires where they were cooked. Also stone implements of various kinds, of course imported from further north, were found. This discovery would indicate a somewhat permanent lower and smaller lake in aboriginal times.

Between the two ferries over the canal the trail led us through several oak and cabbage hammocks which were peculiar in that the undergrowth was composed mostly of wild-coffee (*Psychotria*), whitewood (*Schoeffia*), and myrsine (*Rapanea*). One traversing that region at that time would not suspect it of ever being submerged, but here the cabbage-trees recorded and preserved the record. The cabbage-trees through the then almost parched pine woods had the basal cylinder of roots averaging about a foot above the surface of the ground. Thus it was evident that the water often stood a foot deep for considerable periods.

The sun set as we recrossed Cane Slough and it was quite dark when we reached the eastern coast.

[6] Journal of The New York Botanical Garden 15: 69–70. 1914.

FIGURE 10. A small bald-cypress tree on the eastern shore of Lake Okeechobee, with about four feet of the upper part of the root-system exposed. The remarkable development of underground wood—roots and knees—is evident, for only a part has been uncovered by the waves from the lake. In the primeval hammock back of the shore line, one can walk upright among the root-system of cypress trees where the humus has been burned down to the sand foundation of the hammock.

The following forenoon was devoted to Jupiter Island on our way southward to headquarters. This island is one of the numerous off-shore bars that extend along the Atlantic Coast from Massachusetts to the Gulf of Mexico. It was on this Island that Jonathan Dickenson and his associates were wrecked and captured by the Indians in 1696 while on their way from Jamaica to Philadelphia. The remains of aboriginal occupation are still evident, particularly in the two large kitchen-middens near the northern end of the island. In driving northward the first one was met at about five miles from the eastern end of the bridge on the main road crossing from the mainland. A large part of the mound has been removed in order to make the five miles of road leading to it. Along the way, on the sand-dunes, we found few herbs aside from the dune verbena (*Verbena maritima*) and the dew-flower (*Commelina angustifolia*), but on the kitchen-middens, which as usual are situated along the lagoon side of the island, many herbaceous plants were in bloom. The first midden, measuring about two hundred feet in diameter, was devoted mainly to herbs, a dozen being noted offhand, more than a dozen kinds in flower, and in addition the plants were remarkably luxuriant, some of them with leaves twice as large as usual. The most interesting herb was a rare milkwort (*Polygala cumulicola*) with coral-like wintergreen-scented roots, heretofore found only on the coastal dunes in the Miami region. The second midden, lying about a fifth of a mile northward, is somewhat larger than the first and has a spur running northward and southward into the mangroves. It was devoted to woody plants. These, together with those on the first mound, total about two dozen tropical shrubs and trees. Two naturalized grasses were there, the natal-grass (*Tricholaena rosea*) and the oats (*Avena sativa*). The former will doubtless persist, while the latter will soon die out.

The southern part of the island was our next objective. The road runs close to the barrier ridge, which is unusually high wherever the flat dunes slope westward to the abruptly overhanging mangroves. Brilliantly colored colonies of the dew-flower (*Commelina*), the dune-verbena (*Verbena*), and the sunflower (*Helianthus*) appeared frequently among the greenery or on the bare white sand. Here the coasting party referred to above was

shipwrecked at night during a storm. At daybreak, the leader records, that,

"I went with one negro to view the land, and seek the most convenient place for that purpose [a camp]; but the wilderness country looked very dismal, having no trees, but only sand-hills covered with shrubby palmettos, the stalks of which were so prickly, that there was no walking among them."

The island looks the same today.[7] There is a wonderful group of cabbage-trees (*Sabal Palmetto*) near the northern end of the island and here and there a spontaneous Australian-pine (*Casuarina*) rises above the scrubby hammock growth which the wind and weather keeps down to ten or fifteen feet in height. The southern bridge across the lagoon was not open, so we drove back to the Hobe Sound bridge and crossed to the mainland on which we continued to West Palm Beach and there crossed again over to the coastal dunes on which we continued southward thirty odd miles to Deerfield. There were vast areas of the primeval dune vegetation, ranging from almost pure saw-palmetto to tropical though stunted hammock in which the paradise-tree (*Simarouba glauca*) stood out on account of its copious bunches of ripe date-like fruits. On acres of cleared dunes, grubbed and burned, one kind of plant, a legume, coral-bean (*Erythrina herbacea*) was emphasized against the white sand by its deep-green foliage and plumes of scarlet flowers. It was able to survive the general destruction on account of its large storage root. The more or less extensive marshes, the naturally filled in parts of the lagoons, viewed from the higher dunes, were often vast seas of the southern elder (*Sambucus Simpsonii*) or the wild-papaya (*Carica Papaya*).

From coast to coast

The lower west coast was our next objective. We turned westward at Fort Pierce. After crossing the coastal ridge of pineland and "scrub" we entered the great drainage basin, twenty-odd miles wide, which, apparently, separates the water of the Okeechobee-Everglades basin toward the south and the Saint John's basin to the north. Where we crossed, it has long been known as the Halpatiokee Swamp, which, translated into English,

[7] For further descriptive matter and a view see Journal of The New York Botanical Garden 27: 196.

would be Alligator Swamp. The yellow-heliotrope (*Heliotropium Leavenworthii*), discovered there in Seminole war times, was still widely distributed. On the water-shed which separates the drainage basin first mentioned from that of the Kissimmee River, the air of the hammocks bordering the small tributaries of Lake Okeechobee was heavily laden with the combined fragrance of the sweet-bay (*Magnolia virginiana*) and the loblolly-bay (*Gordonia Lasianthus*). In the scrub that flanks the western side of this drainage basin we found several good examples of witches-broom on the spruce-pine. This fungus is not uncommon on the long-leaf pines, but these were the first brooms we had observed on a short-leaf kind.

We crossed the Okeechobee prairie to Fort Bassinger on the Kissimmee River. Two plants were then outstanding features on the prairie. One, the large flag (*Iris savanarum*) that grows in the lower parts of the prairie, often covering hundreds of acres. The flowers are larger than those of any of our other native Florida species, as are also the fruits which are often like cucumbers, up to six inches in length, and so heavy that they lie flat on the ground. The plants were in both flower and fruit. The other plant in question was a low diffusely branched buckthorn (*Bumelia reclinata*) with myriads of white flowers. It grows on the higher land and has smaller leaves than our other species. Once across the Kissimmee River, in whose broad marshes there were vast pale-lavender seas of water-hyacinth (*Piaropus*), we were soon on the Istokpoga prairie. There were not many kinds of flowers on the prairie, but here and there the yellow-milkwort (*Polygala Rugelii*) and pink meadow-beauty (*Rhexia mariana*) were so abundant that from a low angle the eye saw only a solid sheet of yellow or pink. Along the stream where the flatwoods meet the sandhills of the lake region shrubs common to neither of these regions were copiously blooming. More conspicuous were the blackberries (*Rubus lucidus*), dogwood (*Svida stricta*), and wild-raisin (*Viburnum nudum*)—all white-flowered.

The trail running at right angles to ten parallel sand-ridges, westward, each succeeding one higher than the last, leads to the plateau, as it were, of the lake region where numerous sky-blue lakes fill the depressions. These sand-ridges are floristically more or less desert. This condition is often emphasized by an abun-

dance of Adam's-needle (*Yucca filamentosa*), bear-grass (*Nolina Brittoniana*), and plants with root systems developed against scant water supply and droughts. Frequently there is much scrubby shrubbery, and among these shrub-clumps, more tender herbs may often be found. Thus there are ruellias (*Ruellia parviflora*) with large purple flowers and short and strong cord-like roots, pushing stems up into the bushes. In similar situations there is a small tufted milkwort with stems arising from copious fibrous roots. It is, apparently, safe from extermination, for it produces small but brilliant rose-purple flowers above the ground along the upper part of the stems, and also strings of colorless flowers beneath the surface of the sand. Both kinds of flowers produce fruit.

We drove to the high desert-like sand-dunes about Lake Nancessowee in order to collect the flowers of the new holly we discovered—then in fruit—on the preceding Christmas morning. The trees fortunately were in full bloom. Some of the avenues at Sebring leading to the lake were most gorgeously decorated with two very different kinds of exotic trees—the silk-oak (*Grevillea robusta*) with its heavy red and orange blossoms massed among the deep-green foliage and the rosewood (*Jacaranda mimosaefolia*) with its myriads of sky-blue flowers covering the otherwise naked trees.

We crossed the lake region and drove down the valley of the Pease River to Punta Gorda. South of Arcadia there are many low hammocks often composed largely of maple and elm trees. Shrubbery is frequently present and some of the shrubs were in flower. The most interesting one was a native storax (*Styrax americana*). Its starry white flowers are very fragrant. Small and large herbs were abundant in the wet hammock in flower. In the twilight two of the larger ones were quite conspicuous—two milkweeds. The one with white flowers (*Asclepias perennans*) and the other with golden flowers (*A. curassavica*).

In the morning we set out from Punta Gorda for the western coast. After crossing Charlotte Harbor and proceeding several miles we found the pinewoods so dry that we decided to defer this side trip to a future date. We found plenty of coontie (*Zamia integrifolia*) in the pinelands, but the drought was so great that the leaflets were rolled into so many quills. An old

drainage ditch was without water, but the water-table was near enough to the bottom of the ditch to furnish some moisture for growing plants. It was a conspicuous example of what a little bit of water will do. For, although the pinewoods were nearly barren of flowers, this ditch where the trail crossed it supported not less than fifty kinds of herbs in flower! The trees common along Charlotte Harbor are oaks (*Quercus*), pines (*Pinus*), cabbage-trees (*Sabal*), with a scattering of red-cedar (*Sabina silicicola*). In a thicket on the western side of the harbor, we found the crab's-eye (*Abrus Abrus*) copiously naturalized. The plants were in both flower and fruit.

Our next move was towards, or rather to achieve, Fort Myers, which is about twenty miles distant as the crow flies, but by the trail, forty-nine miles! The long trail, however, was botanically advantageous, for about sixteen miles east of Punta Gorda we discovered a new shrub -a new genus quite different from anything heretofore collected. This plant has a slender-fusiform tap-root, usually one to two feet long. Several or many stems arise from the top of this root and bear white nodding flowers at the joints. The flowers are very fragrant.[8] In the pinelands, white and colors seemed to go by threes. Thus, there were three white flowers—*Heliotropium polyphyllum, Asclepiadora Feayi, Oxypolis filiformis.* Blue or purple was conspicuous by *Dracocephalum denticulatum, Ruellia parviflora, Cirsium Smallii.* Yellow, the almost ever-present color, showed frequently in *Coreopsis Leavenworthii, Rudbeckia floridana, Actinospermum angustifolium.* The sand in dried-up ponds was often a sheet of pure yellow from the myriad flowers of the bladderwort (*Stomoisia juncea*). Eastward of some very low country, four figworts were the dominant flowers. The albino wiry-stemmed blue-hearts (*Buchnera elongata*) were scattered far and wide. Three somewhat succulent carpet-plants copiously greened the banks of ditches and dried-up ponds—*Ilysanthes grandiflora* with purple-spotted flowers, *Bramia Monniera* with pinkish flowers, and *Gratiola ramosa* with cream-colored flowers. The latter plant often

[8] This shrub was named for Charles Deering, whose interest in botany enabled the writer to explore Florida more thoroughly than had been done previously, *Deeringothamnus pulchellus,* and published in 1924 (Bull. Torrey Club 51: 390). An account of its discovery and a description was published in 1926 (Addisonia 11: 33–34, *pl. 369*).

FIGURE 11. A wild-pepper (*Peperomia obtusifolia*)—the largest of the five species of *Peperomia* native in Florida in Royal-Palm Hammock, Collier County. It is a humus plant, and usually epiphytic although it sometimes grows on the "ground" where a thick layer of humus has accumulated on the floor of low hammocks. The only other locality for this species this side of the Gulf Stream is in the Cape Sable region. The insert shows a spike with fruits.

made green lines, circles, and various figures on the white sand, according to the shapes left, where the water last stood before evaporating. Fort Myers being achieved we pushed on to the Cape Romano region. *En route,* we made another attempt—this time successful—to penetrate the Royal-Palm hammock. We drove through the hammock on the Tamiami Trail, parked the car in some low pine woods, and headed for the royal-palms afoot. East of the large hammock are marsh-prairies with saw-grass or switch-grass, cabbage clumps, small hammocks, sometimes with a lone pine tree and mangroves. The original number of royal-palms has been greatly reduced in the past twenty-five years. This hammock was a source of supply of royal-palms of all sizes for planting in southern Florida. Trees, too tall to transplant, perhaps centuries old, were often cut down merely to get the fruits for raising young palms. The palms are mainly in two groups, one at each end of the hammock. Now the greatest number of specimens tall enough to be counted from a distance in either group is about two dozen!

The palms here are more slender than those of the Royal-Palm hammock of Dade County. Their environment is different. The depth of the roots of those in Dade County is determined by the öolitic limestone upon which they directly stand. The depth of the root system in those of Collier County is determined by the water-table, apparently the average water-table. It was on the trunks of these royal palms that the leafless orchid (*Polyrhiza Lindeni*), a Cuban species, was first found this side of the Gulf Stream in the last quarter of the last century. It has been reported as being confined to the trunks of the palm, but we found it equally abundant on all the trees with trunks of good size. This orchid is, one might safely say, ninety-nine per cent. roots. A plant may have six to ten worm-like roots one to two feet long and at the flowering season a wiry flower stalk an inch or two long. This bears a large white flower, and later a capsule like a short vanilla-bean. The roots function as leaves, for they are green with chlorophyll. They are flattened and the lower surfaces cling tenaciously to the host. The other especially interesting epiphyte in the hammock was the small West Indian plant, a wild-pepper (*Peperomia obtusifolia*). It was a perfect match in habit and structure to the one growing in the hammocks of the

Cape Sable region, and its discovery in this royal-palm hammock makes the second known locality for the species this side of the Gulf Stream. As a result of the drought already referred to, little else was in flower. A deep pink marsh-pink (*Sabbatia foliosa?*) and one of the rarer arrowheads (*Sagittaria Chapmanii*) were in bloom in the lower parts under the trees.

Certain conditions sometimes make strange plants bed-fellows. In a permanently wet place in the hammock the red-maple (*Acer rubrum*) and the red-mangrove (*Rhizophora Mangle*) grew together!

The loose sand of the embankment of the Tamiami Trail seemed to stimulate the growth of plants, for there were unusually luxuriant colonies of the various native herbs on the sides of the embankment. The brown-topped rush (*Juncus Roemerianus*), the germander (*Teucrium Nashii*), the obedient-plant (*Dracocephalum denticulatum*), the showy morning glory (*Ipomoea sagittata*), and a dozen others flourished in the almost pure sand. On the top of the embankment were the usual camp followers, such as oats (*Avena*), corn (*Zea*), dock (*Rumex*), turnip (*Raphanus*), and mustard (*Brassica*). It is unlikely that any of these exotics will be permanently established in the region.

On the old trail to Marco we were struck with the difference in vegetation the elevation of a few inches will sometimes make. On the embankments through salt and brackish marshes the three mangroves—red, white, and black—all salt-water plants, have usurped the land just along the water's edge. A foot or less above the high-water mark, such fresh-water plants as live-oak, myrtle, and sumac thrive.

There were no signs of ancient Indian occupation in the Royal-Palm hammock, but the aboriginal red man doubtless derived part of his sustenance from the copious fruits of the palms. On Marco Island and Caxambas Island the aborigines have left us ample evidence of their activities, and furthermore these royal-palm hammocks were easily reached by water in former times, just as they are now. There is a large kitchen-midden at the northern end of the island where the modern town of Marco has sprung up, while a very large midden—over several hundred acres in extent—occupies a kind of broad swale between the sand-hills at the southern end of Caxambas Island. Here is the settle-

ment of Caxambas. It is interesting to note how the white-man has so often unconsciously selected the old village sites of the red-man for his modern towns and cities. The Marco midden produced little of interest, except a ground cover (*Boerhaavia coccinea*) with myriads of little purple flowers and wild-cotton (*Gossypium hirsutum*) with large flowers, white in the morning and pink in the afternoon.

The Caxambas midden is more interesting, both as to its contents and its floristics. It must have been the scene of wonderful activities in ancient times. Besides the shells of the oyster and the clam, the conch enters largely into its structure. The number of these shells is prodigious, and each one was punctured in the same way for the purpose of removing the animal for eating. In the sections made by digging away the shells for making roads, layers or strata of different kinds of shells may be seen. These indicate the remains of the eating of different seasons or of different occupations. Also, marking off different strata are layers of charcoal and bones of animals which indicate where the animals were cooked and eaten. In addition to the large midden, there is a small one in the mangroves. This, as in the case of the village site and burial mound in the mangroves opposite Arch Creek on the lower eastern coast, may once have been on higher ground. It may furnish another bit of evidence that the Coastal Plain is slowly sinking.

Various stone implements are found in this midden imported, of course, from further north. One recently dug out from among the shells was a circular millstone about a foot and a half in diameter, with an eccentric hole, evidently for a handle. It was doubtless used for grinding palm seeds and perhaps maize, if the aborigines grew it then. The woody and succulent vegetation on the midden and the sandhills was flourishing, but the long drought had rendered them a desert, as far as herbaceous vegetation was concerned.

The lime of the disintegrating shells, the humus from past vegetation, the slowly decomposing bones, and the charcoal seem to furnish an ideal food for many plants, for the surface of the midden is copiously clothed. The dense growth and its spiny character has been already remarked on.[9] Many giant live-oaks

[9] Journal of The New York Botanical Garden **23**: 142–144. 1922. **24**: 227–229. 1923.

and other trees lay prostrate—a result of the digging away of the shell-mass. One tree among those fallen and those still standing was the coral-bean (*Erythrina arborea*). This woody plant grows as a vine, a shrub, and a tree. On these shell-middens it occurred as a tree and a shrub combined. It grew just as the Jamaica-dogwood (*Ichthyomethia*) does on the southern front of Big Pine Key. Several stems or trunks, six to ten together, arose from the ground. The bark, too, was smooth and green, just as in the dogwood.

Circumstances combined to defeat our plans to visit the Fackahatchee Cypress with its strands of royal palms, so we bore northward over the Tamiami Trail to Fort Myers. Just north of the point where the trail turns eastward we found a tall brilliantly colored lead-plant (*Amorpha sp. nov.*). Its foliage gives off the fragrance of sweet-vernal grass (*Anthoxanthum*) in drying. Near Estero we found another lead-plant (*Amorpha herbacea*), also with fragrant foliage, of a different group of the genus and much lower in habit. North of Bonito Springs we collected a small atamosco-lily (*Atamosco Simpsonii*) similar to the one we discovered in the Cane Slough east of Lake Okeechobee a week previous.

From Fort Myers we drove up the Caloosahatchee almost to Lake Hicpochee. Just east of the bridge at La Belle stands an old cabbage-tree grove. For some reason air-plants have taken to the trunks of the palms, and seven species representing five genera are present. They represent ferns, orchids, Florida-moss, and wild pines, or in botanical terms, *Polypodium polypodioides, Phlebodium aureum, Dendropogon usneoides, Tillandsia utriculata, T. fasciculata, T. tenuifolia,* and *Encyclia tampensis.*

Our main objective was the Indian ruin near a settlement called Citrus Center, marked on some of the Florida maps "Large Mound." The vegetation of this mound was described from a superficial examination in a former article.[10] This mound and earthworks lie in about the same latitude as the one on the eastern side of Lake Okeechobee, described on a preceding page. The main axis of the ruin is nearly east and west. The earthworks towards the east are closed. Those on the west seem to diverge slightly and an aboriginal canal is said on good authority,

[10] Journal of The New York Botanical Garden **24**: 220. 1923.

to come up between these banks from Lake Flirt. This old waterway is partially navigable in flood seasons. Thus, as in the case of the mound east of Lake Okeechobee, this one could be approached afoot or by canoe, according to the season and the direction the pilgrims may have come from. South of the mound and earthworks are a number of burial mounds of different sizes, each with a dense scrubby hammock growth. It is exceedingly irritating and exasperating to examine, think about, and describe these mounds without any clue or information as to what they were primarily used for or what happened there. One can imagine all kinds of council meetings and ecclesiastical performances as taking place there, but definite information is nil. These structures do not seem to be mentioned in the records of the Spanish adventures or those captured and held prisoners for many years by the aborigines. They appear not to have been places of continuous residence, at least there are no economic aboriginal plants present now as there are on the kitchen-middens.

The Caloosahatchee Prairie was very dry and the cattle were gathered together in groups where water holes should be normally. The cypress heads and strands were brilliantly green and were usually surrounded by masses of large-flowered and large-fruited iris mentioned on a preceding page. North of Thlathtopopkhatchee, or in common parlance Fisheating Creek—literally translated River—we entered the Indian Prairie. This region comprises perhaps one hundred and fifty thousand acres consisting of open prairie or islands of cabbage trees (*Sabal Palmetto*). It is sometimes locally known as Palmetto Prairie. It is one of the most remarkable palm regions in the world, and it becomes more enchanting each time one crosses it. The palm trees are scattered or grouped, or massed—densely crowded—into islands acres in extent. Literally there are billions of palms there. The growth and abundance is inconceivable unless one has been among them, and more than one excursion is necessary in order to realize the magnitude of the palm association. If it were not for prairie fires, there would be a more tremendous growth of the cabbage-tree. Terrific fires had swept the prairies and palms since our latest crossing and we could see how the palm groups are gradually reduced in area by fires. Fortunately most of the trees are tall enough to preserve their bud from the

consuming heat and flames of the tinder that may have gathered under the trees in a fire-free period.

Next came the Kissimmee Prairie with its glorious growth of saw-palmetto (*Serenoa repens*) which here replaces the cabbage-tree. There the fires have reduced the saw-palmetto to various-shaped and various-sized islands, just as in the case of the cabbage-trees on the neighboring Indian Prairie. We reached and crossed the Kissimmee River when the low sun gave every outlook an enchanting touch. The river and its labyrinth of blind channels was filled with fleets of water-hyacinth plants with their sails set, going hither and thither according to the breezes and the currents, but all ultimately bound for Lake Okeechobee. A short cut of about twelve miles through the pinelands and little prairies over a mere trail, perhaps over a century old, brought us promptly to the great Okeechobee Prairie, across which the low houses of Okeechobee City in the horizontal light of the setting sun resembled a white sand-bank in the distance. The nearly full moon rose while the sun was setting and Venus was lighting up for the evening. Thus we had more than twenty-four hours of continuous light.

We reached the eastern coast without special incident. In the morning for the distance of about ten miles along Saint Lucie Sound, we ran through a vast migration of white butterflies. They were so numerous that it frequently was like running through a snow squall. The radiators of the motor cars, going both north and south, were masses of white butterflies!

Two further observations—one destructive, the other constructive –on the coastal dunes along Lake Worth, ended the incidents of general interest before we reached Miami in order to prepare for another excursion. Large areas—many acres—of beautiful saw-palmetto had been grubbed out of the sand and burned. Fire had gotten loose and swept over large areas clothed mainly with cabbage-trees. The low trees were killed while the tall ones were starting to recover—this apropos of a statement about the Indian Prairie on a preceding page. While wandering through the dense hammock between the ocean and the lagoon we unexpectedly found scattered plants of the thatch-palm (*Thrinax parviflora*) and the guiana-plum (*Drypetes lateriflora*). These plants had not previously been found north of the Miami River

region. As they are berry-bearers, we shall have to attribute their presence up at Lake Worth to the work of migratory birds as we did in the case of the silver-palm.[11]

(*To be continued.*)

JOHN K. SMALL.

SELECTING A NATIONAL FLOWER[1]

Taking as a topic "Selecting a National Flower," the speaker pointed out that while many countries have a national floral emblem—England the Rose, France the Iris, Japan the Chrysanthemum, etc.—none has ever been adopted for the United States. Most of the individual states have selected state flowers. In some cases these are wild species, typical of the individual states, as the California Poppy, the Colorado Columbine, and the Maine Pine. In other cases they represent an important crop, as the Florida Orange-blossom and the Delaware Peach. In still others cultivated plants having no obvious connection with the state have been selected, as the Carnation in Ohio and the Red-clover in Vermont. The state flower of New York is the Rose, of New Jersey the Violet, although no details as to what kind of rose or violet appear to have been specified. Connecticut has appropriately adopted the native Mountain Laurel, while Pennsylvania is not known to have made any selection.

Such proposals as have been made for the national flower of the United States have included all of the above types of plants, but many objections can be raised against most of them. Thus the Goldenrod is a weed, and moreover is not limited to this country, having been known and named in Europe long before America was discovered. The Mountain Laurel, on the other hand, grows only in a limited part of our country, and is not easy to cultivate more widely. Some sort of Columbine does grow in every state, but there are also European ones, and a bill presented to the recent Congress proposed to make the English Columbine (*Aquilegia vulgaris*) the national flower of the United States.

[11] Journal of The New York Botanical Garden 23: 152. 1922. 25: 241. 1924.

[1] Abstract of an illustrated lecture given at The New York Botanical Garden on Saturday afternoon, July 21, 1928.

The plant which the speaker favored for the national flower of this country is the Phlox, which has all of the advantages and none of the objections of the others proposed. Some kinds of Phloxes grow wild or as escapes from cultivation in every state in the union; and with the negligible exception of one species, which has crossed the Bering Strait from Alaska into Siberia, all are North American, and none grow in Europe at all (except in gardens). Phloxes come in our national colors, red, white, and blue, and the flowers of some kinds are five-pointed stars; they bloom, too, over the fourth of July. They never become weeds, yet can be easily cultivated, so were this suggestion adopted, every one could grow our own national flower.

The lecture was illustrated by a series of 50 lantern slides, many of them representing wholly the work of the speaker, from the first exposure of the plate in the camera to the hand-coloring of the slide, bringing out as accurately as practicable the color and appearance of the living plant.

EDGAR T. WHERRY.

THE JOHN INNES KANE FUND[1]

This permanent fund was established by Mrs. Kane in December, 1913, as provided through the following letter:

1 West 49th Street,
December 17, 1913.

"Dr. N. L. Britton, Secretary,
New York Botanical Garden.

My dear Dr. Britton:

If it will be agreeable to the Managers of the Garden, I shall be glad to establish a memorial to my late husband, John Innes Kane, remembering his interest at all times in the Garden. I shall be prepared to send to the Managers a cheque for ten thousand dollars upon learning that such purpose is approved by them.

I should wish the fund to be called 'The John Innes Kane Fund,' to be held and invested and the income applied to the purchase of living plants for the grounds and greenhouses.

Please present the subject in the proper quarter, and inform me.

Yours faithfully,
(Signed) ANNIE C. KANE."

[1] See Journal New York Botanical Garden **15**: 175–176. 1914.

The gift was gratefully accepted by the Board of Managers on December 18, 1913, and the income has since been used for the purpose specified. It has added many beautiful and interesting plants to the collections, from time to time, providing income of about $450 annually.

Mrs. Kane died on July 23, 1926; her will includes the following bequest:

"I give and bequeath to The New York Botanical Garden, incorporated in the year 1891, and located at Bronx Park, in the City of New York, the sum of Twenty-five thousand dollars ($25,000) in memory of my husband, John Innes Kane."

This bequest was received from her executors on January 15, 1927.

At a meeting of the Executive Committee of the Board of Managers held November 10, 1927, the Treasurer was authorized to add this bequest to the John Innes Kane Fund, and such action was taken.

Through reinvestment, the principal of Mrs. Kane's gift of 1913 has been increased to $10,347.63. The John Innes Kane Fund thus becomes $35,347.63, yielding annual income of about $1,800.

N. L. BRITTON, *Secretary.*

THE 1928 DAHLIA COLLECTION

The 1928 dahlia collection of The New York Botanical Garden includes 1050 plants, representing 397 varieties. The red bed this season is made up of one variety, Le Toréador, 52 plants. The color bed of the orange, salmon-pink, rose, and light lavender shades is composed of the varieties Sherlock, Captain John, Jean Chazot, Miss Myra Valentine, Casper G. Ware, Mrs. W. E. Treat, Calvin Coolidge, Jr., Mrs. J. T. Marean, Jersey's Beauty, Harry Mayer, George Walters, Jersey's Olympus, Mrs. A. G. Hull, Mrs. Eleanor Martin, Chemar's Masterpiece, Mrs. W. H. Waite, Mrs. I. de Ver Warner, Winifred Devine, Margaret W. Wilson, Jersey's Jewel, Anna C. Barnum, and Eva Williams, in numbers ranging from three to twenty-four of each. In the bend of the

main border, where, on account of soil conditions, too many tree roots, or other cause, the results in previous years have not been altogether satisfactory, a few resistant vigorous varieties, such as Countess of Lonsdale, Papillon, Uncle Sam, and The Choctaw, have been massed, and the outlook for a profuse display of flowers in the most conspicuous part of the collection seems promising.

The principal donors of roots or plants to this year's collection are Fisher & Masson, Trenton, N. J.; Waite's Gardens, Inc., Eatontown, N. J.; Mr. J. A. Kemp, Little Silver, N. J.; Blue Ribbon Dahlia Co., Trenton, N. J.; Downs Dahlia Farms, Clayton, N. J.; Mr. Alfred J. E. Schmidt, Newark, N. J.; Mr. Conrad Frey, Newark, N. J.; Mr. Frederick E. Dixon, Scotch Plains, N. J.; Dahliadel Nurseries, Vineland, N. J.; Mr. W. N. Corby, Verona, N. J.; Mr. James Smith, Plainfield, N. J.; Mr. W. W. Wilmore, Denver, Colorado; W. Atlee Burpee Co., Philadelphia, Pa.; Mr. John Harding, Norwalk, Conn.; Meachen & Sherman, Stratford, Conn.; C. Louis Alling, West Haven, Conn.; Mr. Nathan A. Miller, Branford, Conn.; Mr. William Seltsam, Bridgeport, Conn.; Fraser's Dahlia Gardens, Willimantic, Conn.; Mrs. C. R. Stewart Leckie, Greenwich, Conn.; Mr. J. McCarroll, Greenwich, Conn.; Mr. Herman Rindfleisch, Mamaroneck, N. Y.; Mannetto Hill Nurseries, Hicksville, N. Y.; Chemar Dahlia Gardens, Oyster Bay, N. Y.; Mr. Fred von Rodeck, Brooklyn, N. Y.; Mr. J. E. Du Bois, Sparkill, N. Y.; Success Dahlia Gardens, Lawrence, Mass.; J. B. S. Norton, Hyattsville, Md., and Mr. F. C. Burns, San Rafael, California.

MARSHALL A. HOWE.

PUBLIC LECTURES DURING AUGUST AND SEPTEMBER

August	4.	"Lilies,"	Dr. A. B. Stout.
August	11.	"Phlox,"	Mr. Alfred M. S. Pridham.
August	18.	"Naturalizing Bulbs,"	Mrs. Wheeler H. Peckham.
August	25.	"Summer Flowers Grown from Seed,"	Mr. Kenneth R. Boynton.
September	1.	"The Japanese Beetle,"	Mr. Loren B. Smith.

September 8. "Gladiolus," Mr. Wm. Edwin Clark.
September 15. "Growing Dahlias from Seed," Mr. W. H. Waite.
September 22. "Trinidad and the Virgin Islands," Dr. Fred J. Seaver.
September 29. "Gardening Books," Dr. J. H. Barnhart.

NOTES, NEWS, AND COMMENT

Dr. A. B. Stout spent a week during the latter part of June at the New York Experiment Station at Geneva, in the work of breeding for new varieties of hardy, seedless grapes.

Miss Dolores Fay and Mr. Oliver Orton have been granted scholarships for the summer months to assist in studies now in progress in connection with the sterilities of day lilies (*Hemerocallis*).

Professor F. A. Varrelman, of the department of biology of the American University, Washington, D. C., is spending the summer months in the laboratories of the Garden, in continuation of his studies of the morphology and cytology of dodder (*Cuscuta*), which are parasitic plants on herbs and shrubs.

On January 26 and 27 last, Mr. Clement G. Bowers, a student of the Garden, gave a series of three lectures before the students and staff of the Department of Ornamental Horticulture at Cornell University, Ithaca, N. Y. These lectures concerned the scientific and technical problems involved in the breeding, propagation, and culture of rhododendrons and azaleas, with a practical discussion of the various species and hybrids. A dinner, at which Mr. Bowers was guest of honor, was tendered by the graduate students of the department.

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GENERAL INFORMATION

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

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

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

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

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

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

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

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

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

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

A library of botanical literature, comprising more than 37,000 books and numerous pamphlets.

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

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

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

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

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

Contributions to the Garden may be deducted from taxable incomes.

The following is an approved form of bequest:

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

All requests for further information should be sent to

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NATURALIZING BULBS

During the Nineteenth Century a formal type of gardening, scornfully spoken of nowadays as "bedding out," became the fashion. With the exception of shrubbery, plant-material was anything but permanent. Quantities of plants were propagated and successions of planting were made, giving, often, a gorgeous effect, but the periods of transformation were ugly and unpleasant besides being expensive and needing a great deal of thought. Owing to the almost superhuman efforts of Mr. William Robinson the styles have changed and the best gardens are now planned for continuous beauty, whether it is given by form or by flowers, fruit, or foliage. Instead of taking a piece of country and making it over to suit an alien design, we now consider the natural resources, and our *good* gardening is planned with these for a foundation. We wish, then, to give an effect of Nature and we plan our grouping to produce it, in the flower-border or in the meadow.

The principles of "naturalizing" are: good design; logical choice of material; color effect that is not only beautiful, but is arresting; convenience. The qualities needed for success are discrimination and courage!

As for design, it will be necessary, before we can make a success of it, to study plants as they grow in the wild state. When driving through the country-side or when passing along it in trains, keep the eyes open. Then it will be noted that wild-flowers grow in colonies and, while a certain plant may predominate in one meadow, usually the whole surface will not be given over to that particular variety. There will be "drifts" of other plants

interspersed, perhaps to bloom later and so carry on the flowery season. Another thing, soil, exposure, and moisture control the type of plants of any special locality, so these matters should be considered before it is decided what to plant. After looking over the ground for the proposed planting, make a rough sketch on paper, laying out your "drifts" to run across or diagonal with the usual line of vision from the points most generally vis-

FIGURE 1. Crocus naturalized on edge of lawn, Langthwaite, New Rochelle, N. Y., 1928.

ited. Note the slant of trees to see if winds are stronger from any one direction and, if this is the case, let the tapering ends of the drifts be in line with the slant of the trees, as if seeds had blown there from the original masses. Never put drifts at right-angles to a path or road and try to plant both sides, letting the drifts run across. Color may be washed on to the sketch and varieties chosen to produce the desired color combinations. Not

only will this plan be a help at the time of planting, but it will be valuable to refer to later when identifying varieties. Masses are needed and spottiness is to be avoided like sin, so do not mix the bulbs beforehand and never purchase mixed bulbs. A number of kinds may be used by keeping them to colonies of themselves and letting the drifts blend into one another. For color effects almost anything will be successful if one remembers to blend and put

FIGURE 2. Narcissi naturalized at Knollwood Farm, Port Chester, N. Y., 1928.

medium tones between dead whites and strong blues, reds, purples, and yellows. Blue and mauve tend to disappear into the landscape and lend distance, whereas yellow jumps forward. Even red goes away as compared with yellow, and purplish-reds recede almost as rapidly as do blues.

Background is essential for all good plantings, so, if there is none originally, try to put some in.

Bulbs are especially good for pulling the edges of woods, rock-gardens, and shrubberies down to lawns and meadows.

When introducing a new plant to an association already on the spot, note the average height of what is growing and choose your varieties to be taller than their neighbors at the time they bloom, and be sure that your plants will thrive where you put them. To "naturalize" you will plant in quantity, so, if the experiment turns out a failure the loss will be heavy.

FIGURE 3. *Narcissus poeticus,* with *N. Leedsii* "Evangeline," New York Botanical Garden, May, 1928.

Bulbous plants are very good subjects for natural plantings and varieties suitable for many conditions are available. Kinds may be found for meadows in full sun, for woodland in semi-shade, for dry, shady soils, peaty land on the borders of marshes, dry locations under trees with spring sunshine, for edges of lawns, for lawns under trees, for corners in the country, such as entrances of fields or stable-lanes and for many other patches of

ground too often but a neglected opportunity. The most important thing to keep in mind is that the grass or other herbage must not be cut until the foliage of your bulbs has ripened, which condition will be shown by the yellowing of the leaves. Therefore, if you want a shaven lawn at all seasons do not plant bulbs in it. However, the edges may be planted with uneven drifts of Crocuses or early Squills as this foliage ripens quickly and by June the grass may be scythed off, mown close, and, after a very short time, will all be green again. If Daffodils are used, the hay can be cut the end of June and it will not be harmful to cows. Rabbits and deer do not care for the green leaves of Daffodils or Snowdrops as they push up early in Spring, for in their make-up are bundles of prickly crystals that give animals indigestion. Hence all bulbs belonging to the order Amaryllideae are excellent for naturalizing. I am sorry to say that mice dote upon Crocus corms and Tulip bulbs, but if naphtha flake is put in with the bulbs the disagreeable effect to rodents lasts a couple of years, giving the bulbs a chance to get a good start.

Bulbs that may be used for this type of planting are Narcissi, Tulip species, Crocuses (spring and autumn varieties), Scillas, Colchicums, Camassias, Lilies, Snowdrops, Snowflakes, Fritillaries, Grape Hyacinths, Chionodoxas and Dog-tooth Violets. The best subjects for meadows are Narcissi, Tulip species (*T. sylvestris* is a good one), *Scilla campanulata,* blue, pink, and white; Camassias, blue and white, and, for bordering damp fields, *Lilium canadense.* For open woods where sun sometimes comes, Narcissi belonging to the Leedsii and Poeticus groups, Summer Snowflakes, *Scilla nutans* and Wood Lilies are all good. Under trees that are bare of leaves in early Spring, *Scilla sibirica, Scilla bifolia,* Chionodoxas, Snowdrops, Spring Snowflakes and Crocuses do well. Ferns added in such places will not interfere with the flowers of the bulbs and will cover the bare spots that would be left later when the foliage dies away. Edges of lawns may be planted with Crocuses, using preferably species and not the huge horticultural varities, Snowdrops, or the Siberian Squill. Trees such as apples and maples may well have families of Fritillaries (Guinea-hen Flower) nodding in the wiry grass beneath, while Erythroniums (Dog-tooth Violets) enjoy damp spots in sunny woods. Grape Hyacinths thrive in sun near trees where the

grass does not do well and Autumn Crocuses must be placed where grass is cut in August, not to be mown again until October. For corners of fields where there is heavier herbage, *Camassia Cusickii* will be satisfactory or "Tiger" Lilies in big groups give a fine splash of color. The tall Crown Imperial (*Fritillaria imperialis*) can be tried here in strong sun with good results also. Colchicums may be introduced into meadows where grass will be short in the autumn, but their foliage is extremely coarse and untidy in the garden-bed and perhaps the very best place for masses of these flowers is on the margin of woods where there are patches of Violets or among Epimediums or the hated (?) Pachysandra. Myrtle is another good ground-cover for the Meadow Saffron (*C. autumnale*) provided it does not grow in full sun, causing it to "ramp." The French think that Colchicums are dangerous plants to have where animals are apt to graze as they say the beasts are poisoned. Certainly, a great quantity would not be very digestible and so the woods would be the best place.

When starting a planting, bulbs may be scattered and put in just as they lie, being sure not to plant too thickly as they increase rapidly and, if planted at even intervals and in rows, will always give a clumsily ugly and unnatural effect. Lumpy masses are anathema. One should be far more careful with graded bulbs than with those that are the increase of one's own flower-border plantings. These last come in large and small sizes and, if planted without grading, will give a very satisfactory result. Tools to be used are, best of all, a Barr's Bulb Planter, an excellent, sharp thing that takes out a plug of sod when stepped upon, or else large flaps of sod can be cut with a spade and the bulbs thrust under. It does not matter if they lie on their sides. They should be covered about once and a half their own depth from the bottom to where the neck begins and, as even large groups like Narcissi vary considerably according to the variety, this is a rule to keep in mind. Lilies should go in deeper and Colchicums like the top of their long necks to be just under the surface.

If one is willing to go slowly about naturalizing, it is within the reach of anyone with land to plant, and so satisfying are the results, that it would be well if more of us "went wild."

ETHEL ANSON S. PECKHAM.

BOTANICAL FIELDS, HISTORIC AND PREHISTORIC

(*Continued from page 209*)

On Key Largo

Before starting on the final trip up the coast, the "Barbee" recently rebuilt above the water line, was taken on a trial trip to Key Largo.

While going down Bay Biscayne we frequently passed floating plants washed down from the interior of the State—a water-lettuce (*Pistia*), a water-hyacinth (*Piaropus*), a spatter-dock (*Nymphaea*), water-lily (*Castalia*), and a floating heart (*Nymphoides*). These plants, of course, contribute in an infinitesimal way in filling up the bay, which will ultimately become a marsh unless the land subsides too rapidly.

We landed for a short time near the northern end of Key Largo, where a strong breeze drove the lapping waves against the rocky honeycombed shore line, thus eating away the coral limestone both mechanically and chemically. A white line here and there indicated places where the rock, undermined, had broken away and fallen into the water. Thus directly the area of the keys and indirectly their flora is reduced. The conspicuous trees about an old settlement were the native Jamaica-dogwood (*Ichthyomethia*) and an introduced orchid-tree (*Bauhinia*) with beautiful butterfly-like flowers. Night overtook us in Barnes' Sound, but we managed to sight the target at the entrance to Jew Fish Creek and tied up at the dock near the drawbridge for the night. Early in the morning we found our way through Lake Surprise and anchored at the end of a ditch right in the side of Largo. The red-mangroves everywhere were laden with fruits—viviparous embryos half-grown. A trail through the hammock soon brought us to the settlement and post-office of Key Largo. The exotic natal-grass (*Tricholaena*) was widely naturalized about the settlement, whence we at once made reconnaissance of the northern half of the island through fifteen miles of largely primeval hammock. Spring was already well under way and some shrubs and trees were still in flower. The very conspicuous inflorescences were those of two palms the thatch (*Thrinax parviflora*) and the cabbage (*Sabal Palmetto*). The great

FIGURE 12. A former shore line, now above high tides, where the Everglade Keys abut on Bay Biscayne, Florida. A fault left this wall of oölitic limestone. The result of the action of the small waves of the bay may be seen in the concave sculpturing at the base of the cliff. The sculpturing for several miles along this cliff is not always as smooth and even as shown here; it is sometimes fantastic and forms cañons and grottoes. This rock facies

plumes of myriads of white flowers often gave the effect of gigantic feathers among the dense greenery. The cabbage-tree until rather recently was thought to be nearly or quite absent from the Florida Keys. The thatch is a true fan-palm, the cabbage is a combination of the fan and the feather. Our hopes to add a feather palm (*Pseudophoenix*) to the flora of Key Largo were not realized, but we still suspect that it is hidden somewhere in the primeval forest. The forest trees in flower, but with inconspicuous inflorescences, were mainly: wild-tamarind (*Lysiloma bahamensis*), bustic (*Dipholis salicifolia*), lancewood (*Ocotea Catesbaei*), pigeon-plum (*Coccolobis laurifolia*) wild-coffee (*Colubrina Colubrina*), Guiana-plum (*Drypetes lateriflora*), whitewood (*Drypetes keyensis*), and crabwood (*Gymnanthes lucida*). Some had quite fragrant flowers. Those with hard barks were hosts for many lichens. Those with rough bark were hosts for flowering epiphytes and ferns. Old poison-wood trees (*Metopium*) were favorites. Four or five kinds of wild-pines—*Tillandsia Balbisiana, T. Valenzuelana, T. fasciculata,* and *T. utriculata* were widely distributed. Very abundant locally was one of our rarer tree-orchids (*Epicladium Boothianum*), which could often be stripped off tree trunks in mats several feet square, and the common tree-orchid (*Encyclia tampensis*), which grew in large clumps. Both these orchids were in fruit. The whisp-fern (*Psilotum nudum*) which generally grows at the bases or on the roots of trees was here twenty or twenty-five feet up on old tree-trunks. The wild-papaya (*Carica Papaya*) was almost universal. Two vines, one woody, the other herbaceous, with almost indefinitely elongate stems and branches climbed up into the trees. The woody vine—*Hippocratea volubilis*—had clusters of small white flowers, while the herbaceous one, wild rubber-vine—*Rhabdadenia bicolor*—had large usually solitary flowers. Two woody plants with blue flowers should be mentioned—the Bahama nightshade (*Solanum bahamense*) and the lignum-vitae (*Guaiacum sanctum*), the latter with corollas of intense blue.

The most elegant woody plant was the locust-berry (*Byrsonima lucida*). The trees were laden with clusters of the rather unusual flowers with deep-pink corollas and numerous pendent partly ripe green or yellowish fruits which all together gave the shrubs and trees a very individual and decorative effect. Cacti

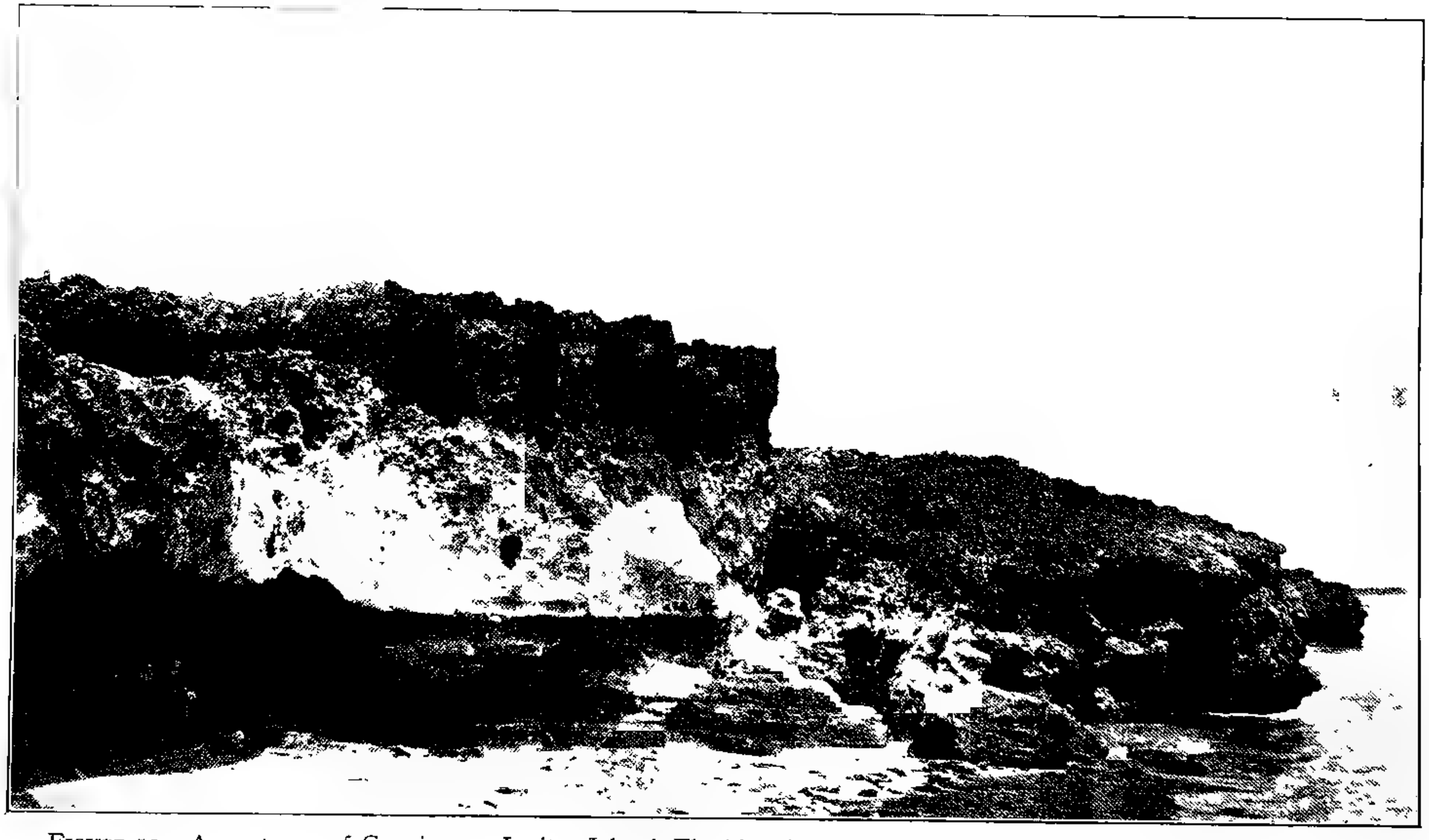

FIGURE 13. An outcrop of Coquina on Jupiter Island, Florida. Here the foot of the cliff is still within reach of high tides. The waves of the open ocean in this case sculpture the rock and often undermine it to such an extent that large sections break off and fall. This formation consists of very small [illegible]

were not wanting, for near the shore the prickly-pear (*Opuntia Dillenii*) and the prickly-apple (*Harrisia Simpsonii*) were occasionally grouped in colonies. On Key Largo this prickly-apple thrives on the rocks on the northwestern part of the island. Curiously enough, on the circular Pumpkin Key, which lies off the northwestern tip of Key Largo, the plant is confined to the northwestern sector of the Key.

Up the Eastern Coast

On our homeward journey, advantage of the course up the Florida coast was taken to do further field work. We crossed from the mainland to the coastal dunes at Boca Ratone. The indigo Gulf Stream was clearly marked off at the horizon by the much paler but bright-blue sky. The barrier-beach was quite variable. In some places it was steep and narrow, supporting merely a line of sea-oats (*Uniola*). In other places it was wide and gently sloping, with patches of Spanish-bayonet (*Yucca*), sea-grape (*Coccolobis*), cocoa-plum (*Chrysobalanus*), beach-lavender (*Tournefortia*), and beach-lobelia (*Scaevola*).

The geology of the eastern coast strip is particularly interesting, especially those parts which seem to be related to the lake region, both in its superficial aspect and its floristics. It has been described in more or less detail,[12] but apparently its origin has not been accounted for to any extent. In the coast strip, that is the mainland, from the Miami River to Riviera, the surface is nearly or essentially flat, the lower areas floristically pineland or flat woods, the slightly more elevated scrub. North of Riviera the land rises into hillocks and ridges, of scrub, and plateaus which are occupied by cypress heads. The land then falls off toward the Jupiter River. North of the Jupiter estuary the land is more elevated and mostly scrub with high hills and valleys which sometimes have lakelets, altogether very suggestive of parts of the lake region. Approaching the estuary of the combined Saint Lucie and Halpatioke Rivers the land again becomes low and level. North of this estuary hills again appear for a few miles and then a kind of barrier ridge close to the lagoon—Saint Lucie Sound—begins and extends northward, sometimes

[12] Sanford, Topography and Geology of Southern Florida, Florida State Geological Survey, Second Annual Report, 177–231. 1908–09.

swinging away from the lagoon, sometimes low and extended, but usually with scrub, indefinitely. The floristics of parts of this ridge, like that of the great dunes of Hobe Sound and thereabouts is composed of the same kind of plants as that of the dunes or sandhills of the lake region. This ridge has been one of the greatest orange regions known. These inland and coastal miniature mountains of sand referred to above would tend to support a popular idea that there are no rocks visible on the surface of Florida. The three figures accompanying these pages show several of the visible rock formations of the eastern coast. These formations are the habitats of many interesting plants.

The two dominant, or we might say natural, plant associations are pineland and scrub. Where the aborigines have built kitchenmiddens or had temporary or permanent settlements we find hammock. In fact hammock tends to be the type of vegetation wherever the natural surface of a region has been disturbed, or, wherever the Indian cleared the land, the original plant-association seldom if ever repeated itself. And so, on up the coast, the succession of hammocks is not wholly due to nature, directly, through the vegetation itself, but to nature with the help of the aborigines who prepared the soil—village sites and kitchenmiddens—and to birds and mammals who sowed the seeds of the fleshy-fruited shrubs and trees, often brought from a distance.[13]

On the coastal dunes about the kitchenmiddens and the village sites of the old Indian, for he lived on one side or the other of the lagoons, some of the plants that furnished the aborigines with staple foods were blooming profusely. Mile after mile of the sea-grape (*Coccolobis*) and the saw-palmetto (*Serenoa*) showed masses of flowers, and the combined fragrance was often almost overpowering. Today the fruits of the former are often eaten as they were in prehistoric times, and also made into preserves. The fruits of the latter are now used in medicine, but they are rarely eaten, as the pulp seems to be offensive to the white man.[14] Their flowers today are of great economic value, for along with the black-mangrove (*Avicennia*) they are locally often the principal sources of honey. The black-mangrove yields

[13] Journal of The New York Botanical Garden **23**: 152. 1922.
[14] Journal of The New York Botanical Garden **27**: 195. 1926.

a pale-honey, the sea-grape one of medium shade, and the saw-palmetto gives a dark honey. Of course the honey from the flowers of the citrus trees—mostly orange and grape-fruit—is often mixed with that of the native kinds. So abundant is the supply from the native plants mentioned above that single apiaries often yield between forty and fifty thousand pounds of honey a year.

Along the way two classes of naturalized plants were observed from time to time. The one class may be represented by the African bowstring-hemp (*Sansevieria*) and the sensitive plant (*Mimosa pudica*); these, dependent mostly upon creeping stems for their propagation, are local in their distribution. On the other hand, the periwinkle (*Catharanthus*) and the beggar's ticks (*Bidens pilosa*), both of which produced fruits copiously, are universal and ubiquitous.

A large part of the territory traversed was barren of showy flowers, but when we passed through the former aboriginal settlement sites with their rich soil, especially in the lower parts, conspicuous flowers appeared aplenty, for example, lead-plant (*Amorpha*), coral-bean (*Erythrina*), pink-mallow (*Kosteletzkya*), vervain (*Verbena*) and ruellia (*Ruellia*).

One of the great centers of aboriginal activities was our ultimate destination on the trip northward, at the upper end of the Indian River. At Cocoa we crossed the lagoon to Merritt's Island, having planned for a further study of the remarkable coquina formation at the southern tip of the island.[15] The two showy plants in the pinelands on the island near the bridge were naturalized exotics, originally from Texas, where they were discovered in the thirties of the last century and after which they spread eastward, gaining greatly in abundance in the last two decades. Curiously enough, both were discovered by the same collector and both bear his name—*Raimannia Drummondii,* an evening primrose with large yellow flowers, and *Phlox Drummondii,* a phlox with numerous flowers of nearly every shade of color except yellow, and often white.[16]

Stormy weather set in with our advent on the island. We secured a small motor boat at Tropic and set out for the coquina.

[15] Journal of The New York Botanical Garden **26**: 268. 1925.
[16] Journal of The New York Botanical Garden **19**: 4–5. 1918.

Coincident with our start a "blow" came up and the waves of the Indian River soon soaked us. However, we pushed southward and rounded the point of the island and entered the Banana River. The wind coming from the south also stirred up the Banana River so that landings could not be made from either side of the island, as the waves would beat the boat on the ragged coquina which extends some distance from shore just under water.[17]

Not being willing to have our plans wholly defeated, we returned to an old dock a mile or more from the tip of the island and landed there. Thence we made a rapid survey of the crest of the coquina afoot, clear to the tip. It was a jagged walk, for not only was it necessary to watch each step on the weathered coquina, but nearly every step necessitated dodging a Spanish-bayonet (*Yucca*), a dangerous saber (*Agave*), myriad cactus needles (*Opuntia, Harrisia, Acanthocereus*) and spine armed shrubs. This spiny character of the vegetation was commented upon in the paper referred to above. The vegetation is in keeping with the jagged rock, for succulents and shrubs and trees, and even herbs, are frequently armed. The armed herb is a mallow, a species of the genus *Pavonia.* Its fruits terminate in ridged spikes, whence its specific name *spinifex.* This is doubtless a native plant, for it is very abundant in primeval parts of the State, although it has been by some botanists considered as a probable introduction into our flora.[18] It occurs in the wild state in the fern grottoes of Citrus County[19] as recorded several years ago. How loath some botanists are to give proper credit as native plants to some prominent members of our floristics! The leadwort (*Plumbago scandens*) is another case in point.[20]

The woody growth of the coquina forms a diminutive forest. The trees are stunted from complete exposure to the constant winds and lack of abundant nourishment. We collected thirty kinds of shrubs and trees, representing nearly a score genera. They were the tropical kinds that also inhabit the kitchenmiddens

[17] For some notes on this coquina formation and its vegetation see Journal of The New York Botanical Garden **28**: 35–38. 1927.

[18] Synoptical Flora of North America **21**: 331. 1897.

[19] Journal of The New York Botanical Garden **21**: 35. 1920.

[20] Synoptical Flora of North America **21**: 55. 1878.

of the region, only not as numerous in kinds. Many of the trees were in bloom. Particularly interesting were two kinds of blolly (*Torrubia*), one with large leaves and one with very small ones—a quarter of an inch broad. We await the collecting of the fruits of these plants with much interest. Some of the other trees were in fruit. Several large mastics (*Sideroxylon*) were laden with yellow fruits, thus supplying some of the wild animals, particularly the raccoon, with an abundance of food.

The following morning we went into the Turnbull hammock above Titusville for further studies in the needle-palm (*Rhapidophyllum Hystrix*.[21] Fortunately the plants were in flower and we secured photographs of the inflorescences of both sexes and of the fruits persistent from the preceding year. The palms with old fruits were not flowering this year. This condition leads us to suspect that the certain plants flower only alternate years, or even less frequently, as we have found plants with fruits that had been persistent in the crown for at least two years. Unlike all our other palms the spadix of the needle-palm is very short, both in flower and in fruit. Our other palms can scatter their fruits directly or indirectly, but this one cannot, hence, evidently, the subterranean branching of its rootstock, as shown on a preceding page. Thus the palm is perpetuated and scattered, very slowly, however, by the vegetative method of propagation. So short is the inflorescence that it is seldom visible without first pulling away a mass of dead leaves and humus that has collected in the crown and is held there by the numerous erect needles of the leaf-sheaths, which are also effective in keeping birds and mammals from carrying off the fruits and thus scattering the plants as they do in the case of other kinds. In case the palm is flowering, when the extraneous matter is pulled out of the crown of leaves a congested panicle of white staminate or green pistillate flowers is found. How the pollen is transferred from the staminate plant to the pistillate is still a mystery. However, if the pistillate plant has made fruit, the fruits will be found attached to the spadix and clustered under the extraneous material just as were the flowers. The fruits may be

[21] More than a hundred specimens of this palm were transplanted from this hammock to the Deering reservation at Buena Vista.

FIGURE 14. On the coastal sand-dunes north of Mosquito Inlet, Florida. The two preceding figures showed formations of the Pleistocene. The present figure represents a very recent geologic formation—of purely human origin. This formation—kitchenmiddens of oyster, clam, and other kinds of shells—collectively comprise thousands of acres. This one—Castle Mound—was once at least thirty feet high. The figure shows the top of the core made by the continuously elevated fire place as the mound was built higher and the shells were concreted. The loose shells have been removed for road material

found a year old with the hairy outer coat still on, or they may be two years old with the outer coat rotted off. At this age or still older, provided sufficient moisture has been present, a cluster of seedlings—a kind of viviparous arrangement—may be found. These seedlings, of course, are destined to die unless they are accidentally dissassociated from the parent plant or are near enough to the ground so that their roots may take hold in the soil. The cabbage tree is equally abundant thereabouts in the Turnbull hammock. Its local propagation and possible distant distribution, so strongly contrasted with the needle-palm, is referred to in a former article.[22] This hammock, many miles in extent, is teeming with subjects for study and problems awaiting elucidation. A large collection of ferns—rare and common species—were taken to Buena Vista for growing and study. Likewise a collection of the tall jack-in-the-pulpit, referred to in a former article, was set out at Buena Vista for study. This plant grows as high as one's head and seems to flower throughout the year. Our desired photographs having been secured, we pushed on another stage northward to the coastal dunes south of Mosquito Inlet. *En route* we looked at the middens near Oak Hill, which were formerly quite extensive, but which have already been much reduced in area and in height by the county road-making operations.

We crossed the lagoon at Coronada just below the Mosquito Inlet, and drove southward for a distance of between fifteen and twenty miles over the coastal dunes to an isolated settlement at the upper end of the Indian River, called Eldorado. Most of the way is through an untamed country, but *en route* we could tell that we were approaching a recently established habitation by the character of the vegetation—WEEDS—along the trail. Peppergrass (*Lepidium virginicum*), beggar's-ticks (*Bidens pilosa*), wild-pea (*Vigna repens*), and cudweed (*Gnaphalium obtusifolium*) eclipsed the native herbs.

This lately opened trail is a wonderful drive. The first few miles of its course lie through a great primeval hammock along the lagoon, in which live-oaks (*Quercus virginiana*) and cabbage-trees (*Sabal Palmetto*) are the prominent plants. The great

[22] Journal of The New York Botanical Garden **28**: 40. 1927.

live-oaks are usually gnarled or twisted with low or high horizontal branches. These are regular hanging gardens copiously laden with ferns and orchids, and frequently with small specimens of cabbage-trees which were, evidently, sown by birds[23] alighting on the limbs. Thus our common palm enters the category of epiphytic plants. At the southern end of this hammock the trail crosses diagonally to the ocean side of the offshore bar and runs through a sea of saw-palmetto (*Serenoa repens*) for many miles. The palmetto, although dominant, does not form a monotonous outlook, for there are islands of various shades of green, representing scrub-oaks, red-bay, myrtle, gopher-apple, spice-tree, and greenbrier, while towards the distant lagoon are clumps or strands of cabbage-tree and low hammock, areas indicative of former Indian occupation. We were now in the land where in prehistoric times the aborigines built up a monument which in historic times has become a very interesting botanical field.

Turtle Mound, the earliest-mentioned and most celebrated of the Florida kitchenmiddens, came into view. It is no wonder that this monumental shell-heap impressed itself on the early visitors to those shores, for as a landmark it is unique on our southern coast.[24] The temptation to revisit the mound which we partly explored in the spring of 1921 was great, but the day was too far spent. On the dunes east of the mound herbaceous plants were scarce. We did find a half dozen kinds of spurge (*Phyllanthus Garberi*), vervain (*Verbena maritima*), rattle-box (*Crotalaria pumila*), sand-wort (*Arenaria lanuginosa*), may-pop (*Passiflora incarnata*), and standing-cypress (*Gilia rubra*). Within sight of Turtle Mound the trail cuts across the dunes diagonally and meets the lagoon in a hammock at Eldorado. This settlement having been achieved, we retraced our course over the trail to Coronada and New Smyrna, and thence to Daytona, where our field work came to an end.

Many herbarium specimens of plants of special interest and museum specimens were brought back to the Garden. More

[23] Journal of The New York Botanical Garden **28**: 40. 1927.

[24] For detailed notes on this mound, see Journal of The New York Botanical Garden **24**: 198–204. 1923.

than twelve hundred specimens of living plants, representing several dozen kinds of particular interest, were taken to the Deering reservation at Buena Vista for growing and study. Some of these, particularly the palms, will ultimately be brought to the Garden for the conservatory collections.

JOHN K. SMALL.

JAPANESE AND SIBERIAN IRISES[1]

The Bearded Irises are the great popular group of these well-known garden plants. There are many hundred varieties of Bearded Iris in existence, including the dwarf forms which bloom in April, followed by the intermediates in May and finally by the tall bearded ones, which reach their maximum in early June. In addition to these common garden varieties, there are several unusual species of Oncocyclus, Regelia, and related forms which belong to the bearded group. There are about forty species of Bearded Iris recognized, and these are found in Southern Europe and in Western Asia. Asia Minor, Palestine and adjacent regions are particularly rich in such species as *Iris susiana, I. Lortetii, I. Korolkowi* and *I. Hoogiana.*

The Beardless Irises may be separated into two large groups, the bulbous and the rhizomatous. The former includes such well-known forms as the Spanish and English varieties. A few of these are familiar as cut flowers in the florist shops in the late winter and early spring. They may be grown as outdoor plants by treating them in the same way as tulips. The bulbs should be planted in the fall for blooming the next season. To some extent, varieties will persist from year to year, but, as a general rule, in Northeastern United States they soon die out.

The Beardless Iris group with rhizomes includes sixty to seventy-five species. They are widely distributed throughout the North Temperate Zone. A few species are native to Europe, a large number occur in various parts of Asia, and North America is represented by about twenty species. From the standpoint of

[1] Abstract of an illustrated lecture given at The New York Botanical Garden on Saturday afternoon, June 2, 1928.

cultivation in the garden, there are three principal groups of these Beardless Irises, namely: the Japanese, Siberian, and Spurian. A number of other species, however, are excellent garden plants.

Although several species of Iris grow in Japan, the term "Japanese Iris" usually refers to the varieties developed from *Iris Kaempferi.* They have been in cultivation for a long time, and their exact origin is quite unknown. The wild species has a rather small flower of a deep red-purple color. The falls are drooping and well separated from each other. The standards are rather small and erect. The cultivated forms vary greatly in color and in the development of the parts. A few varieties are white, others are light with darker veins and still others are various shades and tints of blue and red-purple. There are no true red, orange, or yellow varieties, although all of them have the yellow area at the base of the falls. Many varieties are single, in which there are three distinct more or less drooping falls and three small erect standards; they do not differ greatly from the wild species except in the size of the parts and the color. A large number of varieties, however, are double. In these the standards have grown out into structures as large as the falls and similarly colored. They also assume the same spreading or drooping position. In still other varieties the style branches and stamens have developed into petal-like structures.

The exact number of varieties in cultivation is not known. Perhaps there are as many as five hundred. A large number of these have originated in Japan, but many additional ones have been developed in France, England, and America. These plants are easily grown from seed and excellent new types may be secured in this way.

The Japanese Iris thrive under a variety of conditions. They do well in a good garden soil, especially if they get abundant moisture in the spring and early summer. They are well suited for the edge of the pond or the brook, provided they are not planted too close to the water. The rhizomes should not be covered with water during the winter especially.

The varieties vary considerably in height, but well-grown specimens are usually over four feet. The flowers also vary in size, depending upon the conditions under which they are grown.

They are usually not less than six inches in diameter and frequently ten to twelve, or more.

In Japan, special gardens, such as those at Horikiri, are devoted to the Japanese Iris. In such gardens large masses of different varieties are grouped together. It is common to have elevated walks among the plants so that one can look down upon the flowers.

There is another species of Iris (*I. laevigata*) which has often been confused with *I. Kaempferi.* These two species have been collected wild in the same general regions of Siberia. *I. laevigata,* however, is quite distinct in the characters of its leaves, pods and seeds, as well as in the color of the wild form, which is a deep blue-purple. A few varieties of *I. laevigata* have been developed and are in cultivation.

The Siberian Iris group includes a number of species. The best known are *I. sibirica* from Europe and Russia and *I. orientalis,* found in the northeastern part of Asia. The former species grows about three feet tall, with a flower stem extending well above the narrow leaves. Several small flowers are borne at the end of the stem. In *I. orientalis* the flower-stalk is about as long as the leaves and usually two flowers of larger size are borne at the end. These two species readily hybridize with each other and, as a result, a large number of varieties have been developed. They vary greatly in the size of the flowers, the number of the flowers, relative length of the flower stalks, and the leaves. The color is usually some shade of blue to blue-purple, but a few white varieties are known.

There are a number of other species rather closely related to *I. sibirica* and *I. orientalis.* These have been collected in southwestern China. *I. Forrestii* and *I. Wilsoni* have yellow flowers, while *I. chrysographes* has deep-violet-purple. All these species hybridize more or less and as a result a considerable number of garden forms have been developed.

The Spurian Irises are for the most part natives of the Mediterranean region. Most of them are tall with long erect leaves. The flowers are shaped somewhat like the Spanish Iris. They seem to thrive best in rather moist situations. They bloom after the Bearded Iris and just before the Japanese varieties. The

Goldband Iris (*I. ochroleuca*) is an unusually good plant for the waterside, growing to a height of at least four feet and having white flowers with a yellow center to the falls.

A number of other species of Beardless Iris have a great garden value. The common Yellow Flag of Europe (*I. Pseudacorus*) has been introduced, and thrives unusually well on the borders of streams and ponds. It is valuable as much for its foliage as for its flowers. Our native Blue Flag (*I. versicolor*) is also suited for similar situations. Less well known, but a very valuable species, is *I. prismatica,* which occurs along the Eastern Coast of the United States. It is also adapted for the water's edge, but thrives well in the ordinary garden.

In the Southern Mississippi Valley several valuable species occur. The most noteworthy is the Copper-Flowered Iris (*I. fulva*), which is unique in the terra-cotta color of the flowers. The species has been crossed with *I. foliosa,* which occurs in the same general region, and the well-known garden plants Fulvala and Dorothy K. Williamson have resulted.

The Pacific Coast is also rich in distinct species. While many of them are difficult to cultivate in our region, a few, such as *I. tenax, I. missouriensis* and *I. longipetala,* succeed quite well.

The Vesper Iris (*I. dichotoma*) is the last species to bloom. It opens its first flowers in the latter part of July and usually continues throughout August. The individual flowers last but a short time, opening about three o'clock in the afternoon and closing by sundown. The flowers somewhat resemble those of the Blackberry Lily. It is a comparatively easy Iris to grow and makes a valuable addition to the garden.

The Beardless Irises afford a wide range of uses in the garden as compared with the Bearded. They are suited to a very wide range of conditions. Various types are well adapted to the rock garden; others are successful in ordinary garden conditions, while several species are valuable for the water's edge.

GEORGE M. REED.

LIST OF GLADIOLUS GROWN AT THE NEW YORK BOTANICAL GARDEN, 1928*

FROM KENNEDY GARDENS, MIDLAND, MICHIGAN

Albania, Richard Diener, Robert L. Kunderd, Ming Toy, Mona Lisa, Gold, Pythia, Violet Glory, Jenny Lind, Shell Pink, Mary Pickford, Giant Nymph, Anna Eberius, Crimson Glow, Marshal Foch, Mrs. F. C. Peters, Ruffled Beauty, Byron L. Smith, Mrs. Leon Douglas, Purple Glory, Anthony B. Kunderd, Marie Kunderd, Cameo (Metzner), Exquisite, Carmen Sylva, Golden Measure, Souvenir, Peach Rose, Mrs. Dr. Norton, Jewel, E. J. Shaylor.

FROM L. VASSEUR, MILTON, MASSACHUSETTS

Souvenir de Henri Lecoutre, Micorise, Miss Bl. Perdrizet, Apache, St. Amand, Libourne, Mathias, Matilde Hertz, Ville de Rheims, Golden Rod, Seedling No. 708, Seedling No. 5, Circe, Mamie Cross, Miami, Grand Pierre, General Fayolle, Gabin, J. Laperoni, Master Viola, Michel Yovanowich, Captaine Grognot, Koyeti, Soleil d'Or, Picoti Picota, Modoc, Louis Thiebaud, Mrs. G. Hamon.

FROM SUNSET VIEW GLAD GARDENS, STONEHAM, MASSACHUSETTS

Albania, Jewel, Sheila, Crimson Glow, Marnia, Twilight.

FROM ROCKLEDGE GARDENS, LEXINGTON, MASSACHUSETTS

Anna Eberius, Aviatrix, Albania, Alice Tiplady, Rose Ash, Mary Pickford, Mrs. F. C. Peters, Henry C. Goehl, Scarlet Wonder.

FROM HUNT'S GARDENS

Herada, Rose Ash.

FROM A. E. KUNDERD, GOSHEN, INDIANA

Dr. Van Fleet, Kilima, Neutrality, Bumble Bee, Arcturus, Virginia Hale.

FROM GEO. D. STILL, HUDSON, MASSACHUSETTS

Klondike, Gaiety, Niagara, Empress of India, Mildred Pettman, Souvenir.

*Arranged in order of planting, determined in part by color.

FROM E. N. FISCHER, SHARON, MASSACHUSETTS

Sunnymede, Henry C. Goehl, Ethelyn, John Alden, Mrs. F. C. Peters, Miss T. Rose.

FROM ALBERT C. PERRIN, PORTLAND, OREGON

Iwa, Diener's White, Mistland Lassie.

FROM STANLEY THORPE, MEDWAY, MASSACHUSETTS

Rosenel, Dorritt, Marietta.

FROM TRIANGLE FARMS, CIRCLEVILLE, OHIO

Rosemary, Starbright.

E. M. SANFORD, MADISON, WISCONSIN

Seedling No. 15, Jack London, Giant Nymph, Water Nymph.

FROM RALPH J. ROONEY, PORTLAND, OREGON

Seedling No. 28, Coral, West Virginia.

FROM W. E. CLARK, SHARON, MASSACHUSETTS

Mrs. W. E. Clark, Dr. R. T. Jackson, Primadonna, Dracocephalus.

ROSELAND GARDENS, BOSTON, MASSACHUSETTS

MIXED

FROM C. W. BROWN, ASHLAND, MASSACHUSETTS

Melba, Carnival.

FROM SUNNYSIDE GLADIOLUS GARDENS, NATICK, MASSACHUSETTS

Maurice Fuld, Tiffany, Alma Gluck.

FROM SOUTHWORTH BROS., BEVERLY, MASSACHUSETTS

MIXED

FROM DR. F. T. MCLEAN, NEW YORK BOTANICAL GARDEN

A. W. Hunt, Delphi, Carmine Kid, Purple Glory, Princeps, Pfitzer's Triumph, Dr. F. E. Bennett, Fire Ribbon, Goliath, Arabia, Scarlet Bedder, Autumn Giant, Illuminator, Dr. R. T. Jackson, Scarlet (Burbank), Arden, Mohawk, Pythia, Prof. J. S. Troop, Capella, Early Red, Crackerjack, Thomas Edison, Joe Coleman, Diana, Nanus Spitfire, War, Firefly, Pride of Hillegrom, Sentinel, Crimson Glow, Mrs. Francis King, Helen Wills,

Old Dark Gandavensis, Helen Franklin, Albania, Early Snowflake, Elora, White Pendleton, Kirchoff's Appleblossom, Marie Kunderd, Henry C. Goehl, Lucette, Vaughan's White, King Pearl, L'Immaculée, Crystal, Tiffany, Carmen Sylva, Anne Thompson, Marin, Elena, Giant Pearl, Europa, Lily Lehman, White King, Joerg's White Prim, Ruffolace, Mrs. M. J. Killian, Mrs. Kr. Prestgard, Joerg's White, Purity, Peace, Rose Ash, Lacinatus, Desdemona, Muriel, Prince of India, Fallen Ieaf, Woodpecker, Mary Frey, Peacock, Lavender America, The Orchid, Veilchenblau, Lavender Sport of Parma, Viola Bird, Big Lavender, Olga, Dutchess of York, Purple Victory, Badenia, Lavender Beauty, Florence, Kirchoff's Violet, Opalescent, Violet Glory, Mr. Mark, Lavender, Hubertus, Scarsdale, Baron Jos. Hulot, Lilac Wonder, Titanic, Herada, Henry Ford, Capt. Boynton, Geraldine Farrar, Azure, Mary Fennell, Byron L. Smith, Black Pansy, Seabrook Gem, Catherine, Purple Butterfly, Blue Jay, Jacoba Van Beijerin, Indian Summer, Nebraska, Mrs. F. C. Peters, C. M. Kelway, California, Harmonia, Ruth Huntingdon, Mrs. H. E. Bothin, Marshal Foch, Mission Bells, Topaz, San José, Osalin, Pride of Lancaster, Orange Prince, Ada de Poy, Kiva, Giant Nymph, Richard Diener, Nectarine, Nancy Hanks, Baby Mine, Unique, Papilio, Sunnymede, Remembrance, Loreley, Orange Queen, Mabel Irving, Salbach Prim, Mona Lisa, Ming Toy, Jack London, Antares, Alice Tiplady, Orange Glory, Leewenhoek, Prince of Wales, Halley, Pola Negri, Primunella, Bubbles, Salmon Beauty, Marnia, D. J. Whitney, Remembrance, Dorothy Wheeler, J. A. Carbone, Alma, Del Oro, Los Angeles, Beauty of Hautana, Joerg's Favorite, Golden Butterfly, Dorothy McKibbin, Sirius, Obélisque, Apricot Yellow, Sulphur Frills, Gold, Bobolink, Pride of Pembroke, Schwaben, Ethelyn, Moonbeam, Gold Drop, Golden Dream, Primadonna, Early Lassie, Rags, Souvenir, Golden Swallow, Loyalty, Dawson, Golden Pheasant, Dainty, Golden Girl, Joerg's Yellow Prim, Flora, Golden Measure, Gertrude Ederle, Golden Princess, Mrs. W. E. Olmstead, Lemon King, Starlight, Sulphur Glow, Pride of Goshen, Roanoke, Mrs. C. F. Burke, John Alden, Soleil d'Or, Norma Talmadge, Golden Glory, Van Sion, Fern Kyle, Yellow Hammer, Tobersun, Golden Emblem, Claremont, La Couronne,

Schwaben, Golden Gate, Primrose Beauty, Anne Thompson, Gold Eagle, Genesee, Yellow Treasure, Mary Pickford, Henry Green, Victor, Rainbow, Beauty of Hautana, Oriente, Mrs. T. Piltcher, Mrs. Van Rappard, Soubrette, Adora, Hinemoa, Alphaeus, Mrs. A. E. Kunderd, Anna Eberius, Nimrod, Lord Roberts, Tutanekai, Hinemoa, King Pearl, Iremel, Gertrude Errey, Mrs. T. Ratray, Nimrod, Leolin, Averill, Charlemagne, Shakespeare, Marc Micheli, Lavinia, Marie Lemoine, Weisse Dame, Canary Bird, Augusta, Lamark, Kunderdi Glory, Attraction, Nezinscott, Wm. Falconer, Columbia, Gandavensis, Sulphur King, Torchlight, Asperus, Old Gandavensis, Old White Variety, Mme. Lemoine, Pink Lily, Evelyn Kirtland, The Pearl, Gretchen Zang, Marietta, Acme, Gladis Plath, Miss Madison, Krelage's Favorite, Mrs. W. E. Clark, Fair Lady, Summit (Burbank), Sierra, Revue, Sibyl, Jewel, Betty Darnell, Merced, Jean du Tailles, Peach Rose, Jumbo, Elizabeth, Seabrook Gem, Mrs. Leon Douglas, Radiant, Caretta, Dr. Isabelle D. Kerr, J. R. Walsh, J. C. Randolph, Dainty Lady, Rosy Glow, Joseph Fields, Monon, Van Wales, General Pershing, Rose Mist, W. H. Phipps, E. J. Shaylor, Catherina, Emily Ash, W. G. Brooks, Mrs. J. C. Grossman, Adeline Kent, P. C. Hooft, Mrs. Dr. Norton, Early Sunrise, Fordhook Pink, Mrs. Newell Vanderbilt, Geo. J. Joerg, Miss Christine Treuer, Adeline Patti, Eliz. Tabor, Pink Wonder, Arlene, Arizona, Gaiety, Panama, Mrs. J. K. Armsby, Wilbrink, Early One.

From A. E. Kunderd, Goshen, Indiana

A. E. Kunderd, Paramount, Pauline Kunderd, Dr. Christ Martz, Golden Frills, Tiger, Romance, Purple Queen, Sweet Rose, Watermelon, Highland Laddie, J. Horace McFarland, Kunderd's Yellow Favorite, Cardinal Prince, Athene.

From Geo. S. Birch, Vineland, New Jersey

Mrs. Leon Douglas, Elizabeth Tabor, Ming Toy, Mrs. Richard Lohrman, Albania.

From F. T. McLean, New York Botanical Garden

Parma, Beatrice, Mrs. Dr. Norton, Mystic, Pink Beauty, Frosty, Phantasy, America, Hazel Dawn, Estella, Catharine Cole-

man, Trojana, Tyco Zang, Glory of Kennemmerland, Tubergeni Glow, Myra, Hugo Grotius, Princess, Freda, Crinkles, Longfellow, Early Laddie, American Beauty, Dr. W. Van Fleet, Theda, Mrs. Frank Pendleton.

FROM A. E. KUNDERD, GOSHEN, INDIANA

Dr. Nelson Shook, Purple Glory, Ed Sprenger, Virginia Hale, Royal Purple, Rose.

WILD SPECIES

Gladiolus dracocephalus, Gladiolus Papilio, Gladiolus Saundersii, Gladiolus Garnieri, Gladiolus Leichtlinii, Gladiolus psittacinus Cooperi, Gladiolus Melleri, Gladiolus Masoniorum, Gladiolus primulinus, Gladiolus sp. from Mt. Salida, *Gladiolus Quartinianus.*

The total number of varieties is approximately 450.

FORMAN T. MCLEAN.

VISIT OF A DISTINGUISHED STUDENT OF WILLOWS

The well-known Salix-expert [salicologist], Dr. Sven Johan Enander, Rector of Lillherrdal Parish, Province of Jämtland, Sweden, visited the Garden during part of June and July. He examined our Salix collections and made valuable annotations. His major botanical interest is in the willows of all lands.

He has collected extensively in England, the Kola Peninsula, Nova Zembla, Greenland, Africa, Russia, Siberia, Thibet, and China, as well as in North America and Sweden, and published various extensive works on Salix, among which appear notably his Studies of Salices of the Linnaean Herbarium. He received the honorary degree of Ph.D. from the University of Lund, Sweden, in 1918, and the Linnaean Gold Medal of the Swedish Academy of Sciences in 1921.

Some years ago he was shipwrecked with a scientific expedition to Greenland and the entire equipment of the party was lost. They were marooned on a small island off the west coast of Greenland, whence they were rescued by no less a person than H. M. King Christian X of Denmark, whose yacht happened to be in those waters at the time. Landing eventually in Reykjavik,

Iceland, Dr. Enander changed his plans perforce and decided to make an impromptu collecting-trip in North America, which he carried out successfully. Starting from New York, where he visited the Garden in the vastly picturesque guise of shipwrecked botanist-minister-explorer, he continued his journey across the continent as far as the Pacific Coast.

His present visit to the Garden was made while on a two-years' collecting-trip around the world, sponsored by H. M. King Gustaf V of Sweden, a contemporary, so we are told, of Dr. Enander at Upsala University in their early student days, and it is under King Gustaf's direct auspices and with the aid and sanction of the Swedish Riksdag, which has voted a sum of 25000 crowns for the purpose, that the present extensive journey has been undertaken.

Despite the burden of his 80 years Dr. Enander is full of enthusiasm and plans visiting the Arnold Arboretum, then will proceed to the White Mountains, Canada, Labrador, Hudson Bay, Alaska, and the Bering Sea region, after which he will make a trip down to San Francisco and Mexico, returning by way of Vancouver, thence to Japan, China, Siam, and via India to Baghdad, Damascus, Jerusalem (where he plans to be at Christmas), and Constantinople. From there he will gradually make his way back to Sweden after this extensive journey in the interests of botany.

P. DE C. MITCHELL.

NOTES, NEWS, AND COMMENT

A large Blue Lobelia of Asia, *Lobelia sessilifolia,* flowered in the Garden for the first time this year. Plants were grown from seed sent from the Royal Botanic Gardens at Kew, England, and set out in the Herbaceous Grounds. The deep violet-blue color of the flowers and the smoothness of the stems and leaves of the plant are noticeable features. Another rare plant blooming in the Herbaceous Grounds this summer was *Stemodia chilensis,* a blue-flowered herb of the figwort family collected in South America by Dr. F. W. Pennell.

"The Gasteromycetes of the Northern United States and Canada" by Professor W. C. Coker and Assistant Professor J. N. Couch of the University of North Carolina has just been received.

Although a number of American mycologists have worked on this group of fungi, this is the first attempt to bring together under one cover a complete record of our knowledge of these forms. Dr. Coker, the senior author, has been a frequent visitor at The New York Botanical Garden, spending most of his time on the mycological collections. He has also worked in most of the other large herbaria of America and Europe and is eminently fitted for the task which has just been completed. The work, which has been published by the North Carolina Press, consists of two hundred and one pages of text and one hundred and twenty three plates made from life size photographs and drawings of the microscopic characters.—FRED J. SEAVER.

Seeds of interesting plants recently received include those of the Talipot Palm, *Corypha umbraculifera* L., native of Ceylon and the Malabar coast, sent from the Botanic Garden at Peridéniya, Ceylon; of the Silversword (*Argyroxiphium*) and its varieties, gathered in the ashes of the crater of Haleakala, Hawaii, and sent by Mr. Otto Degener; of the Corean Paulownia tree, sent by Mr. E. H. Wilson of the Arnold Arboretum; and of *Boronia megastigma,* Australian shrub noted for its penetrating fragrance, presented by Dr. H. H. Rusby. Other seeds received are those of the rare West Indian palm, *Maximiliana crassispatha,* from the Service Technique, Port-au-Prince, Haiti; of the brilliant-bracted *Warscewiczia coccinea,* from the Plant Introduction Garden, Summit, Canal Zone; of a *Dombeya* and a *Milletia* (a tender Wisteria-like vine from the Botanic Garden at Durban, South Africa); and of *Flagellaria neo-caledonica,* a representative of an uncommon liliaceous family, which climbs by means of tendrils formed by pointed and twisted tips of the leaves, as in *Gloriosa.* The seeds of the latter were presented by Prof. Georges Poirault of Villa Thuret, Cap d'Antibes, France.

Meteorology for July: The minimum temperatures recorded for each week or part of a week during the month of July were: 54½° on the 1st; *54° on the 7th;* 62° on the 15th; 61½° on the 21st; and 54½° on the 29th. The maximum temperatures recorded were: 86° on the 1st; *96° on the 8th;* 92° on the 12th; 90½° on the 18th; and 89½° on the 25th. The total precipitation for the month was 5.46 inches.

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PHLOX[1]

The interpretation of the word phlox is "flame" and its application to a group of plants was probably suggested because of the dazzling brilliance of the flowers. Phlox is a genus of the plant family Polemoniaceae. They are both annual and perennial herbs. The native home of the majority of the fifty known species is North America, a few being found in Europe and Asia. They may be found native in our woods and prairies; a few are mountain forms.

There are three general horticultural groups of phlox:

1. Annual phlox.
2. Early-blooming species.
3. Summer-flowering hybrids.

In discussing these groups attention was given only to those species and varieties now listed in trade. Many of the species are not listed and are rarely procurable. In all some half dozen species and three hundred and eighty-nine summer-flowering hybrids are listed this year.

ANNUAL PHLOX

These are derivatives of *Phlox Drummondii,* a native of Texas. The original species has been much improved by domestication and named sorts are offered by almost every seedsman. The garden forms differ in height, color, size, and shape of flower. There are cuspidate, fimbriate, and semi-double forms in addition to the normal. The colors range from violet and purple to almost yellow, with many white sorts.

[1]Abstract of an illustrated lecture given at The New York Botanical Garden on Saturday afternoon, August 11, 1928.

Annual phlox is well adapted to bed and border planting and grows easily in a deep rich friable loam. A sunny location is best, though a partial shade is not objectionable. Seed may be sown out of doors or the plants may be started under glass. Best results are obtained from planting at intervals of a foot each way. If the old flower clusters are removed the flowering season may be extended from July to time of frost. Annual phlox is propagated by seed, other types by division of the root.

Spring-flowering Species

This group flowers from April to June and many of the species are adapted to rock-garden planting. All are native and are therefore suitable for planting in the native or wild garden, where they are very valuable additions.

The most important species is *Phlox subulata,* a low-growing to creeping form with prickly juniper-like evergreen foliage. The plants grow in dense mats and are widely used in rock gardens. There are now some fifteen named varieties. Alba, lilacina, rosea and atropurpurea are listed as forms of the species. G. F. Wilson, a delicate pale lilac variety, and Vivid, a bright rose-red, are two important varieties.

Phlox ovata, also listed as Carolina, is native in dry locations from New York to Missouri. The plants grow to a height of 6 inches in tufts or mats. The leaves are small and stiff. The flowers are light lilac pink or white and so cover the whole plant that it is a mass of bloom. The species requires a well-drained soil and open sunny location. It is valuable for rock-garden and border planting.

Phlox divaricata, also listed as *P. divaricata canadensis* or Sweet William phlox, is native to the eastern part of the United States. The plant grows to a height of 18 inches. The flowers are blue or pinkish blue. Laphamii is the only named variety of importance. A good rich clay loam is ideal soil for *Phlox divaricata.*

Phlox reptans or *P stolonifera* is useful when creeping forms are desired. The flowers are ¾ inch across and purple or violet in color. *Phlox pilosa* is a valuable type for rock gardens, for it grows in dense mats and produces flower stems 1–1½ inches in

height, the leaves being linear and sessile. Pink, purple, and white forms are available.

Summer-flowering Hybrids

In this group we have three distinct sections: the *Arendsii*, the *suffruticosa*, and the *paniculata* hybrids.

The *Arendsii* were originated by George Arends, of Ronsdorf, Germany, as a result of a cross of *P. divaricata* and *P. paniculata*. They were exhibited in England in 1912. There are three varieties in American trade, Grete, a dull white; Charlotte, a pale lilac with a dark eye, and Kathe, purple rose-colored, with a dark eye. The plants grow to a height of 18 inches, are open in habit, and flower in late June. The varieties are useful for rock gardens but are best adapted to border planting, where they make a fine display in groups of three or more.

The *suffruticosa* phlox are listed by Bailey as horticultural forms of the species *P. glaberima*. Miss Lingard is the best-known variety of this group. Dr. Hornby and Empress are two other important varieties. Each of these varieties is sold under at least one other name. Miss Lingard is a tall early-flowering white. The heads are dense and pyramidal in shape, the florets are medium in size, of good texture, characteristically waved, and have a faint lilac eye color. Dr. Hornby is the most vigorous grower of the three and is also white but with a prominent magenta eye. The heads are cylindrical, well filled, and very attractive. The plants are of medium height. Empress or Indian Chief is mallow-purple in color, and the heads cylindrical, like those of Dr. Hornby. The *suffruticosa* type is easily distinguished by its herbaceous nature, hollow stems, and glabrous leaves. The varieties flower in July.

The hybrids of *Phlox paniculata* constitute the largest and probably most important group of phlox. The exact parentage of the race is not clearly established. We know that Lemoine of France and Pfitzer of Germany are responsible for many of our best varieties. Dutch and English nurserymen have also introduced fine varieties. In America, Dreer, of Philadelphia; Rea, of Norwood, Mass.; G. N. Smith, of Wellesley, Mass.; W. F. Schmeiske, of Binghamton, N. Y.; Willis E. Fryer, of Faribault, Minn., and D. M. Andrews, of Boulder, Colorado, have all intro-

duced varieties. The present seedlings from these introducers are admirable advances over the old varieties.

The *paniculata* hybrids flower during August and September and should be planted in a sunny location but will do well in partial shade. A clay loam rich in organic matter, well drained and thoroughly prepared is an ideal soil. Phlox will grow in almost any soil but careful culture is necessary for satisfactory results. Plantings should not be regarded as permanent and should be dug every five years and the clumps divided into pieces of not more than three stems each. Such divisions will produce typical bloom the second or third season. Clumps should not be crowded together; space them at least 2½ feet each way. As soon as the heads cease flowering they should be removed to prevent seed formation and dispersion which ultimately means a mixture of seedlings rather than the original named varieties.

Phlox have few pests. Cory & McConnell[2] advise the spraying of plants with Black Leaf 40, 1–500, with an ounce of soap. This mixture was the best control they found for controlling the phlox plant bug. Mildew is controlled to some extent by dusting the plants with finely powdered sulfur. Phlox should be carefully inspected from early July on and sprayed or dusted when necessary.

Phlox varieties are sometimes classified according to certain characters, such as blooming habit, height of plant, color type, form of floret and head. There are two distinct types of blooming habit and a third general type. Some varieties bloom but once each season, produce immense heads of flowers and are very showy as specimen plants or in groups for mass effect. The second type and really a new development is the continuous flowering type. These varieties vary in height from 12 to 40 inches and have a wide range of color but lack the delicate shades of the other groups. The stems are semi-woody and the foliage stiff to leathery in texture and dark green in color, practically free from mildew and spider attack. The flower heads are usually globose or rounded but are not as full as the other types. The plants are moderate to vigorous growers and are well adapted to mass plantings when a long season of bloom is required. They start to bloom as early as the other varieties and continue to bloom till frost comes.

[2] Cory, E. N., & McConnell, P. A. The Phlox Plant Bug. Bull. 292, Univ. of Maryland, S 1927.

Phlox vary in height from 12 to 48 inches. The average height of plants at Cornell is twenty-four to thirty inches according to the season.

There are several color types of phlox. These are dependent upon the color of three different areas in the floret. The pri-

FIGURE 1. Phlox "Europa," in The New York Botanical Garden, July 31, 1928.

mary or fundamental color is usually derived from the outer area of the petal, which is termed the petal area. The color effect of a variety is frequently modified by the color of the eye area, which is a small area 1/16–3/16 inch in diameter immediately adjacent to the tube of the floret. The third area lies between the eye and petal area. It is approximately 1/8 to a quarter inch wide. The

following types drawn up by Prof. C. L. Thayer are primarily based on the relation of these three color areas:

Self-colored Type—Florets of one color; if second color enters in, it is in so small an amount as not to be conspicuous.

Self-intensified Type—Florets of one color, with an eye of the same color in deeper shade of the self color.

White with dark eye—Florets white with a sharply defined eye, usually of a deep shade.

White with dark eye and slight suffusion—Florets white with an eye usually of a deeper shade suffusing slightly into the surrounding white.

FIGURE 2. White Phlox, "Mrs. Jenkins," in The New York Botanical Garden, July 31, 1928.

White with dark eye and heavy suffusion—Florets white with an eye of a deep shade, suffusing heavily and widely into the surrounding white. Eye or center *not* sharply defined.

Light-eyed Type—Florets of one color with a center, more or less sharply defined, of a lighter color or of white.

Halo Type—Florets of one color with an eye or center of varying size, and more or less sharply defined of another color. The eye or center surrounded by a halo of a lighter color or of white.

Self and Eye Type—Florets of one color, not white, with an eye or center of varying size, more or less sharply defined, of another color.

Suffused Type—Florets of one color, overlaid or suffused with another or other colors.

Miscellaneous—Includes those forms not provided for in other groups.

The form of the floret, whether round or star, together with its shape, flat, declined, or cupped, is another character useful in identifying varieties. The purpling of the stem particularly on young shoots and also of the calyx teeth are further characters which should be placed in this same category.

The following is a brief list of varieties, some old and some new introductions:

Mrs. Jenkins, a white of medium height, the florets distinctly angular-cupped in shape and the heads flat to rounded. A vigorous grower, popular and widely used in mass planting. We have it under many names and have arbitrarily assigned this name to the variety because it appears to be most frequently used for it. Fräulein von Lassburg and Independence are other names frequently applied to this same variety.

Rynstrom, generally described as a rose-salmon, blooms rather sparingly with us but is distinct and desirable. The color is of self type. The petal edge typically curled. The name is often confused by the amateur with Rhinelander, another desirable variety. Rhinelander is of Thayer's self and eye type, the color is distinctly salmon-pink in comparison with Rynstrom and the eye is quite distinct. Rhinelander has angular or star-shaped florets and forms a dense globose head. The stems and calyx teeth are distinctly purpled.

Elizabeth Campbell is more distinctly salmon-pink and lighter in color than Rhinelander. It is an old and standard variety of halo type, florets circular, declined, and the head pyramidal. Wellesley, a recent variety introduced by G. N. Smith, is an im-

provement on Elizabeth Campbell, differing in height and color type, for it is of the light-eyed type and the florets are sharply declined with us.

Antonin Mercié, Danton, Widar, Edmond Rostand, Fellbacher Porcelain, and Eugene Danzanvilliers are of similar color type to Wellseley, *i.e.*, light-eyed type. These varieties range from deep phlox purple in Danton and Antonin Mercié to deep wine-

FIGURE 3. Light rose-pink Phlox, "Milly van Hoboken," in The New York Botanical Garden, July 30, 1928.

color in Edmond Rostand. Fellbacher Porcelain, and Eugene Danzanvilliers are the lightest members of this color series. In all the central part of the floret is white. Mrs. Ethel Pritchard is a large-flowered self-colored variety similar in color to the above varieties.

Selma, Mrs. Milly van Hoboken, Special French, Gladstone, and Mrs. J. Jones form a series of tall-flowering light rose pink varieties, all of which are desirable.

Cameron is outstanding as a light pink, really a rose pink, but appearing by comparison to be a true light pink without a salmon hue. The variety is low growing and forms dense oval heads of large round flat florets of suffused type.

R. P. Struthers, introduced by Rea of Norwood, Mass., is a deeper pink with a salmon hue. Other varieties of similar growth habit and approximately the same color are Athis, Sir Edwin Landseer, and Pantheon. Isabey with us is similar also. R. P. Struthers is the outstanding variety of the group. It forms massive heads of medium-sized round flat but typically waved florets, which are of excellent texture, the color type is self-eyed and the stems and calyx teeth are purpled, the plants are tall and vigorous. In the deeper reds to scarlets we find several good varieties. Saladin is outstanding as a scarlet red. The florets are large and round, of excellent texture, the color type is self-intensified, the habit of bloom is continuous, so that the heads are not so full and massive as those of R. P. Struthers, Rhinelander, and Gladstone, etc. Leo Schlager is a deeper red than Saladin and produces a larger head of similar shape and color-type florets. Colorado, a new and promising seedling of D. M. Andrews, is lighter clearer red than either Saladin or Leo Schlager and with us does not show the scarlet of Saladin. Colorado is a brilliant red, the florets are round and cupped, and the head pyramidal. All three of these varieties appear to be more vigorous than Deutschland or Dr. Königshoffer. The plants are not only taller but the stems are more robust and in addition multiply with greater rapidity.

Under the color type white with a dark eye come the varieties Europa, Graf Zepplin, and Mary Louise. All three are good. Europa produces immense panicles of round to angular cup-shaped florets, Mary Louise is a vigorous grower resembling Bridesmaid, though the eye color is not suffused through the petal area as in that variety. Graf Zepplin produces large panicles of round flat milk-white florets with a light rose-red eye. Albion is another good white similar in color to Graf Zepplin but differing in type of panicle and form of floret. The eye is lighter and mallow-purple in color.

Under the classification of continuous flowering phlox, W. F. Schmeiske's introductions, Mrs. Warren Harding and Mrs. Liv-

ingston Farrand, are two outstanding varieties. Mrs. Harding produces large round florets 1½ inches in diameter, the heads are small (6x6) and globose, the color is a salmon-red; that of Farrand, pink. Both varieties have remarkable substance in the petal and are very attractive. In addition they are vigorous

FIGURE 4. Salmon-pink Phlox, "Elizabeth Campbell," in The New York Botanical Garden, July 31, 1928.

growers, little troubled by spider or mildew. The plants grow 30 to 36 inches tall, the color type is self-intensified.

Of this same color type is La Vogue and Jules Sandeau. La Vogue is a dwarf but free-flowering sort 12–18 inches in height, the florets circular cupped self-intensified mallow to amaranth-

pink, but small in size, ¾–1 inch in diameter. Jules Sandeau is a rose-pink, almost pure self. The florets are large, circular in outline, the petals typically curled and of excellent substance. Tapis Blanc of Lemoine and Mai Rupps, which appears to be the same variety, is pure white and of extremely good lasting quality, large in size, and star-shaped. With us it does not grow over 10–14 inches.

Eclaireur is the last and possibly the least satisfactory variety of this class. The florets are typically angular-cupped in outline and of light-eyed color type, for the halo area is quite prominent. The color is deep phlox purple and flecks somewhat. The variety is a vigorous grower and flowers very freely. Diana, introduced by Harrison, is very similar, differing with us in height only. Eclaireur grows from 24 to 36 inches and Diana never exceeds 24.

We have not discussed all of the good phlox varieties and no doubt should you visit the gardens and make your own selection it might be vastly different. The above varieties appear to grow satisfactorily and usually arouse the interest of visitors. Saladin for example has been the object of a great deal of comment.

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THE WILD FLOWERS OF SOUTH AFRICA

If there is one thing more than another that is truly characteristic of South Africa it is her flora. Other countries have their gold and diamonds, sheep and cattle, fruits and wines; but the South African wild flowers are unique. No other part of the world is so richly endowed with flowers as is South Africa, either in quality, quantity, or variety. A century ago amateurs of flowers in England and Europe vied with one another in cultivating rare and lovely plants from the Cape, exquisite heaths, glowing geraniums, amazing proteas, stately aloes, and a great array of bulbs, producing flowers of every form and hue. Some of the most beautiful illustrated books ever produced were devoted to the Cape flora: Andrews, Jacquin, and many others dedicated

years of their lives and infinite patience and skill to recording the beauties of our flowers in volumes which are the treasures of libraries and the joy of collectors. These old artists and botanists have gone from us, but the flowers remain, far more beautiful than even the best of their pictures.

In the time that has elapsed since the Cape flowers first delighted European eyes much has happened in the gardens of the world. Great numbers of newly discovered plants have been brought into cultivation—primulas, rhododendrons, innumerable alpines, orchids, lilies, and irises have been introduced into Europe and America from all over the world, and the most inaccessible corners of the earth have been ransacked for novelties. The hybridizer and selector have been at work, and have produced new strains from old, so that from simple beginnings have been created the astonishing gladioli, roses, carnations, chrysanthemums, dahlias, and delphiniums of to-day. In the profusion of new flowers, specially selected for their hardiness under North Temperate conditions, their brilliance of coloring, lasting qualities, and simplicity of culture, the old treasures from South Africa have been largely forgotten. Some have taken on new shapes like the garden gladioli and pelargoniums, the products of hybridization of ancestors now lost or neglected: others, like the heaths and proteas, have almost disappeared from cultivation because of lack of hardiness and difficulties of propagation.

But South Africa has not ceased to make contribution to the gardens of the world. Even within the last few decades, three outstanding horticultural sensations have been caused by the flowers of our veld: the Nemesias, wild near Darling, only fifty miles from Cape Town, which in Suttons' hands have become one of the most popular annuals in the world; the Barberton Daisy from the Transvaal, whose exquisite form and startlingly novel coloring created something of a furore when first introduced; and *Gladiolus primulinus,* the Maid of the Mist from the Victoria Falls and elsewhere, which has furnished the essential characters of the most delicately beautiful race of garden gladioli yet seen. And it is safe to prophesy that there will be more "new things out of Africa" before long.

But the floral wealth of South Africa cannot be judged merely by its contribution to the stock-in-trade of the European and American horticulturist. The South African veld, Karoo, mountains, and vleis have a hundred flowers of exquisite beauty for every one that they have given to the peculiar and specialized gardens of the North Temperate Zone. Dripping mists, lack of sunshine, and damp frosts furnish an inhospitable environment for the sun-loving flowers of South Africa.

At the National Botanic Gardens, Kirstenbosch, near Cape Town, pioneer work is being done in cultivating the indigenous plants of South Africa, and very rich collections of flowering plants, ferns, cycads, etc., from all parts of the Union can be seen there. Kirstenbosch is acting as an inspiration and an assistance to many in South Africa to grow native plants in their own gardens, and as a revelation to those who had not suspected the floral wealth with which they are surrounded.

Whether we are gardeners or not, however, we South Africans are bound to pay our tribute of admiration to our wild flowers as they grow on their native veld. If compelled to make a choice, the writer would say that in his opinion the Blue Disa of Table Mountain is the most beautiful flower in the world; but there is a bewildering array of others which almost make him falter in his allegiance. The colors, forms, textures, scents, of our wild flowers are unsurpassed the world over. Take color first, and where will you find a more brilliant red than that of *Erythrina Caffra,* more flaming orange than that of the Aloes, a more cerulean blue than that of the Aristeas, Felicias, and Lobelias, a purer white than that of *Watsonia Ardernei,* more dazzling magenta and gold than among the Mesembryanthemums, and more exquisite shades of maroon, terra-cotta, salmon, biscuit, and apricot than among our Watsonias, Nemesias, and Arctotis? Then as to texture, no flower in the world surpasses *Nerine sarniensis* in its amazing beauty of surface. In perfume what is sweeter than our Freesias and Gardenias, more subtly pungent than our Brown Africanders? And where will you find greater miracles of form than are exhibited by the Red Disa and the rest of the orchids, the bizarre Strelitzia, the exquisite neatness and purity of the Heaths or the intricate complexity of the Proteas?

And not only are our flowers beautiful as individuals, but some of them grow in the most luxuriant profusion. The mountains of Swellendam are empurpled with Heaths; the grasslands of the interior are bejeweled with innumerable modest blooms; the plains of Malmesbury and Tulbagh are snow white with Arums, daisies, and Chincherichees, and the sandveld of Namaqualand is a magic carpet of innumerable flowers of all imaginable hues as far as the eye can reach. Nowhere in the world will you find a more lavish outpouring of beauty.

The wealth of the South African flora is reflected in a characteristic local institution, the Wild Flower Show. Shows are held in September and October in Cape Town, Caledon, Tulbagh, Darling, and several other centers in the South West Cape; and the astonishment of visitors at the rich display is unfailing. But the shows are a mere sample; the real glories are outside, on the South African veld under the South African sun, and it is there that you will find the fairest flowers in all the world.

R. H. Compton.

National Botanic Gardens,
Kirstenbosch, Cape.

THE HUNNEWELL ESTATE

In conjunction with a recent visit to the Arnold Arboretum, I spent a portion of an afternoon inspecting one of the fine old New England estates remarkable for its splendid trees. It was the Hunnewell estate of Wellesley, Mass., where during four generations, if I am not mistaken, an enviable collection of trees has been assembled and most conscientiously cared for, including the finest private pinetum in the country. Though the selection of species alone is remarkable for a private planting, perhaps even more striking here is the size which these trees have attained. I believe it would be of interest to record my impressions of this demesne.

Not least among the interesting acquaintances which I made was that of the man who has been responsible for the prestige of this estate in horticultural circles. He is Mr. Hatfield, the superintendent, an Englishman by birth, who proudly designates

himself as a Kew man by training, and an arrival in this country forty-four years ago. Now approaching in age the three-quarter-century mark, he at first fails to betray his intimate acquaintance with plants. But show him an interest in his trees and a little understanding of them and he becomes a most affable mine of information.

I was most fortunate in meeting this gentleman on the grounds and after preliminary introductions I stated that at the time I was interested primarily in conifers, whereupon he proceeded to conduct me about.

My interest was first attracted by the magnificent Norway Spruces that tower above every other tree and hold their narrow crowns seventy or eighty feet above ground. Those that are isolated and have been free to develop laterally are further interesting by virtue of their very long and exceedingly dense lower branches the ends of which cover the ground twenty feet from the trunk as with a thick evergreen shrubbery. Their foliage is so dense as to render the main boughs that sweep to the ground invisible and one wonders at first if all that green bushy growth really belongs to the tree behind it. Here and there one sees in that ground mass of end branchlets a young shoot that assumes a more perpendicular growth than the surrounding more procumbent growth. It is upright, looks like a young tree and actually is one that has risen by layering where some branch in contact with the ground has taken root and given rise to a new individual. This has not occurred very frequently but in one or two cases good-sized young spruce trees have recently been severed from their parents.

This subject of layering induced Mr. Hatfield to lead me under the broad canopy-like foliage of a handsome Weeping Beech. Several independent main trunks a foot and more in diameter support the crown. Connecting the two largest of them is a narrow twisted branch approximately two inches in diameter that leads from the upper portion of the largest and oldest trunk to near the ground line of the lesser of the two boles which it joins. It represents another case of layering that is quite striking, for the small parent branch is seen entering the side of its offspring, which has become ten times as thick.

It would hardly be thought necessary to add fertilizer beneath a heavy group of hemlocks where the natural accumulation of fallen needles furnishes excellent humus. Yet that has been done on this estate. Under a certain group of mature trees Mr. Hatfield called my attention to the lack of undergrowth and spoke of the many loads of manure, if I recall what he used, which he placed there during the past year. The shade in this particular spot is very heavy and practically no direct sunlight enters. As an experiment, azaleas had recently been planted in this almost gloomy spot and Mr. Hatfield seemed rather apprehensive of their ability to endure.

Yews of course have their place here, too, and one particular plant of no mean dimensions has been raised from seed found on a nearby English Yew. Since only pistillate plants of this species were anywhere about, it has been thought most likely that pollination occurred from certain adjacent Japanese forms. The resulting plant consequently is regarded as *Taxus media,* a hybrid, which has shown good features.

The main entrance into the grounds as it passes through a short wooded section is flanked by what, without having examined them carefully, I should say are Japanese Yews. Elsewhere stands a more prosaic array of distinctly upright pyramidal Irish Yews mixed with another form of some other nationality which I fail to recall. At still another spot, Mr. Hatfield prides himself upon a yew hedge which he trims occasionally and the clippings from which, he says, the nurserymen are always anxious to get for cuttings.

Close by stands some topiary work of Arbor Vitae well shaped and excellently trimmed. However finely executed such work may be, its severity is always shocking to one who admires natural beauty and I most concur with Mr. Hatfield in regarding it as less desirable than naturally grown hedges or specimen plants.

One of the interesting bits of information wholly new to me which I gained from my erudite conductor was prompted by my observation of a tall Colorado Blue Spruce whose lower limbs on one side have begun to drop off. I remarked that a similar decadence accompanied, however, by a gumosis was occurring on a

Blue Spruce at my home and I wondered if the cause in both cases might be the same. It was not, I found. He explained that the tree at hand was a grafted individual whose scion had probably come from a lateral branch with the result that the side of the tree which corresponded with the lower side of the scion would always be the weaker and tend to show defects as old age approached. This relation, he claimed, might occur in any grafted stock.

Another defect of grafting caused me to mistake a Japanese White Pine for a native western species. At the ground line was a distinct collar with the main stem arising from it, as any column would if set in the middle of a wider base. The stock, I believe, had been of a two-needle pine which had effected a slight distortion in the five-needled foliage of the matured scion.

I soon spied by its striking bluish foliage some distance away a magnificent Moss Retinospora or Veitch's Sawara Cypress. This popular variety of a Japanese tree is seldom seen other than as a compact shrub, ten feet high at most. Here, however, is a handsome specimen forty or fifty feet tall that stands most conspicuously amid the greener foliage of its companions. Another specimen equally outstanding by its size but not so striking in color is a Thread Retinospora possibly thirty feet tall. It, too, is a variety of the Japanese Cypress and ordinarily is a mere shrub or very small tree. As a rule, seedlings obtained from varieties such as these revert to the type species. I believe it was from this big Thread Retinospora, however, that Mr. Hatfield, much to his surprise, had grown plants true to the variety.

A third garden form of uncommon occurrence and usually small dimensions is here represented by a twenty-foot tree. I refer to that odd form of the Japanese Hinoki Cypress known as the Fern Spray Retinospora.

Of the spruces there is an enormous Alcock's from Japan, the Oriental Spruce from the Caucasus and Asia Minor and the Saghalin Spruce from northern Japan. The Servian Spruce from southeastern Europe and the hostile Tigertail Spruce from Japan are also present.

Of the Junipers I saw only a few, including the well-known Pfitzer's Chinese Junipers and two or three forms of the Creeping Juniper.

These incomplete and cursory notes cannot possibly do justice to this wonderful private collection of trees. I was unable to record any more specific notes, for in the short period that I was so fortunate as to enjoy Mr. Hatfield's guidance I was anxious to see and hear as much as possible.

EDMUND H. FULLING.

JOSEPH EDWARD KIRKWOOD

Dr. Joseph Edward Kirkwood, Professor of Botany in the University of Montana, died suddenly on August 16, 1928, in his 57th year, while engaged in research at the University Biological Station at Yellow Bay, Flathead Lake, Montana. After graduation from Pacific University, in Oregon, in 1898, he studied at Princeton University, Columbia University, and The New York Botanical Garden, receiving the degree of A. M. from Princeton in 1902 and that of Ph. D. from Columbia in 1903. His doctorate thesis on "The Comparative Embryology of the Cucurbitaceae" was published in Volume 3 of the *Bulletin of The New York Botanical Garden*. From 1901 to 1907, he was, successively, instructor, assistant professor, and professor of botany in Syracuse University. From 1907 to 1909, Dr. Kirkwood was associated with the Continental-Mexican Rubber Company, in studying the availability of the guayule shrub as a source of rubber, spending one year at Torreon, Mexico, and the next at the Desert Laboratory of the Carnegie Institution at Tucson, Arizona. Since 1909, he had been connected with the botanical and forestry work of the University of Montana. His summers were devoted chiefly to the study of the flora of Montana and Idaho, with special attention to ecological problems and to experimental forestry. Some of his more important published papers are "The Pollen-tube in some of the Cucurbitaceae," "Some Features of Pollen-formation in the Cucurbitaceae," "The Growing of Guayule in relation to Soil," "The Life History of Parthenium (Guayule)," "Some Mexican Fiber Plants," "The Conifers of the Northern Rockies," and "Forest Distribution in the Northern Rocky Mountains." His illustrated articles of a semi-popular

nature include "Desert Scenes in Zacatecas" in *The Popular Science Monthly* (Vol. 75), "A Mexican Hacienda" in *The National Geographical Magazine* (May, 1914), "Botanical Exploration in the Rocky Mountains" in *The Scientific Monthly* (Vols. 24 and 25). In coöperation with Dr. W. J. Gies, at The New York Botanical Garden, he published an elaborate paper entitled "Chemical Studies of the Cocoanut with some Notes on the changes during Germination." Professor Kirkwood left an unpublished work, which Professor Severy has recently (Science, II, 68: 223. 75, 1928) described as "monumental," on the trees and shrubs of the northern Rockies. It is undersood that the University authorities hope soon to have this on the press.

Professor Kirkwood was active and influential in the development of research work in the University of Montana and served as chairman of several of the university committees. He was a leader also in organizing the Northwest Scientific Association. He was interested, too, in the science teaching of the secondary schools and did much to organize and coördinate the science programs of these schools. In 1925 he was chairman of the Inland Empire Teachers Association.

Professor Kirkwood was a man of imposing physique, commanding personality, and irreproachable character. His untimely passing is lamented by his numerous friends.

MARSHALL A. HOWE.

BEQUEST OF THE BURGESS COLLECTION OF ASTERS

The will of Professor Edward S. Burgess, who died at Yonkers, New York, on February 23rd, 1928, admitted to probate by the Surrogate of Westchester County on March 14th, contains the following provision:

> "ITEM 6. My herbarium of Aster specimens, so far as now stored in my residence, I give to The New York Botanical Gardens to supplement those which I have already given there."

The specimens were received from Mrs. Burgess on June 7th, and at a meeting of the Scientific Directors held June 9th the following minute was authorized:

The collection of herbarium specimens of North American Asters formed during many years of study by Professor Edward Sandford Burgess, bequeathed by him to The New York Botanical Garden, received from Mrs. Burgess in June, 1928, is a noteworthy addition to the herbarium of the institution. It fully illustrates all the plants described by him in "Species and Variations of Biotian Asters, with Discussion of Variability in Asters," published in 1906 as the thirteenth volume of Memoirs of the Torrey Botanical Club, following his learned "History of Pre-Clusian Botany in its relation to Aster," published in volume ten of these Memoirs.

Professor Burgess had been an Annual Member of the Garden since 1906, and he served as a Scientific Director during 1912 and 1913, while President of the Torrey Botanical Club.

The specimens supplementing those already given by him will be deposited in the herbarium of the Garden.

An appreciative record of his life and work has been written by Dr. Howe for publication in *Bulletin of the Torrey Botanical Club*.

N. L. Britton,
Secretary.

PUBLIC LECTURES DURING OCTOBER AND NOVEMBER

The free illustrated lectures of The New York Botanical Garden during October and November are given in the Museum Building, beginning at 4 P. M. Doors are opened at 4:15 to admit late-comers. The program follows:

October 6. "Diatoms, Microscopic Beauties,"
Dr. Marshall A. Howe.

October 13. "Autumn Coloration," Dr. A. B. Stout.

October 20. "Plants that Are Attractive in Fruit,"
Mr. Kenneth Boynton.

October 27. "South American Wild Life,"
Mr. Leo E. Miller.

November 3. "History of Landscape Gardening,"
Prof. H. Findlay.

November 10. "Philippine Life," Dr. Forman T. McLean.
November 17. "Some Interrelations between Botany and Geology," Dr. Arthur Hollick.
November 24. "Java and the Javanese People," Dr. H. A. Gleason.

NOTES, NEWS, AND COMMENT

A party of European entomologists, who came to America to attend the Fourth International Congress of Entomology that was held at Ithaca, August 12–18, visited The New York Botanical Garden on August 1 and were escorted around the grounds and through some of the buildings of the institution by members of the Garden staff. The following letter, expressing appreciation of attentions, was afterwards sent to the Director-in-Chief by an official of the party:

"Dear Sir:

"As Secretary of the party of European entomologists who traveled over on the 'Tuscania' and who were privileged to enjoy a delightful visit to your Gardens, I have been asked to convey to you once again our most cordial thanks. Your kindness in furnishing guidance and transportation through your magnificent Gardens was very deeply appreciated by us all, and we shall carry back to Europe not only a most pleasant memory of the Gardens themselves but also of the hospitable kindness with which we were received there.

"With renewed warm thanks,

"Sincerely yours,

"HILDA JORDAN."

Among the visitors to the library during the summer, other than those mentioned in an accompanying item, were the following botanists: Dr. Lewis E. Wehmeyer, Cambridge, Mass.; Prof. Alex. W. Evans, Yale University; Prof. H. H. Whetzel, Ithaca, N. Y.; Prof. Howard J. Banker, Huntington, N. Y.; Prof. Illo Hein, State College, Pa.; Dr. John M. Fogg, Jr., Philadelphia, Pa.; Dr. C. D. Sherbakoff, Knoxville, Tenn.; Miss Laura M. Bragg, Charleston, S. C.; Prof. A. S. Hitchcock and Dr. Edgar T. Wherry, Washington, D. C.; Miss Louise Sudbury, Muncie, Ind.; Prof. Charles Piper Smith, San José, Cal.; Prof. Carl Ep-

ling, Los Angeles, Cal.; Prof. A. H. Reginald Buller, Winnipeg, Can.; Mr. E. A. McCallan, Bermuda; Prof. Cristobal M. Hicken, Buenos Aires, Arg.; Dr. G. Dufrency, Paris, France; Rev. Dr. S. J. Enander, Lillherrdal, Sweden, and Prof. Tyôzaburó Tanaka, Taiwan, Japan.

A general impression in the region of the New York City that the past summer was an unusually wet one does not seem to be confirmed, at least so far as the years 1925, 1926, 1927 and 1928 are concerned, by a comparison of the precipitation figures for the three summer months, as recorded at The New York Botanical Garden. The figures are as follows:

	1925	1926	1927	1928
June	2.93 inches	2.54	3.42	6.33
July	7.89	6.19	9.75	5.46
August	1.94	6.52	9.97	3.66
	12.76 inches	15.25	23.14	15.45

However, summer showers are often very local, as is shown by a recorded fainfall of 9.75 inches at the Botanical Garden in July, 1927, while the Central Park Station, eight or nine miles away, had only 5.45 inches during the same period. Moreover, the total precipitation has no direct relation to the number of days on which rain fell or to the general humidity and cloudiness.

Dr. Forman T. McLean, Supervisor of Public Education, attended the annual meeting and exhibition of the American Gladiolus Society at Toledo, Ohio, on August 15, 16 and 17. As a member of the Board of Governors during the past year and as editor of the Gladiolus Review, the official journal of this society, as well as one of the judges of the exhibits at the show, his time was quite taken up with official duties. The show itself had a number of interesting features. Mr. A. E. Kunderd, of Goshen, Indiana, made a fine exhibit of his Gladiolus arranged in a formal group across one end of the hall. This was easily the most artistic part of the exhibit. In the corresponding position at the other end of the large Armory Building, Vaughan's Seed Store had a very attractive trade exhibit with a semi-circular bank of Gladiolus flowers of the varieties introduced by Vaughan, serving

as the central part of the exhibit. This was grouped around a wooden pergola. On one side of this central exhibit was a group of seedlings of Vaughan's not yet given names and on the opposite side was a similar arrangement of a large number of the commercial varieties of the trade. The seedlings included a goodly number of handsome yellow and blue seedlings. The exhibit as a whole throughout the hall was conspicuous more for its splendid show of many of the novelties and rare things among Gladiolus than for spectacular spikes of extremely great size. Perhaps the highest quality of flowers was shown by Vaughan's exhibit and by P. J. Pentecost's table featuring the variety, W. H. Phipps. Few of these spikes had less than 10 open blooms and they made a wonderful show.

As a part of the summer meeting of the American Phytopathological Society, a considerable number of members of that organization visited The New York Botanical Garden on the afternoon of August 21. Those who left their autographs on the visitors' register included H. W. Anderson, Urbana, Ill.; Norman Armstrong, Poughkeepsie, N. Y.; O. E. Boyd, Thomasville, Ga.; C. O. Bratley, Miami, Florida; H. C. Bucha, Yonkers, N. Y.; Lucia McCulloch, Washington, D. C.; E. E. Clayton, Riverhead, L. I.; W. A. Cubbin, Harrisburg, Pa.; Irene Dobroscky, Yonkers, N. Y.; Eugene T. Erickson, Ithaca, N. Y.; Alberto Graf, Santiago, Chili; R. W. Harned, A. & M. College, Miss.; Mr. and Mrs. A. J. Haskell, Washington, D. C.; F. O. Holmes, Yonkers, N. Y.; R. A. Jehle, College Park, Md.; Leon K. Jones, Geneva, N. Y.; L. O. Kunkel, Yonkers, N. Y.; O. N. Leining, Wooster,Ohio; T. F. Manns, Newark, Del.; G. Hamilton Martin, Washington, D. C.; A. W. McCallum, Ottawa, Can.; C. R. Orton, Yonkers, N. Y.; D. P. Perry, Haddon Heights, N. J.; W. H. Rankin, Geneva, N. Y.; F. P. Schlatter, Washington, D. C.; Carl A. Schwarze, Woodhaven, L. I., N. Y.; W. H. Tisdale, Wilmington, Del.; Y. Tochnai, Hokkaido, Imp. Univ., Sapporo, Japan; M. B. Waite, Washington, D. C.; Mr. and Mrs. Errett Wallace, Washington, D. C.; D. S. Welch, Ithaca, N. Y.; John B. Wentz, Ames, Iowa.

After the visit the following letter from the chairman of the summer meeting committee of the American Phytopathological Society was received by Dr. Britton:

"Dear Dr. Britton:

"As chairman of the summer meeting committee of the American Phytopathological Society, I want to express my appreciation of the many courtesies shown us by you and your associates on our visit to The New York Botanical Garden. This was one of the most enjoyable features of the meeting, and the committee appreciates your willingness to devote your time to entertaining us.

"With best personal regards, I am

"Sincerely yours,

"Wm. H. Martin,

"Plant Pathologist."

Meteorology for August. The maximum temperatures recorded at the Garden for August during each week or part of a week were: *96° on the 4th;* 91° on the 9th; 92½° on the 15th; 82° on the 26th, and 92° on the 30th. The minimum temperatures recorded were: 62° on the 1st; *57½° on the 12th;* 60° on the 14th, and 59° on the 20th. The total precipitation for the month was 3.66 inches.

Meteorology for September. The maximum temperatures recorded at The New York Botanical Garden for each week or part of a week were: *87° on the 8th;* 85° on the 13th; 80½° on the 17th, and 69° on the 24th. The minimum temperatures recorded were: 51° on the 2nd; 53° on the 6th; 60° on the 15th; 46° on the 24th, and *38° on the 28th.* The total precipitation for the month was 3.60 inches.

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Journal of The New York Botanical Garden, monthly, containing notes, news, and non-technical articles. Free to members of the Garden. To others, 10 cents a copy; $1.00 a year. Now in its twenty-ninth volume.

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Memoirs of The New York Botanical Garden. Price to members of the Garden, vols. I–VI, $1.50 per volume; to others, $3.00. Vol. VII, $2.50 to members; to others, $5.00.

Vol. I. An Annotated Catalogue of the Flora of Montana and the Yellowstone Park, by Per Axel Rydberg. ix + 492 pp., with detailed map. 1900.

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

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

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

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

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

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

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

THE NEW YORK BOTANICAL GARDEN
Bronx Park, New York City

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

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

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

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

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

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

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

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

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

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

A library of botanical literature, comprising more than 37,000 books and numerous pamphlets.

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

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

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

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

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The following is an approved form of bequest:

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

All requests for further information should be sent to

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A RECATALOGUING OF THE PINETUM

Just a year ago the writer undertook the task of preparing a popular guide to the evergreen collections at The New York Botanical Garden. It was his intention to present in a simple manner all interesting information pertaining to every kind of coniferous tree in the Garden and in such a manner that the completed volume would become a progressive guide as one followed certain paths and plans.

This work immediately resolved itself into two distinct phases. The second became the actual preparation of the guide itself and this phase, it is hoped, will be completed by next spring. It is with the first phase, namely, the recataloguing of all the plants concerned, that this article deals. This part of the work has provided a basis upon which to establish the guide.

It has been the intention at the Garden that each and every tree and shrub in the collections arranged botanically should bear a copper tag indicating its scientific name, its source and year of acquisition, and a number to correspond with that on its index card in the card catalogue kept in the Head Gardener's office. The result has been an alphabetically arranged index of many thousand cards, each species, variety and form having its own card whereon is indicated the approximate location by large areas, the source, an acquisition number, and the number of individual plants of each species, variety, and form. In short, a record of every plant in the scientific collections of the institution was intended to be kept, through cataloguing and tagging.

It has not been possible to maintain these records as accurately as was desirable. Every few years a check-up was made but

Summary of Catalogue of Coniferous Evergreens in the outside Collections.

Genus	No. of known species.				No. of species in Garden.							No. of known varieties.	
			In American cultivation.		Native.			Foreign.					
	Native.	Foreign.	Native.	Foreign.	P	D	T	P	D	T	Total.	Native.	Foreign.
Abies	9	26	9	22	5	1	5	8	2	8	13	15	16
Cedrus	—	3	—	3	—	—	—	—	—	—	—	—	10
Cephalotaxus	—	6	—	3	—	—	—	1	—	1	1	—	4
Chamaecyparis	3	3	3	2	2	2	3	2	2	2	5	22	24
Cryptomeria	—	1	—	1	—	—	—	1	1	1	1	—	10
Ginkgo	—	1	—	1	—	—	—	1	1	1	1	—	5
Juniperus	12	25	8	15	3	2	3	7	2	9	12	38	24
Larix	3	7	2	5	—	—	—	2	—	2	2	—	3
Picea	7	32	7	25	3	2	3	8	3	8	11	19	37
Pinus	35	35	23	16	12	4	12	11	5	13	25	10	32
Pseudolarix	—	1	—	1	—	—	—	1	—	1	1	—	—
Pseudotsuga	2	2	1	1	1	1	1	—	—	—	1	8	1
Sciadopytis	—	1	—	1	—	—	—	1	1	1	1	—	—
Taxodium	2	1	2	1	2	—	2	—	—	—	2	3	—
Taxus	3	3	2	3	—	—	—	2	2	2	2	—	18
Thuja	2	4	2	3	2	1	2	2	2	2	4	33	10
Tsuga	4	5	4	3	2	1	2	2	1	2	4	7	—
Tumion	2	4	2	2	—	—	1	1	1	1	2	—	—
Total	84	160	65	108	32	14	34	50	23	54	88	155	193

Summary of Catalogue of Coniferous Evergreens in the outside Collections.

Genus	No. of varieties in Garden.							No. of trees in Garden.					No. of species and varieties in Garden.		
	Native.			Foreign.			Total.	Native.		Foreign.		Total.	P	D	T
	P	D	T	P	D	T		P	D	P	D				
Abies	—	—	—	2	—	2	2	29	37	121	31	218	15	3	15
Cedrus	—	—	—	2	—	2	2	—	—	3	—	3	2	—	2
Cephalotaxus ..	—	—	—	1	—	1	1	—	—	3	—	3	2	—	2
Chamaecyparis .	4	1	5	26	19	26	31	27	38	229	282	576	34	24	37
Cryptomeria ...	—	—	—	5	—	5	5		—	34	6	40	6	1	6
Ginkgo	—	—	—	1	—	1	1	—	—	13	29	42	2	1	2
Juniperus	16	2	17	17	1	17	34	76	28	128	50	282	40	7	46
Larix	—	—	—	—	—	—	—	—		11	—	11	—	—	2
Picea	7	4	8	11	1	11	19	111	42	86	36	275	30	10	30
Pinus	1	—	1	6	3	7	8	121	500	181	118	920	30	12	33
Pseudolarix	—	—	—	—	—	—	—	—	—	3	—	3	1	—	1
Pseudotsuga ...	1	1	1	—	—	—	1	20	21	—	—	41	—	—	1
Sciadopytis	—	—	—	—	—	—	—			5	3	8	1	1	1
Taxodium	—	—	—	—	—	—	—	9	—	—	—	9	2	—	2
Taxus	-	—	—	11	5	12	12	—	—	55	90	145	13	7	14
Thuja	23	7	24	2	3	4	28	108	155	21	57	341	29	13	32
Tsuga	2	1	2	—	—	—	2	14	24	8	1	47	6	3	6
Tumion	—	—	—	—	—	—	—	—	1	4	2	7	1	2	2
Total	54	16	58	84	32	88	146	515	846	905	705	2971	214	84	234

Legend: P In Pinetum.
D—In decorative plantings.
T—Total.

Note: Numbers of known species and varieties are from Bailey and Rehder. Numbers of species in Garden exclude varieties, given elsewhere.

never completely. The removal of dead trees, the transferal of others and the planting of new stock altered the plantings in places not indicated by the catalogue. Through natural deterioration or by the pranks of visitors many tags have been lost.

This condition the writer has remedied by a thorough revision of the catalogue so far as the conifers are concerned. Practically every tree in the collections has been relabeled and some 250 cards in the catalogue have been rewritten. Some genera, as *Chamaecyparis,* occupied several months in the process, not continuously, of course, but periodically, in order that the many color varieties might be checked by their seasonal changes. Approximately one half of all tags were lost, necessitating, as a result, a redetermination of as many plants, with continuous reference to the card catalogue.

In addition, there are in the Garden over a thousand evergreens, outside of the generically arranged groups, which had never been labeled, or, at least, of which there were no records. These are in the various mixed decorative plantings and in some respects they are of more interest to the public than the generic collections, for they exhibit the ornamental value of mixed planting. Included in these are all the evergreens forming backgrounds in the flower garden plots about Conservatory Range 1, those about the stairway at the Rose Garden, those at the entrances into the Garden at the Lilac collection, and at Kipp's Corner or the Iris Garden Entrance, the handsome group at the west end of the Long Bridge over the Bronx River and the fine collection at the 204th Street stairway. Every evergreen in these several locations now bears a copper tag and is recorded.

The accompanying tabulation shows, by various comparisons, the nature of these evergreen collections in the Garden. There are about thirty-four known genera of plants that are listed as cultivated evergreens and of this number some twenty-one contain species regarded as hardy in the latitude of New York City. Eighteen of these are now in the outside collections.

The chart shows a count of 2,968 trees, which figure includes an estimate of three hundred to cover the planting of white pine, pitch pine, and Douglas spruce opposite Fordham Hospital. They are the only untagged evergreens, with minor exceptions of a few

others to be removed, and the wild hemlock trees of the Hemlock Grove. The tagged trees have been classified into two hundred and thirty-four different species and varieties and labels have been provided for many of them. There is a possible source of error in this count no greater than five or ten at the most to allow for discussion concerning the horticultural varieties of *Thuja, Juniperus,* and *Chamaecyparis.* These were the most difficult in the entire work of classification. Several visits to local nurseries and the Arnold Arboretum at Boston assisted the writer to a great extent in the many determinations of these forms. There is such frequent variation in them, however, that their accurate determination is often very difficult. In only two or three cases did the writer find good reason to make definite changes in former labeling.

In the two large conservatories and the propagating house there are other evergreen genera represented which are not hardy outside. They include *Cupressus, Cunninghamia, Glyptostrobus, Agathis, Araucaria, Callitris, Keteleeria, Libocedrus, Podocarpus, Sequoia,* and *Thujopsis.* Of these eleven genera there are about fifty plants in the collections, some of which are good-sized trees reaching the tops of the greenhouses.

Since the two hundred and fifty different species and varieties of evergreens in the Garden, including the tender species, are about half the known number in cultivation, allowing for differences of opinion on varietal matters, there is yet ample room for expansion. All the hardy genera except two or three and one half of the supposedly hardy cultivated species of the genera represented in the Garden, and less than half of their cultivated varieties are in the collections. Several of the lacking forms might not be hardy here and a few have already been tried but in vain. However, the greater number of them should be hardy and some are standard forms carried by the nurseries. Others are more difficult to secure in the trade and would have to be specially obtained or propagated.

EDMUND H. FULLING.

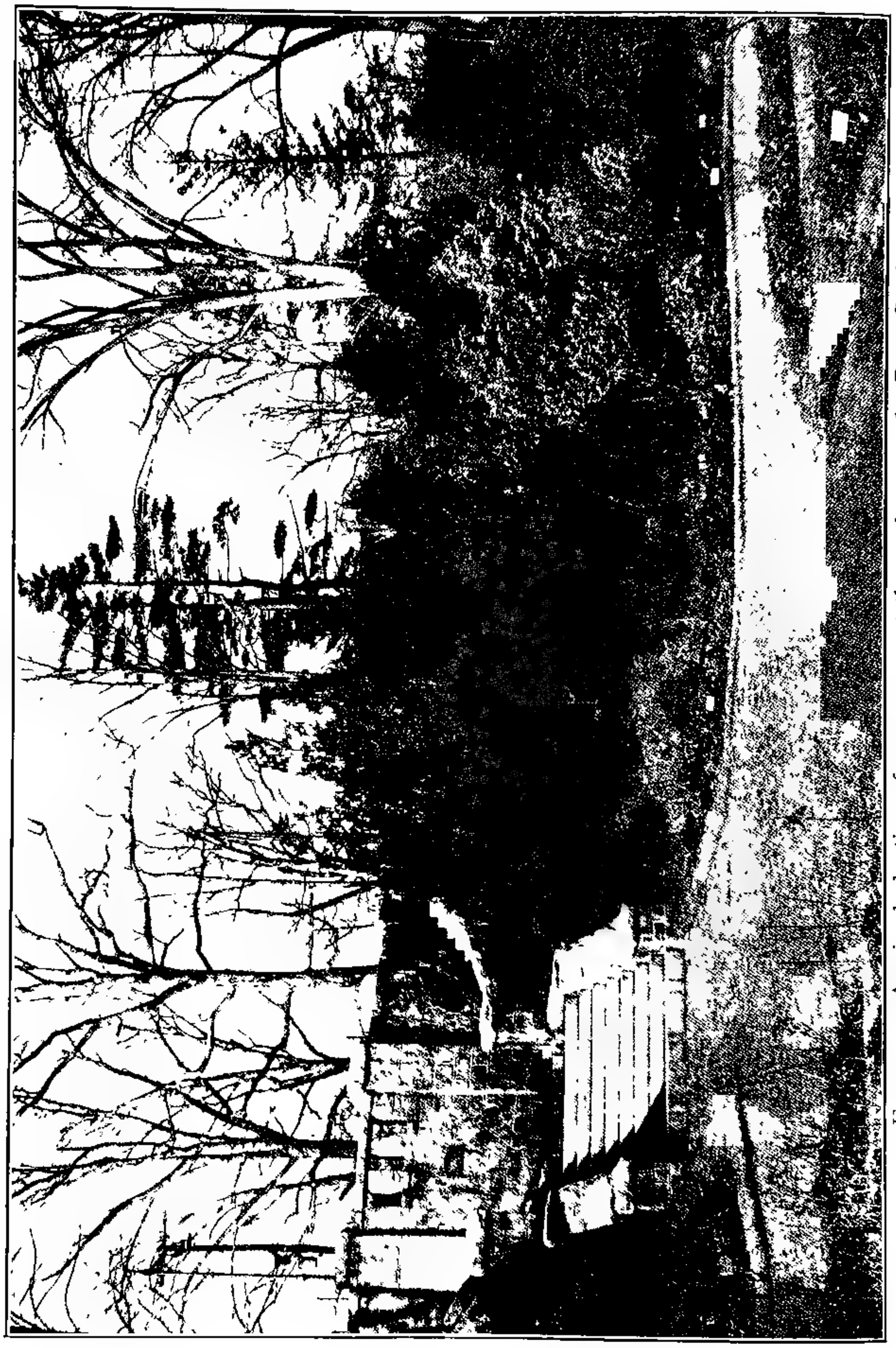

FIGURE 1. A mixed planting of evergreens at the entrance to the Rose Garden.

FIGURE 2. A mixture of Colorado Blue Spruce, *Picea pungens glauca,* and Koster's Blue Spruce, *Picea pungens Kosteri,* north of Conservatory Range No. 1.

FIGURE 3. Four fine specimens of the Needle leaved Prostrate Juniper, *Juniperus squamata*, in the foreground,

THE STORY OF THE REDWOODS[1]

"Redwood" is a popular name applied to the two species of *Sequoia*—*S. sempervirens* of the California coastal region, and *S. gigantea* of the Sierras. The former are more generally known as the "redwoods" and the latter as the "big trees." These two species are the only living representatives of the genus in the world, and they are confined to an isolated area on the Pacific slope of the United States.

Fossil remains, however, consisting of leafy twigs and cones, demonstrate that the genus was formerly represented by many different species, and that these were, until recent geologic times, almost world-wide in their distribution—at least throughout the northern hemisphere. Remains have been found in Asia, Europe, Iceland, Greenland, British America, the United States, and Alaska. The ancestry of the genus probably dates back to the Cretaceous period. It reached its maximum development in the Tertiary period. During the Quaternary period, when a large part of the northern hemisphere was buried under ice and snow, in the Glacial epoch or Ice Age, it was exterminated in the Old World, but managed to survive, in reduced numbers, in a limited area, on the western slope of the Sierras and along the Pacific coastal region of North America.

Incidentally, it is of interest to note that the fossil remains of *Sequoia* were discovered in the Old World before the living trees were discovered in America. The fossil remains, of course, were not called *Sequoia,* because that name had not yet been coined. They were given names designed to indicate their supposed relationship with certain known coniferous trees, such as *Taxodites,* indicating resemblance to *Taxodium,* or bald cypress, etc. *Sequoia* trees, therefore, enjoy the more or less unique distinction of having been discovered and named as fossils before they were found in a living state, or even suspected of being in existence.

The cause of their extinction everywhere, except in the limited region to which they are now confined, was due to the climatic changes coincident with the Ice Age, in conjunction with the main topographic features of the Eurasian and North American con-

[1]Abstract of an illustrated lecture given at The New York Botanical Garden on Saturday afternoon, July 7, 1928.

tinents. The previous mild climatic conditions of the Tertiary period gradually gave way to the advancing cold of the Quaternary period, and only such vegetation as could migrate and live southward was able to exist. Most of the mountain systems of the Old World may be seen to extend in an east and west direction. These cut off any outlet southward, and all life that was caught between these mountains and the advancing ice perished. In North America, however, the mountain systems extend in a north and south direction, and along the sheltered western slope of the Sierras the Sequoias were able to maintain their existence.

If the trees were left undisturbed, they would continue to live and propagate themselves indefinitely. They are peculiarly free from fungous and insect pests, and that is the main reason why they have continued to live and thrive, and why many individuals have reached the great age they have. Those that have met death have been destroyed by man, by lightning, or by wind. Otherwise they would be, practically, immortal. John Muir, the naturalist, has said that he never saw one of the big trees that had met a natural death.

The lecture was illustrated by lantern slides, showing the location of the redwood forests in California; the groves that are now under government ownership and protection; certain of the largest individual trees; lumbering operations in the privately owned tracts, etc.

ARTHUR HOLLICK.

LIFE ZONES OF THE ROCKY MOUNTAINS[1]

We have learned from our school geographies that the earth is divided into five zones, the Arctic, the North Temperate, the Torrid or Tropical, the South Temperate, and Antarctic zones, separated by the Polar Circles and the Tropics. This division is, of course, arbitrary and the climate changes gradually from one to the other. From a biological standpoint, each of these should be subdivided. This is especially the case with the Temperate Zone. For example, the pine woods of Scandinavia and northern

[1] Abstract of an illustrated lecture given at The New York Botanical Garden on Saturday afternoon, June 16, 1928.

Russia are very unlike the olive and orange groves of the Mediterranean region. It would be better to admit a Cold Temperate and a Warm Temperate zone on each side of the tropics. But, even if the earth was divided into seven instead of five zones, there would be belts where two of the zones intergrade or dovetail into each other, -transitional zones. The Middle Temperate zone, or zone between the Warm and Cold Temperate zones, was called by Dr. C. Hart Merriam the Transition zone. The northern hemisphere may therefore be divided into the following subzones: 1, *Glacial* zone (ice-covered polar cap, with no vegetation except a very few lichens and algae); 2, *Arctic* zone proper to the timber-line; 3, *Subarctic* (transitional); 4, *Boreal* or *Cold Temperate;* 5, *Subboreal* or *Middle Temperate;* 6, *Warm Temperate;* 7, *Subtropical* (transitional); 8, *Tropical,* with one rainy and one dry season; 9. *Equatorial,* with two rainy seasons or a continuous wet season through the year.

That North America held definite belts of vegetation has been known for a long time. Even the great Swedish botanist Linnaeus recognized it 175 years ago. He named plants *canadensis, virginiana, and caroliniana,* even if the types did not come from Canada, Virginia, or Carolina. These names represented vegetative regions rather than states, in other words, the Cold, Middle, or Warm Temperate zones of eastern North America.

Dr. C. Hart Merriam was the first one in the United States who called attention to this zonation in a striking way and gave names to the zones which are in use to-day. Just as the earth is divided into vegetative zones from the equator to the pole so the mountains are from sea-level to the summit. Standing on the top of San Francisco Peak in Arizona, Dr. Merriam saw some of these zones before his eyes. Around him was the barren summit, the Alpine-Arctic zone; below that the dark green woods of Engelmann Spruce, his Hudsonian zone; the lighter woods of Pines and Red Fir, his Canadian; then the open pineries of Bull Pine, his Transition; then the spotted foothills with piñons and cedars, the Upper Sonoran; and in the far distance the desert, the Lower Sonoran zone. He, as well as many others, had noticed that the Eastern United States had a humid climate and that the western half as a rule had an arid one, except the northwestern corner and the higher mountains. As the climate of the

mountains was more like that of the humid East, he used the same terms for the mountain in altitude zonation as that of the latitude zonation of the East, hence his Arctic, Hudsonian, and Canadian zones. His Transition zone meant first the transitional zone between the forest and the desert, later the corresponding transitional zone between the Boreal and Austral (parts of the Temperate zones of the East). As the Warm Temperate zone of the West is so unlike that of the East, he called the former Sonoran; the latter, Austral. His lower Austral corresponds to the Subtropical zone mentioned above.

After this general introduction, the lecturer showed one of the earlier of Dr. Merriam's maps of the United States and pointed out corrections that had to be made on account of better knowledge of the extent of the different zones, also a map of the life zones of the Rocky Mountains made by himself. He showed nearly 100 slides, some colored and others uncolored, of general vegetation of the zones, the characteristic trees and many of the flowers growing in each from both the eastern and western sides of the mountains. He also mentioned a few animals, characteristic of each zone. As the lecture was given more as an altitudinal zonation of a mountain chain, he used the names Sonoran, Submontane, Montane, Subalpine, and Alpine, instead of the corresponding Warm, Middle, and Cold Temperate, Subarctic, and Arctic. Dr. Merriam would have used Sonoran, Transition, Canadian, Hudsonian, and Arctic.

P. A. RYDBERG.

THE HERBARIUM OF EUGENE A. RAU

The extensive and valuable botanical collections formed by Mr. Eugene A. Rau, of Bethelehem, Pennsylvania, have been presented by him to The New York Botanical Garden, and will be incorporated into the herbarium, for the use of students. This important accession includes several thousand specimens collected by Mr. Rau and his correspondents during many years of study; it is especially rich in mosses and their relatives, groups of plants in which he was particularly interested, but also includes many lichens and algae.

He had made exchanges of mosses with Thomas C. Porter, John Macoun, Coe Finch Austin, Charles Mohr, and other bryologists and published in 1880 in coöperation with A. B. Hervey a Catalogue of North American Mosses, which indicated their distribution, throughout the United States, British America, and Mexico. He contributed specimens to Leo Lesquereux and T. P. James, who published in 1884 the Manual of the Mosses of North America. He also exchanged lichens with Edward Tuckerman and fresh-water algae with Francis Wolle.

At the meeting of the Scientific Directors held on October 15, the following resolution was adopted:

> "*Resolved,* That the Scientific Directors of The New York Botanical Garden cordially appreciate the gift, in July, 1928, of the very valuable cryptogamic herbarium formed, during many years of study, by Mr. Eugene A. Rau, of Bethlehem, Pennsylvania."
>
> N. L. Britton,
> *Secretary.*

BARRETT'S "THE TROPICAL CROPS"[1]

This book is emphatically written by "one who knows," as distinguished from one who compiles. As one travels through its pages and realizes, at every step, that the author is telling of what "he himself saw and a great part of which he was," the marvel grows that a man, in one lifetime, could have seen so much while traveling so far. So far from making any attempt to pad the pages and paragraphs, the writer has condensed his statements to such an extent as to require some concentration of thought to follow him quickly.

A proper review of the book should begin with a verbatim copy of the two pages of preface, for which we have not space. Here the author visualizes the rôle that the tropics are to play in supplying the world's needs when it shall be forced to conservation of all its resources for accomplishing that result. When that time

[1] The Tropical Crops, by Otis Warren Barrett, B. Sc., Agricultural Director, Department of Agriculture and Labor, Porto Rico. 445 pages, 24 plates. The Macmillan Company, New York. 1928.

comes, this book will find its mission, for it is a vast store-house of valuable information that must be consulted by all classes of tropical growers, in all lands. Having said this much, a fairly good review could be supplied by merely printing the table of contents! Chapter one deals with the general conditions of tropical culture and the practices followed in various tropics for successfully meeting them. The incidental manner in which Mr. Barrett skips over the surface of the earth for his illustrations, all of which he seems to have observed, is rather bewildering, not to say startling. Seven-league boots are here quite useless; we have to go a thousand leagues at a step. But the climax of this mode of treatment is reached in the second chapter, which, in twenty-two pages, carries us over all the tropical areas of the earth's surface, and leaves us with an excellent general idea of the lay-out, but not until after we have read it over several times. A thorough grasp of the matter of this chapter would constitute a liberal education in regional geography of this area, which, we are reminded, comprises 40 per cent. of the earth's surface. Chapter three deals with living conditions for the tropical planter, and is the chapter which is perhaps the most open to criticism. The main portion goes far to correct the dangerous impression given in the first pages, which quite underestimate the perils of tropical residence as compared with life in temperate regions. I recall the temporary occupation of a cabin on the banks of the River Orinoco. The lady of the house, in turning it over to us, gently requested us to respect a small enclosure at the rear of the building, where six of her children were buried. She had two living. Soon after our installation there, a visitor came down the river to join our party. When almost within sight of the river-bend where we were located, he stopped at a settlement to make inquiry. They persuaded him to spend the night there, as it was nearly sun-down, and in the morning, he was dead! A child of five years living near us was a mass of ulcers from head to foot. and spent his days in moaning, between his attempts to play. It is such experiences as these during my few years in the tropics, viewed with the eyes of the intelligent physician, that furnishes my picture of living conditions in the tropics. It is true that if one observes all of the precautions and protective measures that

Mr. Barrett describes—and describes them very well indeed—he may be as safe as in some more favorable regions, but the fact remains that in the tropics generally, the human being, especially the stranger, is many times more liable to disease. His diseases are far more numerous and more difficult to avoid and far more dangerous, all other things being equal, than is true in extra-tropical centers. Any one going to the tropics will do well to bear these facts in mind and to act accordingly, without, of course, inviting sickness by undue fears and anxieties.

After a general account of tropical vegetable products and their geographical distribution, and of the conditions favorable to them, respectively, the author devotes each of ten chapters to a description of a major product, as tea, coffee, rubber, bananas, and pineapples, and to directions for their culture. Nearly as many more chapters are devoted to groups of these products. This portion of the book is almost encyclopaedic in its treatment and must be regarded as reference material for the practical man who is in need of guidance in his work. It is likely to be the standard reference handbook for a generation to come. At the same time, it constitutes fascinating reading for one interested in economic plants from the botanical standpoint, for one interested in tropical pen pictures, or even for the housekeeper who goes marketing where tropical products are common merchandise. As a reading course for school children in the higher grades, I can think of nothing more attractive or educational in this particular field.

H. H. Rusby, M. D.

College of Pharmacy,
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NOTES, NEWS, AND COMMENT

Mr. Willard N. Clute, editor of *The American Botanist*, who was connected with the staff of The New York Botanical Garden in its early days, has recently been appointed Director of the Botanical Gardens of Butler University, Indianapolis, Indiana.

The dahlia collection of The New York Botanical Garden was somewhat retarded in its development this season and reached

the climax of its flowering during the second half of October. A special "Dahlia Day" was observed on Saturday, October 20, with a good attendance. Other special flower days during the season were April 27 (Daffodils); May 18 (Late Tulips and Rock Garden); June 8 (Iris and Peonies); June 29 (Roses); September 8 (Gladiolus); and November 3 (Chrysanthemums). The dahlias were killed by frost on the morning of October 27.

Mr. L. B. Smith, of the Gray Herbarium of Harvard University, sailed October 27 for Rio Janeiro, where he will devote five or six months to a field study of the family Bromeliaceae, which is particularly well represented in southern Brazil. He visited The New York Botanical Garden before his departure to make studies of our material of the family.

In connection with a convention of the National Association of Gardeners held in Greenwich, Conn., in the third week of October, a party of more than 200 men and women visited The New York Botanical Garden on Thursday afternoon, October 18. After a brief address of welcome and description of the main features of the Garden by Director Britton, the visitors inspected the library and were escorted around the grounds by members of the staff.

Mr. Norman Taylor, of the Brooklyn Botanic Garden, formerly a member of the staff of The New York Botanical Garden, sailed for Rio Janeiro, October 27, as a member of the American-Brazilian Scientific Expedition to the Amazon valley. Mr. Taylor will be the botanist of the expedition and will devote his attention primarily to the gum plants of the region. The expedition will travel inland some 1,100 miles by rail to Matto Grosso, thence by boat down an eastern tributary of the Madeira to its mouth, and return by way of the Madeira and Amazon through Manaos and Pará, reaching New York in the summer of 1929.

Dr. H. A. Gleason returned October 16 from an extended visit in Europe. His time there was largely spent at the Royal Botanic Gardens at Kew in the preparation of manuscript for the proposed Flora of British Guiana, a coöperative project between

the Royal Botanic Gardens and The New York Botanical Garden. He also studied various groups of the Andean flora, particularly the families Hypericaceae, Sapindaceae, and Melastomataceae. During July he joined the fifth International Phytogeographic Excursion for study of the vegetation of Czecho-Slovakia, traveling through that country from the German boundary on the north to the Austrian frontier on the south and as far east as the High Tatra mountains on the borders of Poland. While at Kew he was instrumental in securing a valuable series of duplicate herbarium specimens to be incorporated in our own herbarium.

The New York Botanical Garden has recently received from Miss Barbara Bayne, "Tree Historian of America," of Inglewood, California, three seeds of the "Washington Friendship Tree," growing at Bath, Pa. This ancient tree is a horse-chestnut and is said to have been presented, when very young, in 1781, by General George Washington to General Robert Brown, of Bath. The crown of this old tree, the trunk of which is reputed to have a circumference of more than twenty feet, was badly injured by a storm in 1921, and it is believed that the tree will not long survive. Thirteen seeds, representing the thirteen original colonies, have been sent to President Coolidge and to the governors of the forty-eight states, for the starting of "Friendship Groves" in the District of Columbia and in each state of the Union. Also, three seeds are sent to each of the state universities, to the California Botanic Garden in Los Angeles, and to The New York Botanical Garden in Bronx Park.

Meteorology for October. The total precipitation for the month was 1.42 inches. The maximum temperatures for each week or part of a week recorded at The New York Botanical Garden were: 78° on the 6th; *89° on the 12th;* 84° on the 17th, and 73° on the 23rd. The minimum temperatures were: 39½° on the 1st; 38° on the 9th; 43° on the 21st, and *28° on the 27th.* The first killing frost was on the night of the 26th.

ACCESSIONS

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MUSEUMS AND HERBARIUM

51 specimens of flowering plants from Illinois. (By exchange with Mr. Willard N. Clute.)

63 specimens of flowering plants from Australia. (By exchange with the National Herbarium of Victoria.)

1 specimen of *Hibiscus Trionum* from Pennsylvania. (Given by Mrs. William Mitchell.)

1 specimen of *Panicum stipitatum* from Virginia. (Given by Mr. W. T. Davis.)

9 specimens of American Mimosaceae. (By exchange with the United States National Museum.)

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

137 specimens of flowering plants from Jamaica, West Indies. (Given by Dr. W. R. Maxon.)

7 photographs of American Mimosaceae. (By exchange with the United States National Museum.)

1 specimen of *Chamaesyce* from Quintana Roo, Yucatan. (Given by Mr. S. S. Yeates.)

102 specimens of flowering plants from Uruguay. (Collected by Dr. Guillermo Herter.)

3 specimens of *Sonchus arvensis* from Pennsylvania. (Given by Dr. C. L. Gruber.)

12 specimens of flowering plants from Trinidad. (By exchange with the Agricultural Experiment Station, Port of Spain.)

57 specimens of woody plants from Central America. (By exchange with Yale University.)

230 specimens of flowering plants from Colombia. (Collected by Mr. Rafael A. Toro.)

1 specimen of *Centaurea solstitialis* from New Jersey. (Given by Miss C. C. Haynes.)

14 specimens of flowering plants from Washington. (Given by Professor R. Kent Beattie.)

1 specimen of *Fissipes acaulis* from Conway, New Hampshire. (Given by Mrs. Sinclair Kennedy.)

1 specimen of *Setiscapella cleistogama* from Florida. (Given by Dr. Hermann Kurz.)

26 specimens of flowerless plants from North America. (By exchange with the United States National Museum.)

1 specimen of *Anneslia Winzerlingii.* (By exchange with Professor S. J. Record.)

210 specimens of mosses from Mexico. (By exchange with the United States National Museum.)

242 specimens of sedges from Cuba and Brazil. (By exchange with the Riksmuseum, Stockholm, Sweden.)

36 specimens of Alabama mosses. (By exchange with Miss Helen Blackiston.)

4 specimens of Brazilian mosses. (By exchange with E. Armitage.)

41 specimens of mosses from Rainier National Park. (By exchange with Dr. J. M. Grant.)

127 specimens of Louisiana mosses. (By exchange with Brother Arsène.)

6 specimens of mosses from Ecuador, Colombia, and Brazil. (Collected by Messrs. Rusby, Pennell, Rose, and Russell.)

45 specimens of Haiti mosses. (By exchange with E. C. Leonard.)

4 specimens of Mexican mosses. (By exchange with Fr. Amable.)

1 specimen of *Bryum andicola.*

25 specimens of Musci Acro. Bor. Am. & Eu. (Given by Professor J. M. Holzinger.

71 specimens of mosses from Ecuador. (By exchange with Dr. J. N. Rose.)

19 specimens of Philippine mosses. (By exchange with Professor J. M. Holzinger.)

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

3 specimens and 2 photographs of *Acrothrix Novae-Angliae* from Massachusetts. (By exchange with Professor William Randolph Taylor.)

2 specimens of marine algae from Massachusetts. (By exchange with Professor William Randolph Taylor.)

2 specimens of *Riccia* from Maine. (Given by Dr. George H. Conklin.)

4 specimens of marine algae from Honduras. (Given by the Field Museum of Natural History.)

559 specimens of American flowering plants. (By exchange with the Royal Botanic Gardens, Kew.)

702 specimens of plants from Venezuela. (Collected by Mr. H. Pittier.)

135 specimens of flowering plants from Hue, Indo-China. (By exchange with the University of California.)

50 specimens of flowering plants from Hawaii. (By exchange with Mr. Otto Degener.)

172 specimens of plants from Mongolia. (By exchange with the American Museum of Natural History.)

2 specimens of flowering plants from California. (Given by Mrs. T. R. Allen.)

498 specimens of flowering plants from Idaho, Nevada, and California. (By exchange with Stanford University.)

135 specimens of flowering plants from Montana. (By exchange with the University of Montana.)

10 specimens of *Oxypolis* from New Providence, Bahamas. (By exchange with Mr. L. J. K. Brace.)

659 specimens of plants from Mt. Roraima. (By exchange with the American Museum of Natural History.)

58 specimens of flowering plants from Honduras. (By exchange with the United States National Museum.)

2 photographs of *Phlox amplifolia.* (Given by Dr. Edgar T. Wherry.)

19 specimens of flowering plants from North America. (By exchange with Harvard University.)

139 specimens of flowering plants from Quebec. (By exchange with Brother Marie Victorin.)

Plants and Seeds

Additions to the Collection of Dahlias (1928)

34 roots, 12 varieties. (Given by Mr. Fred von Rodeck.)

26 plants, 13 varieties, and 5 roots, 5 varieties. (Given by Fisher and Masson.)

25 roots, 13 varieties. (By exchange with Dr. Marshall A. Howe.)

21 roots, 10 varieties. (Given by Mr. W. W. Wilmore.)

20 plants, 12 varieties. (Given by Chemar Dahlia Gardens.)

17 roots, 7 varieties. (By exchange with Mr. L. Ritter.)

16 roots, 12 varieties. (By exchange with Mrs. W. G. Welsch.)

16 roots, 8 varieties. (Given by Blue Ribbon Dahlia Co.)

15 roots, 5 varieties. (Given by Mr. Charles G. Reed.)

14 roots, 5 varieties, and 3 plants, 1 variety. (Given by Mannetto Hill Nurseries.)

12 roots, 12 varieties. (Given by W. Atlee Burpee Co.)

12 roots, 2 varieties. (By exchange with Mrs. Wm. Hunter Latimer.)

11 roots, 6 varieties, and 8 clumps, 5 varieties. (By exchange with Mr. Alfred J. E. Schmidt.)

10 plants, 5 varieties. (Given by Dahliadel Nurseries.)

10 roots, 5 varieties. (Given by Mr. William Seltsam.)

9 roots, 9 varieties, and 1 clump. (By exchange with Mrs. Carl P. Sherwin.)

9 roots, 9 varieties. (Given by Meachen & Sherman.)

8 roots, 8 varieties. (By exchange with Mr. A. Parrella.)

7 plants, 4 varieties, and 3 roots, 1 variety. (By exchange with Mr. W. N. Corby.)

7 plants, 7 varieties, and 1 root. (Given by Mr. J. A. Kemp.)
7 roots, 7 varieties. (By exchange with Mr. A. Bazdorf.)
7 roots, 4 varieties. (Given by Mrs. C. R. Stewart Leckie.)
6 plants, 6 varieties. (Given by Waite's Gardens, Inc.)
6 roots, 6 varieties. (By exchange with Mr. Thomas Corrigan.)
6 roots, 6 varieties. (By exchange with Dr. J. Hahn.)
6 roots, 5 varieties. (Given by Mr. Herman Rindfleisch.)
6 roots, 3 varieties. (Given by Mr. C. Louis Alling.)
6 roots, 3 varieties. (By exchange with Mr. Ludwig J. Manz.)
6 roots, 2 varieties. (Given by Mr. Jack Rowe.)
5 roots, 5 varieties. (By exchange with Mr. J. H. Branson.)
5 roots, 5 varieties. (Given by Mr. John Harding.)
4 plants, 2 varieties, and 4 roots, 2 varieties. (Given by Downs Dahlia Farms.)
4 roots, 4 varieties. (By exchange with Mr. Herbert D. Green.)
4 roots, 3 varieties. (Given by Professor J. B. S. Norton.)
4 roots, 2 varieties. (Given by Mr. Frederick E. Dixon.)
4 roots, 2 varieties. (Given by Mr. Nathan A. Miller.)
4 roots, 1 variety. (Given by Mr. James Smith.)
3 roots, 3 varieties. (By exchange with Mrs. Edythe McDonald.)
3 roots, 1 variety. (Given by Mr. Ralph W. Clark.)
3 roots, 1 variety. (Given by Sheffield Bulb Farm.)
2 clumps, 2 varieties. (By exchange with Mr. R. Vanderheid.)
2 plants, 2 varieties. (Given by Fraser's Dahlia Gardens.)
2 roots, 2 varieties. (Given by Mr. J. McCarroll.)
2 roots, 1 variety. (Given by Mr. F. C. Burns.)
1 clump. (By exchange with Mr. Frank Hoffstadt.)
1 clump. (Given by Dr. A. B. Stout.)
1 root. (By exchange with Mr. Conrad Frey.)
1 root. (Given by Mr. J. E. Du Bois.)
1 root. (By exchange with Mr. W. A. Orton.)
1 root. (By exchange with Mrs Grace Schilling.)
1 root. (By exchange with Mrs. B. Simek.)

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GROWING DAHLIAS FROM SEED[1]

Raising Dahlias from seeds has become a popular pastime and if Dahlias can be raised from seeds produced in one's own garden this pastime becomes very fascinating.

Breeding is accomplished in two general ways: first, by saving seeds from flowers that have been pollinated by insects; and secondly, through hybridization by hand-pollination. The former is easy but the latter is relatively difficult. Before undertaking to do any hand-pollination one should have at least an elementary knowledge of the structure of the flower and I herewith give a short summary of its various organs:

Flowers are made up of the following: sepals, which form the calyx; petals, which form the corolla; stamens, the important parts of which are the anthers, where the pollen grains are found; and the pistil, the upper part of which is called the stigma. The lower part of the pistil is the ovary, which in its matured form contains the seed. The ovary and stigma may be referred to as female parts of the flower and the stamens and pollen grains as the male. When the pollen grain reaches the stigma, either by the aid of insects or by hand, if the pollen grain is ripe and the stigma receptive, the pollen grain germinates and its germ-plasm reaches the essential female cell of the ovule, which becomes fertilized.

The Dahlia belongs to the family Compositae, which have flower heads which consist of many florets or a composite of flowers; thus the essential organs are somewhat difficult to see,

[1] Abstract of an illustrated lecture given at The New York Botanical Garden, on Saturday afternoon, September 15, 1928.

but if a large individual flower such as a lily be dissected all these various organs will be readily seen.

The Dahlia flower has two types of florets called the ray and the disk. The ray floret has a completely developed petal-like corolla which is called a ray and the assemblage of these is the conspicuous part of the bloom. In the "single" type of Dahlia we only have one outer series of these ray florets, the rest being all disk florets, whereas in the so-called double-flowered types such as the Decorative, Cactus, etc., the entire head or "flower" is practically made up ray florets. The ray florets are not complete, as they have no stamens, but in many types they have pistils, with ovaries, and if fertilized are capable of producing seed.

The disk is the other type of floret and is easily seen in all open-centered flowers, although it is only when those that are full to the center of ray florets are fully opened that they may also be seen there. These disk florets, while only having rudimentary petals, are complete flowers, having the sexual organs capable of producing seed.

Fruitfulness in the Dahlia

Fruitfulness means the ability of the flower to produce seeds. Many plants are so constituted that they cannot produce seed with pollen from another flower on the same plant. The reason for this may be that the anthers ripen before the stigma is receptive, or *vice versa*. There is another cause of failure to produce seeds that is known as self-incompatibility or self-unfruitfulness. In this form the pollen is ripe at the same time as the stigma, but for some reason is not able to fertilize that pistil or any other pistil of the same variety. It is believed that the Dahlias generally belong to this class, and that cross-fertilization must take place before any seed can be produced. That is, Jersey's Beauty will not fertilize any stigma on any other plant of Jersey's Beauty; but pollen of a similar variety of say, the same color, is capable of fertilization. Of course, there may be some exceptions, as every variety has not been scientifically tested. Research workers have determined that many varieties of Dahlias are self-sterile, but will set seed to foreign pollen. However, in order to be absolutely certain in this connection a trial should be given

every variety proposed to breed, for the reason already stated, that there may be exceptions.

Breeding the Ray Florets

To be absolutely sure of both parents, it is necessary to use control measures. This is tedious work but interesting nevertheless. In the case of the varieties which will set seeds in ray florets the technique is to select the flowers to be bred and cover them with a waterproof transparent bag just before the bloom opens. This bag is fastened loosely at the bottom, around the stem, by means of a wired tree label. As soon as the rays develop each day the showy part of the ray should be clipped off with a pair of curved-point maincure scissors. The next day the pistils which are exposed should be pollinated with pollen from the desired variety, the flower having been covered before shedding its pollen so as to prevent contamination. This process should be continued until the disk florets begin to shed pollen. At this time all of the disk florets should be pulled out with tweezers, thus preventing possible self-pollination.

The seeds are then allowed to ripen. If frost should threaten, the stalk should be cut and placed in clear water in a light, airy room, the water being changed daily.

W. H. Waite.

TULIPS PLANTED IN 1928

The New York Botanical Garden has been enriched by another generous gift of 68,750 tulip bulbs from the Holland Bulb Growers' Association.

The following have been planted in the Conservatory court: 8,125 early singles, in 16 varieties; 11,025 cottage, in 40 varieties; 4,700 early doubles in 15 varieties; and 6,300 breeders in 36 varieties, using about 5,500 square feet of ground. There were 38,625 Darwins in 50 varieties planted in the Horticultural Grounds, using about 9,500 square feet of ground. Owing to the lack of space here, the Breeders were planted in the Conservatory court this year. 3,000 Scilla, Chionodaxa, and Galanthus bulbs were planted under shrubbery. Following is a list of varieties of tulips received this year:

1928 Tulips

Single Early

Cottage Maid
Couleur Cardinal
Diana
Drapeau Rouge
Golden Standard
Golden West
Ibis
Keizerskroon
La Reine Maxima
Max Havelaar
Pelican
Prince of Austria
Queen Flora
Rising Sun
Rose Luisante
Vermilion Brilliant
White Hawk
Yellow Prince

Early Double

Boule de Neige
Couronne d'Or
Imperator Rubrorum
Lac van Haarlem
Mr. van der Hoeff
Mr. van Tubergen
Lucretia
Murillo
Peach Blossom
Queen of the Pinks
Salmonette
Schoonoord
Tea Rose
Titian
Vuurbaak

Cottage Tulip

Adonis
Alaska
Amber
Amber Gris
Ambrosia
Argo
Artemis
Avis Kennicott
Avis
Alcimene
Caledonia
Carrara
Diamond
Dido
Dulcinea
Ellen Willmott
Gesneriana Spathulata
Leda
Grenadier
Inglescombe Yellow
John Ruskin
Mrs. Hoog
Marvel
Mrs. Kerrel
Mrs. Moon
Moonlight
Nectar
Orange King
Picotée
Retroflexa
Siren
Sir Harry
Rose Bella
Scarlet Emperor
Union Jack
Walter T. Ware

General France
Thalia
Zeus

Breeder Tulip

Abd-el-Kadir
Apricot
Bacchus
Black Diamond
Cardinal Manning
Clio
Copernicus
Dom Pedro
Feu Ardent
Godet Parfait
Gold Finch
Illias
James Watt
Jaune d'Oeuf
La Singulière
Louis XIV
Lucifer
Marginata
Mme. de Stael
Marie Louise
Medea
Melva
Panorama
Perle Royale
Prince of Orange
Professor Schotel
Salomon
St. James
Tricolor
Turenne
Velvet King
Vinsor
Virgilius
Vulcan
Yellow Perfection

Darwin Tulips

Afterglow
Aphrodite
Baronne de la Tonnaye
Bartigon
Bleu Aimable
Centenaire
Chant du Cygne
Citronella
City of Haarlem
Clara Butt
Duchess of Westminster
Eclipse
Ednée
Euterpe
Faust
Flamingo
Frans Hals
Feu Brillant
Herodiade
Isis
Jubilee
King George V.
La Fiancée
Le Tulipe Noire
Louise de la Vallière
Jacob Mares
Mme. Barrois
Mr. Farncombe Sanders
Mme. Krelage
Marnix van St. Aldegonde
Philippe de Commines
President Taft
Pride of Haarlem
Prince of Wales

Princess Elizabeth
Princess Mary
Prince of the Netherlands
Professor Rauwenhoff
Rev. Ewbank
Roi d' Islande
Sundew
Scarlet Beauty
Silvie
Sir Trevor Laurence
The Bishop
Zwanenburg

KENNETH R. BOYNTON.

STUDENTS AND TEACHERS OF ALL AGES VISIT THE NEW YORK BOTANICAL GARDEN

The mild Indian summer of the past two months has brought crowds of nature students from the grade schools and high schools, Teachers College, Fordham, and Columbia Universities, and from the walking clubs of the city, to study plant life at first hand in The New York Botanical Garden. With the coöperation of Mr. Van Evrie Kilpatrick, who is in charge of the nature-garden work of the Board of Education, an invitation was sent to the schools this autumn to bring their nature study classes to visit the Botanical Garden under the guidance of members of the staff. In response to this, nearly a thousand pupils with their teachers have visited the Garden during the first month. They have studied the native trees, shrubs, and vines, and how they can be recognized by their leaves; ferns and mosses, and their life histories; they have seen the economic plants of other lands growing in the conservatories, and observed their products displayed in the Museum—such as coffee, cacao, rubber, bananas, etc. No amount of book learning can equal the experience of seeing and studying the living plants themselves, and learning about them at first hand under trained guidance. Groups of students have come to the Garden practically every school day of the past month, and each group has taken away not only lasting impressions gained from personal observation of the plants but also an assortment of plant materials –leaves, twigs, and fruits for further study in the classroom.

More advanced instruction is given in a similar way, with the use of living plants as object lessons, to the high school biology classes, to the teachers of the future from the Training School

for Teachers, and to students of pharmacology, of landscape gardening, and kindred subjects in the universities. These special students, hundreds of whom have visited the Garden this year, find here an assemblage of plants gathered from all over the known world, and supplying material for the greatest diversity of investigations.

There is always a group of research students carrying on investigations in the laboratories and herbaria of the Botanical Garden, and the results of this educational work oftentimes have a far-reaching influence, not only in educational but in industrial and scientific circles as well. Thus the process of making puffed wheat and puffed rice for breakfast cereals was developed by a graduate student working at the Botanical Garden; the effect of radium on plants was studied here. Another investigator, Dr. Wodehouse, is studying pollen grains in relation to hay-fever, and the similarities of the structure and effects of pollens of related plants. Under the direction of Doctor Stout, numerous investigations in plant-breeding and heredity are being vigorously pushed. They have already yielded a new seedless grape of commercial promise, new rapid-growing poplars to produce paper from planted forests, new and more beautiful flowering plants among the day lilies, mallows, etc. Dr. Britton, Director-in-Chief, continues his researches on the flora of the West Indies and northern South America; Dr. Howe, Assistant Director, his studies of marine algae, including the reef-building forms; Dr. Small, Head Curator, his work on the flora of the Southern United States; Dr. Gleason, Curator, his researches on the flora of northern South America; Dr. Rydberg, his studies of the plants of the Rocky Mountain region, and Dr. Seaver, his researches on the fungi; Dr. Dodge, Plant Pathologist, is actively engaged in the study of plant diseases; Mrs. Britton continues her studies of mosses, and her helpful interest in the conservation of our native flora. These are only a few instances of many productive researches carried on at the Garden.

This autumn, weekly excursions on Saturday afternoons, to visit the parts of the Garden that have displays or interesting plants each week, under the leadership of the members of the staff, have been added to the usual afternoon docentry service

which has always been available to visitors. These conducted tours have been popular, especially with the members of the walking clubs of the city. While plant life has been emphasized on these walks, birds, rocks and other natural features of the park have not been neglected. Scores of interested hikers have joined these tours each Saturday, and often the topics discussed have been made to supplement the subjects of the Saturday afternoon lectures at the Museum Building, to the mutual advantage of both.

For many years, the Botanical Garden has conducted a series of popular lectures on botanical subjects. To make them available to the greatest number of people, these are given on Saturday afternoons, are illustrated by lantern slides, usually colored ones to make them more realistic, and are free to the public. These lectures continue from March to December each year. During the winter months, activities are transferred to the Display Greenhouse on the east side of the Garden, where demonstrations are given, using living greenhouse plants, every Saturday afternoon. This year, these demonstrations are being made into practical gardening instruction.

Thus the educational work of the Botanical Garden supplies information of value to everybody interested in plant life, and to people of all ages, from the youngest school child to the most mature and advanced scientist.

FORMAN T. MCLEAN.

MRS. HENRY MARQUAND

At the first meeting of the winter of the Advisory Council of The New York Botanical Garden, on Nov. 13, the following resolution was adopted:

> "RESOLVED, That the Advisory Council of The New York Botanical Garden records its deep sense of loss in the death last spring, April 3, 1928, of its fellow member and one-time chairman, Mrs. Henry Marquand."

The good works of Mrs. Henry Marquand, our much loved member of the Advisory Council and chairman from February 3, 1914, to April 3, 1919, who died last spring, were many and

varied. As President of the Northern Westchester County District Nursing Association, as President of the Bedford Music Association, as President of the Bedford Garden Club and in numerous other important offices that she from time to time held, she showed an ever-ready coöperation and able executive energy that have left a gap difficult to fill. But what we all most deeply mourn and most vividly remember is the almost indescribable quality that was peculiarly hers, alas too rare these modern days. It is the quality, oddly enough, that we associate with Mrs. Marquand's chief interest, gardens; the evanescent, fleeting, intangible, restful sweetness and beauty that one may catch but not hold, that passes as the scent of a rose passes.

Gracious, kind, gentle beyond words, her presence in some subtle way permeated a gathering, whether in a home or in a concert hall. This is what the world that knew her will miss, unless in the gardens that she loved it may be found again.

MRS. BRITTON AND THE LANTERN-SLIDE COLLECTION

At the meeting of the Scientific Directors of The New York Botanical Garden, held October 13, 1928, the following resolutions were unanimously adopted:

"WHEREAS, Mrs. N. L. Britton has, for many years, generously contributed her time and sacrificed her convenience in the laborious service of arranging and caring for our large lantern-slide collection, and

"WHEREAS, As a result of this service, the convenience of our lecturers has been greatly subserved, and the interest and value of our lecture course greatly enhanced; Therefore, it is

"RESOLVED, That the Scientific Directors hereby record their grateful appreciation of this, among the many benefits that we have received from Mrs. Britton and

"RESOLVED, That a copy of these resolutions be transmitted to Mrs. Britton, with the thanks of the Scientific Directors, and be spread upon the Minutes of this body."

THE CHOCOLATE TREE FRUITING UNDER GLASS

FIGURE 1 shows a photograph, taken last March, of the specimen chocolate tree (*Theobroma Cacao*) growing in House No. 4, Conservatory Range No. 1, The New York Botanical Garden. This fine plant, which was given to the Garden by Mr. Charles Patin some 28 years ago, flowers freely, almost continuously. The small but numerous blooms issue in clusters directly from the bark of branches or trunk of the tree, on which occasionally fruits have been secured by hand pollination. The fruit shown in the photograph was one of two set by Mr. H. W. Becker, which has since dropped. It is a fleshy, woody-coated pod, with seeds imbedded in the pinkish-white pulp. The exhibit of commercial chocolate in our museum is quite extensive. Reference may be made to the JOURNAL 28: 86. 1927, for abstract of a lecture on chocolate by Dr. F. J. Seaver.

KENNETH R. BOYNTON.

CONFERENCE NOTES FOR NOVEMBER

The first monthly Conference of the Scientific Staff and Registered Students of the Garden for the autumn was held on Wednesday, November 7.

Dr. N. L. Britton displayed a work on the paleobotany of Porto Rico by Dr. Arthur Hollick, issued October 31, 1928, as Volume VII, Part 3, of the Scientific Survey of Porto Rico and the Virgin Islands. Dr. Britton commented on the nature and the significance of the results presented in this volume.

Dr. John K. Small spoke on the general history of the species of Iris in North America, east of the Mississippi River. It was shown that, beginning with the botanical publication of the first species by Linnaeus in 1753, there were, at the outset of Dr. Small's work, eleven generally accepted species of Iris growing naturally east of the Mississippi River. Exploration in the Gulf States and contiguous territory added six more species, which were published between 1924 and 1927. Eight additional species, mostly from the Mississippi River delta, will be published in *Addisonia* early next year. In addition to the totals cited above, there are two European species naturalized in eastern North

FIGURE 1. Chocolate Tree (*Theobroma Cacao*) in fruit in Conservatory Range 1.

America. Colored plates of all the Irises published up to 1928 were shown and ten paintings, including the new species just referred to, were exhibited.

Mr. Kenneth R. Boynton displayed for the benefit of the Conference nearly fifty new varieties of chrysanthemums, which were given to The New York Botanical Garden by their originator, Mr. Elmer D. Smith, of Adrian, Michigan. These varieties included the new yellow anemone type Golden Pheasant, the pink Princess Ileana, of the same type, and the new exhibition anemone, Captivation.

The most attractive pink single, Pink Simplicity, while not new, was included in the Garden collections for the first time, as was Dusky Maid, a fine yellow intended for the Thanksgiving season. Varieties designed for new floral uses were shown; such as the pompons Padoka, salmon, and Delmar, pink; and the large-flowering varieties Benoit and Josetta, grown for pot culture; the pompons Cometo, rose, Muskoka, golden bronze, and Angelo, pink, were shown to represent a section bred for disbudding to produce one bloom per growth. A much more extensive range of pompon varieties was displayed than is usual in most collections, some showing two months range of blooming in the same colors, others exhibiting the wide range in usefulness and color of the small baby, or button, types. Attention was directed to the very late-blooming sorts designed for December and to very early-blooming sorts, which at the time were through flowering.

A. B. STOUT,
Secretary of the Conference.

SHERLOCK'S "CITY AND SUBURBAN GARDENING"[1]

This recently published book is a handy compact volume of 186 pages and 76 illustrations. It covers very adequately the essential matters involved in the building and the maintaining of the city and the suburban garden devoted entirely to ornamentals.

Several chapters deal with such basic matters as "The Necessity for Preparation," "How to Build Lawns," "Fences and Borders,"

[1] By Chesla C. Sherlock. Published by the A. T. De La Mare Company, Inc., N. Y. City. 1928.

and "Planning the Garden." Seventeen planting plans with planting keys are given, covering almost every size and requirement of suburban homes. These include the three plans that were awarded prizes and the plan awarded special honorable mention in the Small Garden Competition of 1928 conducted under the auspices of The New York Botanical Garden, and also the plans which obtained first and second prizes for a suburban garden in miniature at the Fifteenth International Flower Show, New York.

Specific discussion of the plants used in gardening are given in chapters on "Shrubs and Trees," "Understanding the Evergreen," "The Perennial Border," "Peony and Iris Pointers," "Roses for Small Gardens," "Succeeding with Bulbs," "Summer Flowering Bulbs," "Climbers and How to Use Them," "Dwarf Friends" (mainly on rock garden plants), and "The Small Water Garden." Two chapters deal with the very practical matters of "Tools and Spraying Equipment," and "Pests to Overcome." The manifold items of concern to the home gardener are presented simply, concisely, and authoritatively. There is wise guidance for the beginner in gardening; there is much that will benefit the more experienced gardener.

But an outstanding feature of this volume is its rare quality of inspiration. There is an effective appeal for beauty, for a realization of the original Paradise, for seeing "the footprints of Divinity." To the author "the garden is the supreme altar of faith." "The Author's Preface," the chapters "Dooryard Garden Lessons," and "The Dooryard Beautiful" and the concluding chapter, "Along the Garden Path," are excellent expressions of the articles of faith of the true gardener. They reveal the secret of the gardener's delight and the source of his success.

The deliberate appeal of this volume is to the average man and woman of the simpler home and grounds of limited area, to those who work the soil and can better appreciate the results, and to those who leave the crowded city for the suburb, where they "can have their vine and sit under the shade of their own fig tree."

The reviewer knows of no one book on the matter of city and suburban gardening more adequate, more helpful, or more inspiring.

A. B. Stout.

LECTURES AND DEMONSTRATIONS DURING DECEMBER

During the month of December, free lectures and demonstrations were given by members of the staff of The New York Botanical Garden on Saturday afternoons in the Central Display Green house of Conservatory Range No. 2. The program was as follows:

Dec. 1. "Bulbous Plants and How to Force Them for the Home," Dr. Marshall A. Howe, Assistant Director.
Dec. 8. "Flowers for the Small Conservatory," Mr. Kenneth R. R. Boynton, Head Gardener.
Dec. 15. "Cacti and Their Habits," Dr. John K. Small, Head Curator.

NOTES, NEWS, AND COMMENT

Professor Robert A. Harper, Chairman of the Scientific Directors of The New York Botanical Garden, and Dr. Marshall A. Howe, Assistant Director, attended the autumn meeting of the National Academy of Sciences, which was held in the Physics Building of Union College, Schenectady, November 19–21. Visits to the research laboratories and factories of the General Electric Company were a feature of the occasion.

Dr. H. S. Jackson, now at Purdue University, has recently accepted a professorship in Mycology and Cryptogamic Botany at the University of Toronto, Toronto, Canada, to take effect in 1929. It is expected that the new position will give Dr. Jackson a chance to devote more time to research work on plant rusts. Dr. Jackson has been devoting considerable time to the study of tropical plant rusts and several noteworthy contributions on this subject have been published in *Mycologia*.

Meteorology for November. The maximum temperatures recorded at The New York Botanical Garden for each week or part of a week were: 66° on the 2nd; 65½° on the 7th; *75° on the 18th;* 63° on the 19th; and 56° on the 30th. The minimum temperatures recorded were: 29° on the 10th; 34° on the 14th; *20° on the 26th;* and 25° on the 28th. The total precipitation for the month of November was 1.43 inches.

ACCESSIONS

LIBRARY ACCESSIONS FROM APRIL 1–OCTOBER 31, 1928

ALLAN, DONALD. *Sweet pea culture.* Edinburgh, 1928.

APGAR, AUSTIN CRAIG. *Ornamental shrubs of the United States (hardy, cultivated).* New York, c1910.

BALL, GEORGE J. *Better sweet peas.* Chicago, n. d.

BAKER, MARY FRANCIS. *Florida wild flowers.* New York, 1926.

BARRETT, OTIS WARREN. *The tropical crops.* New York, 1928. (Given by Dr. N. L. Britton.)

BEAL, ALVIN CASEY. *The gladiolus and its culture.* New York, 1927.

BENNETT, HUGH HAMMOND, & ALLISON, HUGH. The soils of Cuba. Washington, 1928. (Given by Dr. N. L. Britton.)

BEST, THOMAS R. *Back-yard gardening for business men.* Philadelphia, c1917.

BIRKENHEAD, JOHN. *Ferns and fern culture.* Ed. 3. London, n. d.

BISSET, PETER. *The book of water gardening.* Ed. 2. New York, c1924.

BLAIR, THOMAS STEWART. *Botanic drugs; their materia medica, pharmacology and therapeutics.* Cincinnati, 1917.

BOURCAT, E. *Insecticides, fungicides and weed killers.* 2nd English ed., revised and enlarged. New York, 1925.

BREWSTER, KATE L. *The little garden for little money.* Boston, c1924.

BROOKS, CHARLES ERNEST PELHAM. *Climate through the ages; a study of the climatic factors and their variations.* New York, [1927].

BROWN, A. F. *Sylviculture in the tropics.* London, 1912.

BROWN, BLISS S. *Modern propagation of tree fruits.* New York, c1916.

BROWN, LOUISE BUSH-. *Flowers for every garden.* Boston, 1927.

BURGESS, THORNTON WALDO. *The Burgess flower book for children.* Boston, 1923.

CARTER, HERBERT R. *Jute and its manufacture.* London, n. d.

CHEYNEY, EDWARD GHEEN. *What tree is that?* New York, 1927.

CHUPP, CHARLES. *Manual of vegetable-garden diseases.* New York, 1925.

COBB, ERNEST. *Garden steps; a manual for the amateur in vegetable gardening.* Boston, c1917.

COCKERHAM, KIRBY LEE. *A manual for spraying.* New York, 1923.

COOK, LAWRENCE J. *Carnation culture for amateurs.* Ed. 5. London, n. d.

COON, NELSON. *Practical violet culture.* New York, 1925.

———. *The small nursery.* New York, 1923.

COPELAND, EDWIN BINGHAM. *Rice.* London, 1924.

CORBETT, LEE CLEVELAND. *Garden farming.* Boston, c1913.

COULTER, MERLE CROWE. *Outline of genetics, with special reference to plant material.* Chicago, c1923.

CUMMINS, JULIA H. *My garden comes of age.* New York, 1926.

DAGLISH, ERIC FITCH. *Marvels of plant life.* London, 1924.

DAVIS, KARY CADMUS. *School and home gardening.* Philadelphia, c1918.

DAVY, JOSEPH BURTT. *Hand-book of conifers grown in the arboretum, Bagley Wood, Oxford, 1926.* (Given by Dr. N. L. Britton.)
DILLON, JULIA LESTER. *The blossom circle of the year in southern gardens.* New York, 1922.
DOUGLASS, BENJAMIN WALLACE. *Orchard and garden: a guide book for beginners.* Indianapolis, 1918.
DUGGAR, BENJAMIN MINGE. *Plant physiology with special reference to plant production.* New York, 1927.
DUNHAM, EDITH. *Fifty flower friends with familiar faces.* Boston, c1907.
DURAND, HERBERT. *Field book of common ferns.* New York, 1928.
———. *My wild flower garden.* New York, 1927.
FAULKNER, HERBERT WALDRON. *The mysteries of the flowers.* New York, c1917.
FERNALD, HENRY TORSEY. *Applied entomology.* Ed. 2. New York, 1926.
FITZPATRICK, THOMAS JEFFERSON. *Rafinesque; a sketch of his life with bibliography.* Des Moines, 1911. (Given by Dr. J. H. Barnhart.)
FOSTER, OLIVE HYDE. *Gardening for little girls.* New York, 1917.
FOX, HELEN (MORGENTHAU). *Garden Cinderellas; how to grow lilies in the garden.* New York, 1928. (Given by Mrs. H. M. Fox.)
FRASER, SAMUEL. *The strawberry.* New York, 1926.
FREE, MONTAGUE. *Flowers of winter, indoors and out.* Garden City, 1917.
GIBERNE, AGNES. *The garden of earth.* London, 1921.
GILES, DOROTHY. *The little kitchen garden.* Boston, 1926.
GOURLEY, JOSEPH HARVEY. *Text-book of pomology.* New York, 1927.
GREEN, SAMUEL BOWDLEAR *Popular fruit growing.* Ed. 5. St. Paul, 1918.
———. *Vegetable gardening.* Ed. 16. St. Paul, 1925.
HARDENBURG, EARLE VOLCART. *Bean culture.* New York, 1927.
HARRISON, C. ALWYN. *Commercial orchid growing* London, 1914.
HARRISON, CHARLES SIMMONS. *A manual on the Phlox.* [Ed. 2.] York. Neb., c1910.
———. *A manual. . of the peony.* Ed. 4. York, Neb., n. d.
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HAUPT, ARTHUR WING. *Fundamentals of biology.* New York, 1928.
HEDRICK, ULYSSES PRENTISS. *Cyclopedia of hardy fruits.* New York, 1922.
HEMSLEY, ALFRED. *The book of fern culture.* London, 1908.
HENDERSON, CHARLES. *Picturesque gardens and ornamental gardening, illustrated.* New York, 1908.
HIGGINS, MYRTA MARGARET. *Little gardens for boys and girls.* Boston, c1910.
HILBORN, ERNEST C. *The amateur's guide to landscape gardening.* Valley City, 1923.
HIRMER, MAX. *Handbuch der Paläeobotanik.* Vol. 1. München, 1927.

HOLLAND, LEICESTER BODINE. *The garden blue book; a manual of the perennial garden.* New York, 1927.

HOLMES, EBER. *Commercial rose culture under glass and outdoors.* Ed. 3. New York, 1926.

HOTTES, ALFRED CARL. *The book of annuals.* Ed. 2. New York, 1928.

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HUBBARD, SAMUEL C. *Roses and their culture.* New York, 1926.

JEKYLL, GERTRUDE. *Colour schemes for the flower garden.* Ed. 6. London, 1925.

JENKINS, EDMUND HOWARD. *The hardy flower book.* Ed. 2. London, 1914.

JOHNSON, LEONARD H. *Foundation planting.* New York, 1927.

JOHNSON, WILLIS GRANT. *Fumigation methods.* New York, 1920.

JONGMANS, WILLEM JOSEPH, ED. *Fossilium catalogus.* 2: Plantae. Pt. 1–13. Berlin, 1913–27.

KAINS, MAURICE GRENVILLE. *The principles and practice of pruning.* New York, 1926.

KEELER, HARRIET LOUISE. *Our northern shrubs and how to identify them.* New York, 1925.

———. *The wayside flowers of summer.* New York, 1917.

KIFT, JANE LESLIE. *The woman's flower garden, indoor and outdoor.* New York, 1927.

KIRKEGAARD, JOHN. *Practical handbook of trees, shrubs, vines and herbaceous perennials.* Boston, 1916.

KNIEP, HANS. *Die Sexualität der niederen Pflanzen.* Jena, 1928.

LAY, CHARLES DOWNING. *A garden book for autumn and winter.* New York, 1924.

LUBIMENKO, WLADIMIR N. *Traité de botanique générale.* 2 vols. Paris, 1927–28.

LUNDELL, PETER MAGNUS. *Calceolarium; ein neues Geschlecht und neue Pleurotaenium-Arten der Familie Desmidiaceae.* Berlin, 1928.

LYON, THOMAS LYTTLETON. *Soils and fertilizers.* New York, 1926.

LYON, THOMAS LYTTLETON, FIPPIN, ELMER OTTERBEIN, & BUCKMAN, HARRY OLIVER. *Soils; their properties and management.* New York, 1924.

MCDONALD, DONALD. *Sweet-scented flowers and fragrant leaves.* London, 1895.

MAC DONALD, JAMES. *Lawns, links, & sports-fields.* London, 1923.

M'EWEN, GEORGE. *The culture of the peach and nectarine, edited and enlarged by John Cox.* London, 1859.

MCFARLAND, JOHN HORACE. *Roses and how to grow them.* New York, 1924.

———. *The rose in America.* New York, 1926.

MCILVAINE, FRANCES EDGE. *Spring in the little garden.* Boston, 1928. (Given by Mrs. E. A. S. Peckham.)

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