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The New York Botanical Garde

EDITOR

DANIEL TREMBLY MACDOUGAL

Assistant Director

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JOURNAL

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Director of the Laboratories

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THE TROPICAL STATION AT CINCHONA, JAMAICA.

A great need in the formation of the collection of tropical and subtropical plants at the Garden up to the present time has been a suitable place in the American tropics where seeds could be germinated and cuttings and seedlings grown under natural conditions for periods up to two or three years, before their transportation to the conservatories at Bronx Park. Plants can be germinated and grown under glass, but in many instances it is desirable or even necessary that they should be cultivated in the open, and the care of such nurseries is far less expensive than that of propagating houses. Larger plants collected in the tropical forests are also transported to the temperate zone only with difficulty and with considerable loss unless they have been again rooted in the tropics and sent north in pots or tubs, sections of bamboo stems being readily available for this purpose. I came to realize this condition on my trip to the West Indies in the autumn of 1901, in company with Mr. Cowell, Director of the Buffalo Botanic Garden, and we discussed the project for the establishment of a nursery a great deal, and concluded that in order to make as complete an exhibition of tender plants as possible in our northern conservatories such an adjunct to our work was necessary.

During Professor Underwood's recent extended visit to the island of Jamaica, while pursuing his investigation of the ferns of Tropical America (see JOURNAL, 4: 109), he learned that the buildings and grounds of the Colonial Government at Cinchona were offered for rental and he at once communicated this fact to me. It has long been the desire of all American botanists that arrangements should in some way be made for a laboratory in the American tropics, to which investigators could conveniently go for the purpose of carrying on studies of tropical and subtropical plants growing under natural conditions, instead of under the the necessarily artificial conditions which glass houses afford in the temperate zone. This matter was taken up as long ago as 1897, when the island of Jamaica was visited by our Dr. MacDougal and by Professor Douglas Houghton Campbell, who, at the request of other American botanists, made an examination of available sites for such a laboratory, and decided that this very place, Cinchona, was the one probably best adapted to the purpose in view. At that time, however, the Department of Public Gardens and Plantations of Jamaica was using these buildings and grounds as a part of their agricultural and horticultural system of gardens and experimental plantations, and this, together with other reasons, caused the postponement of the movement.

During the autumn of 1902 Mr. William Fawcett, the Director of the Public Gardens and Plantations of the island, was in New York, together with Sir Daniel Morris, the Imperial Commissioner of Agriculture for the British West Indies, and at that time the matter was discussed again with them, and this gave an emphasis to the reconsideration of earlier plans, both for nursery and laboratory. The decision of the Colonial Government to rent Cinchona, and transfer most of the work there carried on to other plantations, was reached only last summer, and as it was feared in Jamaica that the property might be diverted from its most desirable purposes, I concluded, after consultation with a number of persons interested, to assume the rental of the property, with the idea of carrying out both plans if possible. Dr. MacDougal immediately went to Jamaica, after Professor Underwood's return, and made the necessary arrangements for the lease and for the caretaking of the property. I communicated this action by mail to over sixty of the botanists and horticulturalists of this country and Europe, who expressed the most enthusiastic appreciation of the scheme. My action was approved by the Scientific Directors of the Garden in October, and arrangements have since been made to commence the carrying out of plans both for the nursery and the laboratory, in coöperation with the Department of Public Gardens and Plantations of Jamaica.

The government of Jamaica began cultural experiments with

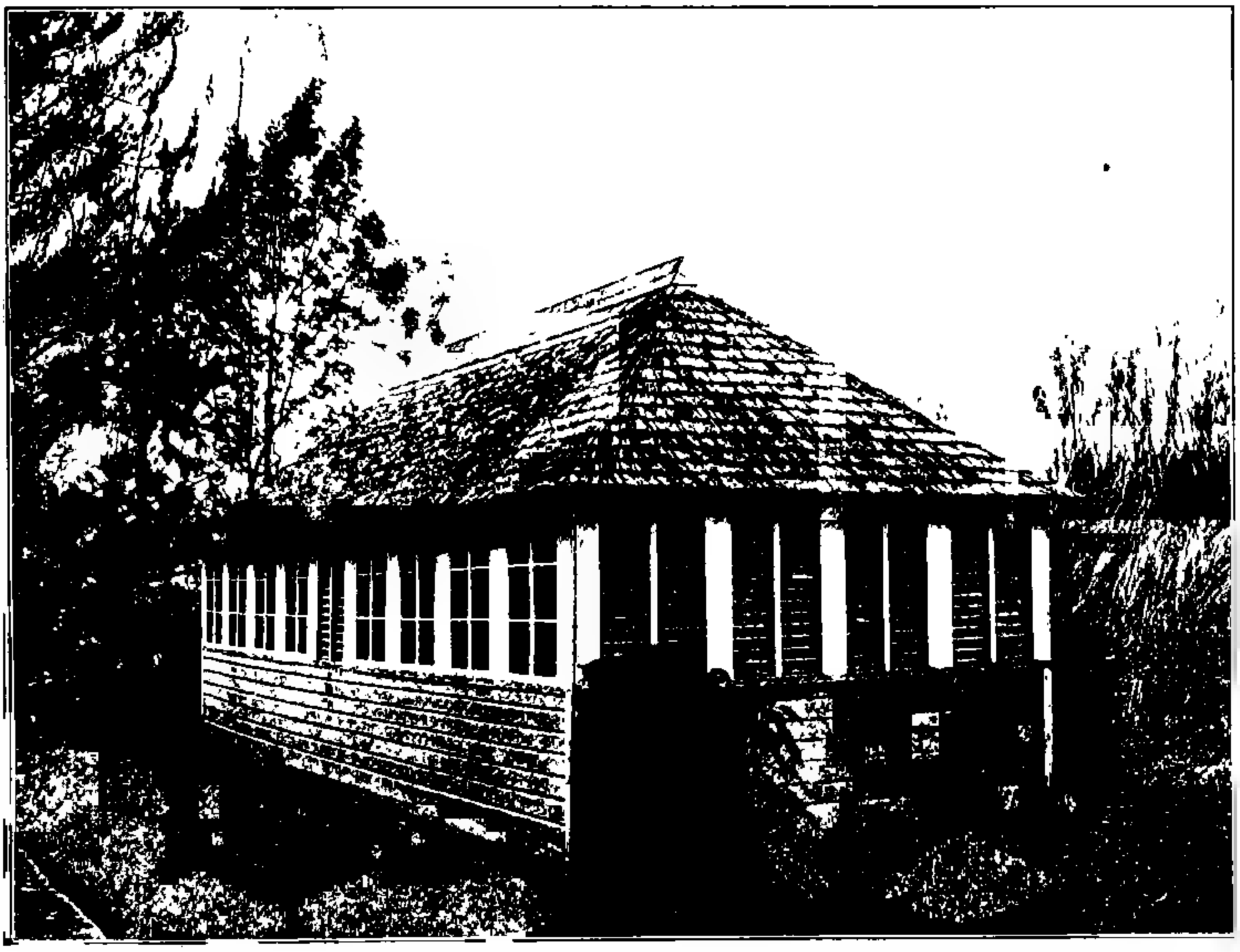

FIG. 1. A laboratory at the tropical station, Cinchona, Jamaica.

Cinchona in 1860 with seeds sent out by Sir Joseph Hooker, from Kew, and after preliminary trials a tract of six hundred acres of land on the southern slopes of the Blue Mountains between the elevations of 4,000 and 6,000 feet was set aside as a plantation in 1868 and forty acres planted with five species of *Cinchona*, the quinine trees of the Andes. A number of other trees from various parts of the world were also introduced and still flourish in this location. The reservation was increased at various times until the areas used for various experimental purposes included much more extensive plantations at the above and at lower altitudes. Headquarters for the work was established on a spur extending southward from the main range of the Blue Mountains at an elevation of about 5,000 feet. It is this central station with about ten acres of land, designated by the Jamaican government as Bellevue House and Grounds, that has been secured for the use of the Garden.

The buildings include a furnished residence, stable and servants' quarters, two glass houses, three buildings suitable for laboratories and offices, a storehouse and a small building designed for lodging visitors to the station, the entire suite being admirably adapted for the purposes for which it has been secured.

The grounds immediately around the buildings contain a large number of introduced ferns, shrubs and trees, together with many native species, and the experimental plots also lengthen the list of species accessible to the worker who visits Cinchona. Well-built trails or paths with easy grades penetrate the region in all directions from the station. The valley of the Mabess River at an elevation of about 3,000 feet is within a mile; New Haven Gap and Morse's Gap, three miles distant at a level not much different from the station, furnish unequalled opportunities for the examination of a primitive tropical forest. The summit of John Crow peak may be reached from Morse's Gap, and here at an elevation of 6,000 feet the forest of tree ferns is so luxuriant that a view of the surrounding lower country is obtained with difficulty. The wealth of ferns, hepatics, and other lower forms as well as of seed-plants that may be found here is remarkable. In addition, the flora of the coastal region of the island, and the vast collections in Hope Gardens and Castleton Gardens place within easy reach of the visitor an enormous number of species native to regions with a range of conditions from the most humid to those of extreme aridity. The algal flora of the coast is also easily accessible.

The data on page 5, taken from the government record illustrate the general climatic conditions prevalent at Cinchona.

The station at Cinchona is in direct communication with Kingston, a city of 60,000 inhabitants, from which place nearly all supplies are obtained.

In addition to the facilities offered by the Station at Cinchona, the government of Jamaica, by the courtesy of Hon. Wm. Faw-

Month.	Bar. Pressure.		Temperature.					Dew-Point and Humidity.				Rain-fall.
	7 a.m.	3 p m.	7 a.m.	3 p.m.	Max.	Min.	Range.	7 a. m.		3 p. m.		
1899	in.	in.	°	°	°	°	°	°		°		in.
Jan.	25.256	25.208	57.4	63.9	67.4	53.9	13.1	53.8	88	59.6	84	14.54
Feb.	25.260	25.219	57.6	64.3	67.7	53.5	13.8	51.6	85	59.0	83	1.04
March.	25.235	25.195	56.9	61.9	65.6	53.5	12.1	52.9	86	58.0	85	5.16
April.	25.217	25.179	59.0	63.7	66.6	55.1	11.5	54.8	83	60.0	86	4.21
May.	25.234	25.205	61.3	65.4	69.2	56.6	12.6	54.8	78	60.6	84	4.54
June.	25.251	25.224	62.8	67.1	70.4	58.4	12.0	58.3	83	61.5	82	1.78
July.	25.229	25.210	63.3	66.8	70.8	57.5	13.3	55.9	81	60.8	78	2.32
Aug.	25.222	25.213	60.0	69.7	74.2	57.5	16.7	55.8	80	63.2	79	.76
Sept.	25.211	25.209	63.2	67.7	72.5	59.8	12.7	58.7	83	63.9	87	5.39
Oct.	25.158	25.121	61.6	64.4	68.0	58.6	9.4	57.9	87	62.3	92	41.22
Nov.	25.186	25.137	60.6	64.8	67.7	58.0	9.7	57.3	87	61.9	90	44.09
Dec.	25.203	25.163	57.8	63.2	66.5	54.4	12.1	54.9	88	60.9	87	16.90
												Total, 141.92
1900												
Jan.	25.222	25.196	57.7	62.4	65.4	54.9	10.5	54.6	89	60.3	91	7.60
Feb.	25.249	25.213	57.0	64.8	67.2	54.1	13.1	53.4	87	59.3	82	2.28
March.	25.234	25.200	57.4	64.6	66.8	53.9	12.9	53.9	87	59.8	83	7.45
April.	25.233	25.195	60.0	65.0	68.3	56.4	11.9	56.3	86	61.3	87	3.31
May.	25.220	25.202	62.4	66.8	69.9	58.7	11.2	58.9	88	63.2	89	9.53
June.	25.225	25.204	63.5	66.7	70.8	57.0	13.8	60.2	86	63.2	89	5.14
July.	25.250	25.226	62.5	66.9	70.4	60.5	9.9	59.7	89	64.5	85	6.77
Aug.												2.37
Sept.	25.219	25.189	62.8	66.3	69.7	60.1	9.6	58.2	83	62.6	88	18.95
Oct.	25.193	25.162	62.0	65.9	69.2	59.9	9.3	58.9	87	63.0	89	7.51
Nov.	25.222	25.175	61.5	65.5	68.6	59.4	9.2	58.6	87	62.0	88	12.25
Dec.												10.63
												Total, 93.79

cett, Director of the Public Gardens and Plantations, has granted to the Garden substantial privileges which will be of great value to visiting investigators. Among these may be mentioned the opportunities for study at Hope Garden, which lies near sea-level near Kingston, including the use of a table in the laboratory, and of the library of about twelve hundred volumes. Botanists are also to be allowed to withdraw books from this library for use at Cinchona under conditions imposed by Mr. Fawcett. Castleton Garden and the other plantations of the Government are likewise open to the student.

All persons who may apply for permission to study at Cinchona must submit such evidence as the Director-in-Chief of the New York Botanical Garden may require that they are competent to pursue investigation to advantage. While in residence at Cinchona they will be under the supervision of the Hon. William Fawcett, Director of Public Gardens and Plantations, to

FIG. 2. A laboratory at the tropical station, Cinchona, Jamaica.

whose interest and advice the establishment of this American Tropical Laboratory is largely due.

A laboratory fee payable to the New York Botanical Garden will be required of persons granted the above privileges.

Upon approval by the Scientific Directors of the New York Botanical Garden, any other institution, society or individual may be assigned the use of a table at Cinchona by the payment of $100 annually, which will entitle them to the nominate students desiring to avail themselves of the facilities of the laboratory, for admission without the payment of fees, but not more than one person may be granted the use of any table at the sametime.

The necessary expenses for a month's residence at Cinchona including traveling expenses to and from ports on the Atlantic seaboard of the United States, are from $140 to $200; for two months' residence $160 to $230.

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

OLIVIA AND CAROLINE PHELPS STOKES FUND FOR THE PROTECTION OF NATIVE PLANTS.

Since the establishment of this fund by the Misses Stokes in 1901, and largely through the stimulus which it has afforded, a great public interest in the preservation of native plants has been developed, and the literature on the subject has become quite large.

A society has been formed for the moulding of public opinion in this matter and the diffusion of information concerning it, with a membership all over the country.

In 1902 most of the income of the Stokes Fund was used for the payment of prizes for essays on the protection of native plants, and for the distribution of printed copies of these. In 1903 a series of lectures was arranged for, and delivered by Mr. C. L. Pollard, Secretary of the Plant Preservation Society, in ten eastern cities, which were reported in the newspapers and reached a wide audience.

The plan adopted for 1904 contemplates:

1. The distribution of prize essays.
2. Arrangement for additional lectures.
2. The printing of notices to be posted wherever it is practicable.

The essays for 1904 will be in competition for the following prizes, payable April 15.

1. A first prize of $25.00.
2. A second prize of $15.00.
3. A third prize of $10.00.

The essays must not exceed three thousand words in length and must be clearly written or typewritten in triplicate, and must be submitted to the Director-in-Chief of the New York Botanical Garden not later than March 1; the manuscripts submitted become the property of the Garden, which does not undertake to return any essay submitted. The three prize essays will be printed in the JOURNAL of the Garden, and republication of them is invited from other journals, magazines and newspapers.

Presentation of essays in competition for these three prizes is now invited from any one interested, under the above conditions.

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

RESEARCH WORK IN THE GARDEN.

Since the last general description of the facilities for investigation given in the JOURNAL (Jan., 1902), the opportunities for research offered by the Garden have been notably widened in all directions.

The library has been steadily built up until it now contains more than fourteen thousand volumes and accessions are received at a rate which varies from a thousand to fifteen hundred volumes per year. The acquisition of books has been consistently, and steadily directed toward works dealing exclusively or almost exclusively with botany, horticulture, agriculture and forestry and but little has been expended in the purchase of journals or volumes dealing only incidentally with these subjects. The needs of visitors to the Garden for books other than the above are readily met by the opportunities for consultation offered by the libraries of Columbia University and of New York City.

The collection of living and preserved plants now include a vast amount of material which may easily be supplemented at any point to meet the requirements of investigation upon any subject.

The equipment of the laboratories has been increased in all departments, but the most notable additions have been made to the apparatus used in morphology and chemical physiology.

Perhaps the most important step recently taken by the Garden is the establishment of the tropical station at Cinchona, in Jamaica, and the connections by which coöperation with the Botanical Department of Jamaica is secured, as described in this number of the JOURNAL by Dr. Britton.

FIG. 3. Morphological laboratory, New York Botanical Garden.

The appointment of Dr. Wm. J. Gies, of the College of Physicians and Surgeons, as consulting chemist to the Garden has made possible the investigation of a group of problems of great significance in connection with some of the fundamental problems of physiology.

The weekly botanical conventions are of value to the workers in the Garden in offering early opportunities for the discussion of results obtained in the laboratories and for the presentation of various subjects by visiting botanists.

Among the notable titles presented at these sessions may be mentioned:

Jan. 14, "Studies on rust fungi," by Dr. J. C. Arthur, Purdue University.

Feb. 4, "Features of the work of an experiment station botanist," by Prof. A. D. Selby, Wooster, Ohio.

Feb. 11, "Electrical response in plants," by H. M. Richards, Barnard College.

FIG. 4. Physiological laboratory, New York Botanical Garden.

Feb. 18, "Results of a forestry survey of Vermont," by Dr. C. D. Howe, Chicago University.

March 4, "A tour of American deserts," by Dr. D. T. MacDougal.

April 1, "The family Convolvulaceae," by Mr. H. D. House.

April 8, "Botanical explorations in Cuba," by Prof. F. S. Earle and Mrs. E. G. Britton.

October 21, "Sugar cane," by Sir Daniel Morris, Imperial Commissioner of Agriculture for the British West Indies.

Nov. 4, "The Antillean flora and the probable method of its distribution," by Dr. C. F. Millspaugh, Field Columbian Museum, Chicago.

Nov. 18, "A cotton disease prevalent in Texas," by Mr. C. L. Shear, Bureau of Plant Industry, Washington, D. C.

Dec. 2, "The morphology and physiology of tubers," by Miss W. Robinson, Vassar College.

Dec. 18, "The influence of chemical stimulation upon plants," by Dr. B. E. Livingston, University of Chicago.

Research Subjects.

The collections of living and preserved plants and books, the equipment and arrangement of the laboratories and herbaria, and the facilities for cultural work under glass and in the open air are organized in such manner that opportunities for research are offered in the following subjects:

Taxonomy of Algae. — The diagnostic characters and relationships of selected families and genera. Field, herbarium and laboratory. Doctor Howe; Doctor Hazen.

Taxonomy of Fungi. — The diagnostic characters and relationships of selected families and genera. Field, herbarium and laboratory. Professor Underwood; Professor Earle.

Taxonomy of Bryophyta. — The diagnostic characters and relationships of selected families and genera. Field, herbarium and laboratory. Professor Underwood; Mrs. Britton; Doctor Howe.

Taxonomy of Pteridophyta. — The diagnostic characters and relationships of selected families and genera. Field, herbarium, garden, conservatories and laboratory. Professor Underwood.

Taxonomy of Spermatophyta. — Study of the principal families and genera. Field, herbarium, garden, conservatories and laboratory. Doctor Britton; Doctor Small; Doctor Rydberg.

Taxonomy of Gramineae. — The diagnostic characters and relationships of selected genera of grasses. Field, herbarium and laboratory. Mr. Nash.

Morphology of Algae. — Problems in the structure and development of algae. Field and laboratory. Doctor Howe; Professor Richards; Doctor Hazen.

Morphology of Fungi. — Problems in the structure, polymorphism and development of fungi, including culture methods. Field and laboratory. Professor Earle.

Morphology of Bryophyta. — Problems in the structure and de-

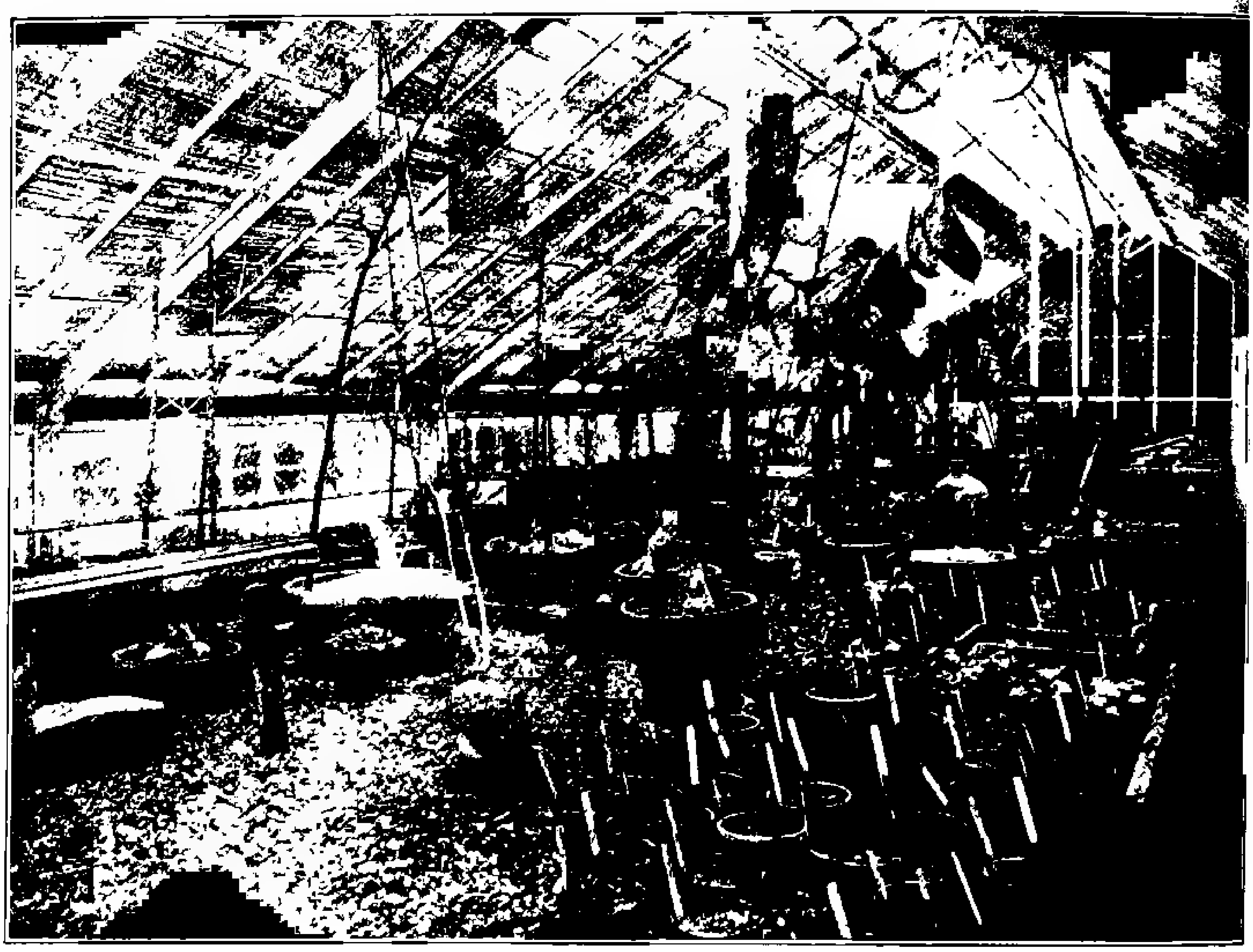

FIG. 5. Experimental greenhouse, New York Botanical Garden.

velopment of musci and hepaticae. Field and laboratory. Professor Underwood; Mrs. Britton; Doctor Howe.

Morphology of Pteridophyta. — Problems in the structure and development of ferns and fern-allies. Field, garden, conservatories and laboratory. Professor Underwood.

Morphology of Spermatophyta. — Comparative anatomy and development of the seed plants. Field and laboratory work. Not less than ten hours a week for one year. Professor Lloyd; Doctor Rydberg; Doctor Curtis.

Experimental Morphology. — Problems in variation of form and structure, and determination of the causes. Morphogenic reactions. Professor Lloyd; Professor Richards; Doctor MacDougal.

Embryology of Spermatophyta. — Comparative embryology of special groups. Special embryological problems. Technique. Laboratory. Professor Lloyd.

Special Taxonomy. — Critical study of a family or genus of plants of not less than fifty species. The group may be chosen

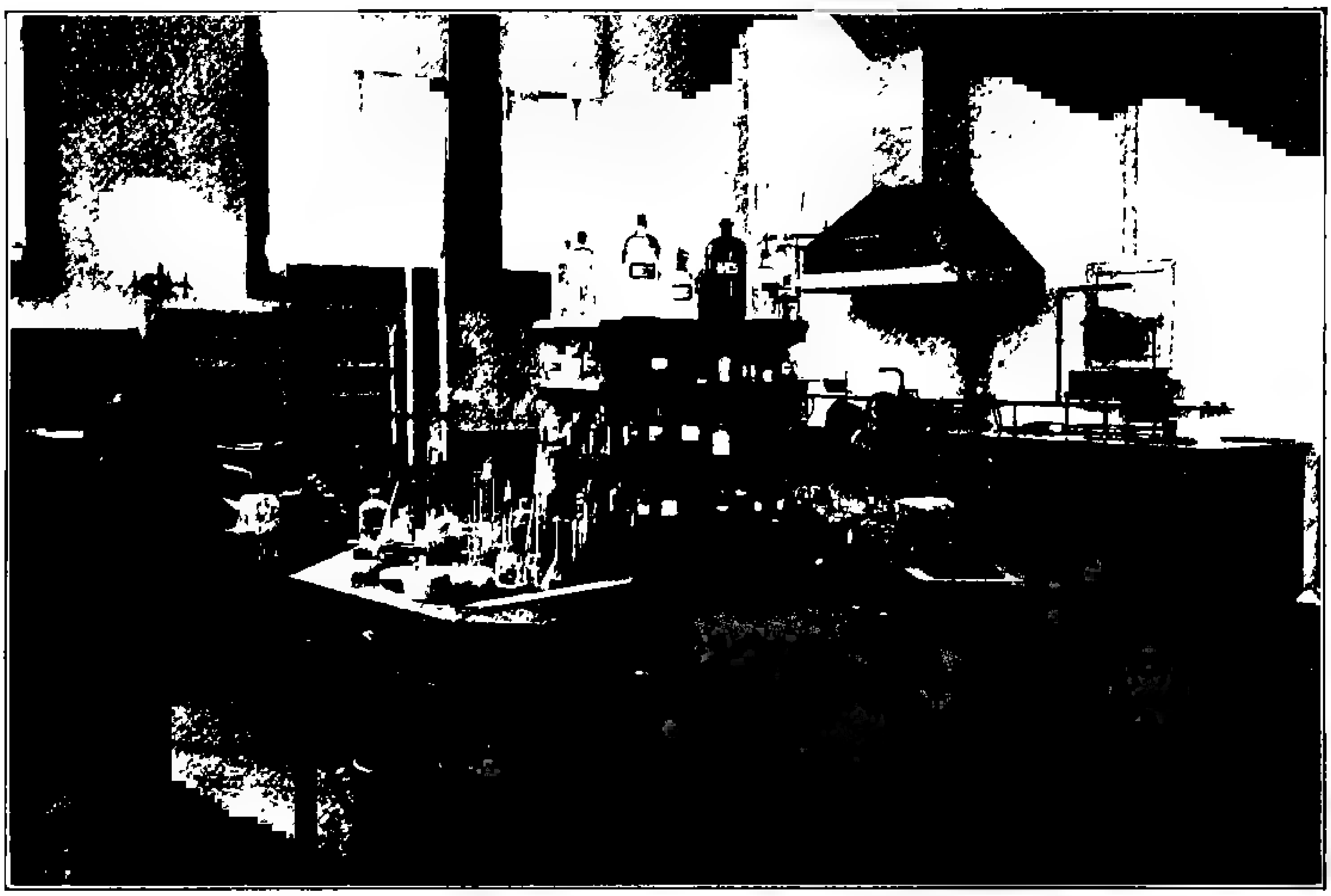

FIG. 6. Laboratory for chemical physiology, New York Botanical Garden.

from the entire range of the vegetable world. Field, herbarium, laboratory, conservatories and garden. Directed, according to the group chosen, by Professor Underwood, Doctor Britton, Doctor Small, Doctor Howe, Professor Earle, Doctor Rydberg, Mr. Nash, Professor Burgess, Mrs. Britton.

Regional Botany. — Collection, determination and comparative study of the plants of some restricted area. Field, herbarium and laboratory. Professor Underwood; Doctor Britton.

Developmental Taxonomy. — Comparative study of the living and fossil representatives of some family of plants. Laboratory and museum. Doctor Britton; Doctor Hollick.

General Palaeobotany. — Developmental history and arrangement of the fossil flora of some selected locality. Critical study of structure. Laboratory field and museum. Doctor Hollick.

Cretaceous Flora of Eastern North America. — Collection and determination of specimens of some station, with attention to stratigraphic relations. Field and laboratory. Doctor Hollick.

Plant Geography. — Occurrence, characters and arrangement of groups and formations. Relations of plant societies to one another, and to topographic, climatic and other conditions. Factors governing distribution. Not less than ten hours a week for one year. Professor Britton; Doctor MacDougal; Professor Lloyd; Doctor Curtis.

Physiology of the Cell. — Problems in the chemical and the physical properties, movements and irritability of unicellular and other generalized organisms. Laboratory. Doctor MacDougal; Professor Richards; Professor Lloyd.

Chemical Physiology. — Problems relating to nutrition, nature of storage substances and composition of secretions and excretions. Professor Gies; Professor H. M. Richards; Doctor MacDougal.

Physiological Anatomy. — Problems in the relationships of tissues and functions. Laboratory. Doctor Curtis; Professor Richards; Doctor MacDougal.

General Physiology. — Problems in absorption, excretion, nutrition, and transformation of energy, growth, the general irritable organization of the plant, and the mechanism of its movements. Laboratory. Doctor Curtis; Doctor MacDougal and Professor Richards.

General Pathology. — Causes of diseases of plants with special attention to the morphology of pathological organisms. Also problems in immunity, and effects of unfavorable environment. Professor Earle; Doctor MacDougal.

Economic Botany. — Investigation of plant products used in the arts and sciences and of the methods employed in their production. Professor Rusby.

D. T. MACDOUGAL,
Director of the Laboratories.

THE DESERT BOTANICAL LABORATORY OF THE CARNEGIE INSTITUTION.

The close of the first year of the existence of the Desert Botanical Laboratory of the Carnegie Institution at Tucson, Arizona, is marked by the publication of a booklet with the title

FIG. 7. Desert Botanical Laboratory of the Carnegie Institution, Tucson, Arizona.

of "Desert Botanical Laboratory of the Carnegie Institution," by Messrs. Coville and MacDougal, the members of the Advisory Board entrusted with the direct management of the laboratory. Both members of the board had previously and separately visited the more marked desert areas of North America during the last decade, but it was deemed advisable to make a rapid survey of a large area in the selection of a site for the buildings. Accordingly inspections were made of deserts in New Mexico, Sonora, Chihuahua, Arizona and California during January and February, 1903. The publication mentioned above includes a running transcript of the note-books of the expedition together with a discussion of the broader generalizations concerning deserts and desert vegetation.

The concept that the arid character of a place depends upon the ratio existing between the actual amount of precipitation and the amount of water which might be evaporated from a free surface is elaborated in its various bearings and is made the basis for the delimitation of deserts.

Some important new results concerning the White Sands, a gypsum desert in New Mexico, are given, including an analysis of the substratum by Dr. Wm. J. Gies. The Sonoran desert also yielded many new facts of interest which may not be described within the limits of this brief notice.

A very valuable bibliographical list of the publications which refer to the features of xerophytic vegetation by Dr. W. A. Cannon is not the least interesting and practical part of the booklet.

As a result of the inspection tour the vicinity of Tucson was selected as a site for the laboratory, and a commodious building has been erected upon a tract of land including several hundred acres donated by the city of Tucson.

Dr. W. A. Cannon, who has been appointed resident investigator, has already entered upon his duties and has one or two important researches already under way. In addition to the investigations to be carried on by the organization of the laboratory, facilities are also furnished for the use of visitors who may wish to take up related subjects. Permission has already been granted to three botanists to make use of tables, and other applications are pending. In accordance with present arrangements botanists desirous of availing themselves of the opportunities offered may send their application to Mr. Frederick V. Coville, 1836 California Avenue, Washington, D. C., or to Dr. D. T. MacDougal, at the New York Botanical Garden, Bronx Park, New York City.

D. T. MacDougal.

NOTES, NEWS AND COMMENT.

The total precipitation in the Garden during December, 1903, amounted to 4.25 inches. Maximum temperatures of 42° on the 5th, 52° on the 13th, and 52° on the 20th, were recorded: also minima of 21° on the 1st, 6° on the 19th, and 4° on the 25th.

The temperature of the soil at a depth of a foot ranged from 35.5° on the 5th to freezing point on the 19th, rising to 35.5° on the 20th and falling to 33° on the 22d, which was maintained during the remainder of the month.

Total rainfall for 1903 amounted to 56.6 inches.

ACCESSIONS.

PLANTS.

1 plant for the conservatories. (Given by Mr. Louis Tiffany.)
1 *Cereus* cutting from Dominica. (Collected by Prof. F. E. Lloyd.)
20 bulbs for the conservatories. (Given by Mr. E. S. Miller.)
1 bulb of *Hymenocallis*. (Given by Mr. O. F. Barrett.)
2 plants for the conservatories. (By exchange with Mr. F. Weinberg.)
14 cuttings of cassava. (Given by Prof. S. M. Tracy.)
2 plants of *Acorus*. (Collected by Dr. H. H. Rusby.)
2 palms of the genus *Cocus*. (By exchange with the Bureau of Plant Industry.)
12 plants for the conservatories from southern Florida. (Collected by Dr. J. K. Small.)
6 succulents. (By exchange with Dr. J. N. Rose.)

SEEDS.

29 packets of *Crataegus* seed. (Purchased from Mr. W. W. Eggleston.)
1 package of seed. (Collected by Prof. F. E. Lloyd.)
2 packages of seed. (By exchange with Mr. F. Weinberg.)
7 packets of seed from southern Florida. (Collected by Dr. J. K. Small.)
1 packet of palm seed. (By exchange with the Bureau of Government Laboratories, Manila, P. I.)
1 packet of seed. (By exchange with the Botanical Department, Jamaica.)

MUSEUMS AND HERBARIUM.

430 cryptogams from the West Indies. (Collected by Mr. F. S. Earle.)
2 parasitic fungi from Florida. (By exchange with Prof. S. M. Tracy.)

4 lichens from California. (Given by Messrs. A. J. Hill and C. F. Baker.)

3 museum specimens of *Daedalea quercina*. (Given by Mr. D. S. George)

2 museum specimens of *Casuarina* from Florida. (Collected by Dr. M. A. Howe.)

68 fossil plants from western North America. (Collected by Mr. Chas. H. Sternberg.)

1 herbarium specimen from California. (Given by Mr. George B. Grant.)

6 herbarium specimens from Lake George. (Given by Mr. S. H. Burnham.)

1 photograph of the type specimen of *Rudbeckia spathulata*. (Given by Mr. C. D. Beadle.)

23 herbarium specimens from the southwestern United States. (By exchange with Prof. S. M. Tracy.)

4 herbarium specimens from San Diego, California. (Given by Mr. J. S. Merriam.)

22 Japanese ferns. (Given by Miss Clara L. Brown.)

8 museum specimens from Jamaica. (Given by the Hon. Wm. F. Fawcett.)

8 specimens of flowering plants from Connecticut. (Collected by Mr. F. S. Earle.)

1 museum specimen of *Ptilium cristacastrensis* from Lake George. (Given by Mr. S. F. Burnham.)

18 herbarium specimens from New Mexico. (Given by Prof. T. D. A. Cockerell.)

1 museum specimen of *Collinsonia Canadensis*. (Given by Prof. L. M. Underwood.)

137 herbarium specimens from Patagonia. (Given by Mr. Barnum Brown.)

1 specimen of *Onagra pallida latifolia*. (By exchange with Mr. Geo. B. Osterhout.)

11 museum specimens of insect flowers. (Given by McCormick & Co., of Baltimore.)

163 specimens of European fungi. (Given by Mr. Wm. A. Murrill.)

43 specimens of fungi from Connecticut. (Given by Prof. L. M. Underwood.)

3 museum specimens from New Jersey. (Collected by Dr. N. L. Britton.)

184 herbarium specimens from Colorado. (By exchange with the Colorado Agricultural College.)

1,320 specimens of fungi. (Given by Dr. J. S. Billings.)

1 specimen of *Vaccinium* from Long Island. (Given by Dr. A. J. Grout.)

1 specimen of *Dryopteris simulata*. (Given by Mr. H. D. House.)

2,340 herbarium specimens mainly from Long Island and eastern North America. (By exchange with Mr. E. S. Miller.)

19 herbarium specimens from the southern United States. (By exchange with Prof. S. M. Tracy.)

1 specimen of *Rynchospora* from North Carolina. (By exchange with the Biltmore Herbarium.)

1 museum specimen of *Crucibulum crucibuliforme* from Connecticut. (Given by Prof. L. M. Underwood.)

1 fern from the southeastern United States. (Given by Prof. C. S. Williamson.)

52 mosses from Michigan. (Given by Prof. W. J. Beal.)

195 mosses from Paraguay. (Collected by M. Dusén.)

1 specimen of *Lunularia cruciata* from California. (Given by Mrs. Shinn.)

36 miscellaneous mosses. (Given by Dr. A. J. Grout, for the Columbia Herbarium.)

59 miscellaneous mosses. (Collected by Prof. J. M. Holzinger.)

125 herbarium specimens from Washington. (By exchange with Prof. C. V. Piper.)

10 specimens of *Viola*. (Distributed by Mr. C. L. Pollard.)

11 miscellaneous specimens from New York. (Given by Mr. H. D. House.)

1 specimen of *Rubus* from Maine. (By exchange with Prof. J. C. Arthur.)

2 specimens of *Razoumofskya* from Colorado. (Given by Prof. E. Bethel.)

1 specimen of *Physalis* from Missouri. (Given by Mr. N. L. T. Nelson.)

57 herbarium specimens from Colorado. (By exchange with Mr. Geo. B. Osterhout.)

11 orchids from New York and vicinity. (Given by Mr. E. P. Bicknell.)

50 specimens from California. (By exchange with Mr. C. F. Baker.)

6 specimens of fungi from Pennsylvania. (By exchange with Prof. D. R. Sumstine.)

1 specimen of a hybrid oak from North Carolina. (Given by Dr. W. P. Coker.)

1 museum specimen of *Cassia montana* from Australia. (Given by Prof. H. H. Rusby.)

49 photographs of west American vegetation. (Given by Mr. T. H. Kearney, Jr.)

5 photographs of Montana conifers. (Given by Dr. D. T. MacDougal.)

3 photographs of Georgia pines. (Given by Mr. R. M. Harper.)

10 miscellaneous plant pictures. (Given by Miss A. M. Vail.)

22 fungi from California. (By exchange with Mr. A. A. Heller.)

21 herbarium specimens from Pennsylvania, Maryland and North Carolina. (Given by Mr. J. J. Carter.)

211 specimens from Georgia and South Carolina. (Given by Mr. A. Cuthbert.)

2 museum specimens of *Acorus*. (Given by Prof. H. H. Rusby.)

11 photographs of lichens. (Given by Prof. A. Schneider.)

27 miscellaneous herbarium specimens from eastern North America. (Given by Mr. E. P. Bicknell.)

3 photographs of *Isotria affinis*. (Given by Prof. L. R. Jones.)

478 mosses from the herbarium of Dr. E. C. Howe.

19 hepatics from New Jersey. (Collected by Miss C. C. Haynes.)

82 miscellaneous plants from Peru. (Collected by M. de Lautreppe.)

18 bryophytes from the Pacific slope. (Collected by Mr. C. F. Baker.)

36 bryophytes from the Yellowstone National Park, Wyo. (Collected by Professor A. Nelson.)

76 "Hand Lens Mosses." (Given by Dr. A. J Grout, for the Columbia Herbarium.)

51 mosses from Idaho and Washington. (By exchange with Prof. C. V. Piper.)

293 herbarium specimens from Florida. (Collected by Dr. and Mrs. N. L. Britton and Mr. J. A. Shafer.)

1 basket of grass leaves from Georgia. (Given by Mr. R. M. Harper.)

3 herbarium specimens from the Bahamas. (Given by Mr. A. H. Curtiss.)

82 herbarium specimens from southern Pennsylvania. (Given by Dr. J. K. Small.)

1 specimen of *Hypopytis lanuginosa* from Pennsylvania. (Given by Prof. D. R. Sumstine.)

4 specimens of *Teucrium Botrys*. (Given by Hon. A. Brown.)

1 specimen of *Kalmia* from New York. (Given by Mr. A. A. Johnson.)

127 miscellaneous plants from Washington. (By exchange with Prof. C. V. Piper.)

79 fossil plants from Europe. (By exchange with Jardin des Plantes, Paris.)

102 fungi from Massachusetts. (By exchange with Mr. T. A. King.)

89 specimens from Alaska. (Collected by Dr. A. Hollick.)

1 museum specimen of *Pinus* from California. (Given by Mr. S. B. Parish.)

4 specimens of *Hicoria* from Vermont. (Given by Mr. C. L. Allen.)

4 museum specimens from California. (Given by Mr. C. De Kalb.)

1 specimen of *Eriocaulon Parkeri* from Pennsylvania. (By exchange with the Philadelphia Academy of Natural Sciences.)

5 herbarium specimens from Missouri. (Given by Mr. K. K. Mackenzie.)

4 herbarium specimens of *Galium* and *Asperula* from Connecticut. (Given by Mr. C. H. Bissell.)

25 fungi from Italy. (Distributed by Briosi and Cavara.)

62 herbarium specimens from North Dakota and British Columbia. (By exchange with the University of Minnesota.)

18 herbarium specimens from Las Vegas, New Mexico. (Given by Professor T. D. A. Cockerell.)

4 specimens from Vermont. (Given by Mr. W. H. Blanchard.)

212 "Algae aquae dulcis exsiccati, praecipue scandinavicae," fasc. 30 to 34. (Distributed by Wittrock, Nordstedt and Lagerheim.)

4,516 specimens of marine algae from Porto Rico. (Collected by Dr. M. A. Howe.)

50 herbarium specimens "Uredineae Austro-americanae" fasc. 23 a. (Distributed by Dr. P. Sydow.)

100 specimens "Phycomyceten et Protomyceten," fasc 1 and 2. (Distributed by Dr. P. Sydow.)

81 miscellaneous specimens from Ontario. (Given by Mr. J. Fowler.)

11 photographs of Georgia plants. (By exchange with Mr. R. M. Harper.)

9 herbarium specimens of fungi from Pennsylvania. (By exchange with Prof. D. R. Sumstein.)

25 miscellaneous fungi. (By exchange with Prof. J. C. Arthur)

78 specimens "Uredineae exsiccatae et icones," fasc. 3 and 4. (Distributed by Arthur and Holway.)

18 miscellaneous types of new species of fungi. (Given by Mr. J. B. Ellis.)

14 specimens of lichens from California. (Given by Prof. A. Schneider.)

450 specimens from Missouri and neighboring states. (Distributed by Mr. B. F. Bush.)

40 specimens of North American lichens. (Distributed by Miss Clara E. Cummings.)

11 museum specimens from Dominica. (Collected by Prof. F. E. Lloyd.)

17 Montana fungi. (By exchange with Prof. Blanckinship.)

4 herbarium specimens from Texas. (Given by Mr. A. A. Heller.)

1 hornet's nest. (Given by W. L. Folin.)

82 herbarium specimens from Montana. (By exchange with the University of Montana.)

20 specimens "Ohio Fungi," fasc. 8. (Distributed by Prof. W. A. Kellerman.)

5 specimens of linseed oil. (Given by the National Lead Company.)

75 fungi from Wyoming. (By exchange with Prof. A. Nelson.)

205 Oregon plants. (Collected by Mr. Wm. C. Cusick.)

8 specimens of sedges. (Given by Mr. S. B. Parish.)

208 specimens from the central states. (By exchange with Mr. F. E. McDonald.)

30 specimens of *Crataegus*. (Given by Mr. W. M. Canby.)

10 specimens of *Alnus* from southern New York. (Given by Mr. E. P. Bicknell.)

26 specimens of hepatics from Jamaica. (Given by Dr. A. W. Evans.)

61 herbarium specimens from southern California. (By exchange with Mr. E. Braunton.)

29 specimens of *Crataegus* from Vermont and Canada. (Collected by Mr. W. W. Eggleston.)

103 herbarium specimens from British America. (By exchange with Mr. J. Macoun.)

143 herbarium specimens from eastern North America. (Given by Miss H. B. Bailey.)

12 museum specimens of medicinal plants used by the Cheyenne Indians. (Given by Mr. G. B. Grinnell.)

7 herbarium specimens from Staten Island. (Collected by Miss P. C. Clarke.)

18 herbarium specimens from Montana. (By exchange with Oberlin College.)

26 mosses from the palisades of New York and New Jersey. (Collected by Mrs. N. L. Britton.)

200 mosses mainly from Patagonia and Chili. (By exchange with the Royal Gardens, Kew, England.)

12 mossss from Trinidad. (Collected by Mr. A. Fendler.)

6 mosses from Washington. (Collected by Mr T. A. Bonser.)

30 specimens "Cryptogamae Exsiccatae a mus. pal. vindob.," dec. 17–19.

17 mosses from the Thousand Islands. (Collected by Messrs. Robinson and Maxon.)

53 mosses from Prospect Harbor, Maine. (Collected by Mrs. J. I. Northrop.)

25 mosses from California. (Collected by Helen Brown.)

4,000 Chinese plants. (Collected by Dr. A. Henry.)

62 mosses, hepatics, and lichens from Woodland, New York. (Collected by Mrs. N. L. Britton.)

330 mosses from Alaska from the Harriman Alaska Exploring Expedition. (By exchange with the Missouri Botanical Garden.)

59 mosses from Ontario. (Collected by Mr. J. Fowler.)

97 mosses from Brazil. (Collected by Ule.)

666 South American mosses. (By exchange with the Berlin Botanical Garden.)

200 miscellaneous mosses from South America. (Collected by Messrs. Weddell and Mandon.)

7 mosses from Cape Nome, Alaska. (Collected by Dr. F. E. Blaisdell.)

22 Georgia mosses. (Collected by Mr. R. M. Harper.)

5 mosses from Tennessee. (Given by Mr. T. H. Kearney, Jr.)

357 Brazilian mosses. (Collected by Mr. Weiss.)

2 mosses from Wyoming. (Given by Prof. A. Nelson.)

1 moss from California. (Given by Prof. A. J. MacClatchie.)

3 mosses from Essex County, N. Y. (By exchange with Miss C. C. Haynes.)

6 miscellaneous mosses. (Given by Dr. A. J. Grout, for the Columbia Herbarium.)

6 mosses from Sparrowbush, N. Y. (Collected by Mrs. N. L. Britton.)

30 specimens "Musci Pleurocarpi." (Given by Dr. A. J. Grout, for the Columbia Herbarium.)

30 mosses from Colorado. (Collected by Mr. H. L. Shantz.)

22 mosses from the Pacific slope. (Collected by Messrs. Hill, Baker, Hasse and Finlayson.)

64 mosses from North Carolina. (Collected by Mr. and Mrs. Curtis and Mrs. A. M. Smith.)

8 mosses from Florida. (Collected by Mrs. N. L. Britton.)

465 mosses mainly from Canada.

4 mosses from Maine. (Collected by Mr. J. F. Collins.)

14 hepatics from Pennsylvania and New Jersey. (Collected by Mrs. N. L. Britton.)

385 specimens "Cryptogamische Gewäsche des Fichtelbirgs." (Collected by H. C. Funck.)

29 willows from Ohio. (By exchange with Mr. R. F. Griggs.)

7 herbarium specimens of *Salix* from Ontario. (Given by Mr. W. Herriot.)

1 specimen of *Solidago* from Massachusetts. (Given by Mr. A. V. Osmun.)

1 specimen of *Quercus* from New Jersey. (Collected by Dr. M. A. Howe.)

5 herbarium specimens from Michigan. (By exchange with Mr. O. A. Farwell.)

23 herbarium specimens from Long Island. (Collected by Miss L. T. Hanks.)

4 herbarium specimens from Colorado and Utah. (By exchange with Miss Alice Eastwood.)

1,483 herbarium specimens from Honduras. (Collected by Mr. P. Wilson.)

2,572 herbarium specimens from Cuba. (Collected by Dr. and Mrs. N. L. Britton and J. Shafer.)

1,407 herbarium specimens from Cuba. (Collected by Dr. and Mrs. N. L. Britton and P. Wilson.)

4 photographs of *Salix*. (Given by Mr. W. Herriot.)

1 specimen of *Cypripedium* from Virginia. (Given by Messrs. Pollard and Maxon.)

56 specimens of fungi from Nebraska, South Dakota and the District of Columbia. (Given by Dr. P. A. Rydberg.)

511 miscellaneous plants from Washington, Oregon, California, Nevada and Arizona. (By exchange with Dr. David Griffiths.)

8 specimens of *Fraxinus* from New York. (Collected by Dr. N. L. Britton and P. Wilson.)

1,627 miscellaneous specimens from Martinique and Guadeloupe. (Collected by Pere Duss.)

1 specimen of fungus from New York. (Given by Mrs. W. C. Lobenstine.)

3 specimens of *Dryopteris cristata* $\times$ *D. marginalis*. (Given by Dr. W. A. Cannon.)

4 miscellaneous herbarium specimens from Pennsylvania. (By exchange with the Carnegie Museum.)

437 Chinese plants. (Given by Messrs. James Veitch & Sons.)

950 specimens "Uredineen," fasc. 1331. (Distributed by Dr. P. Sydow.)

323 museum specimens from Porto Rico. (Collected by Dr. M. A. Howe.)

37 Cuban plants. (Collected by Mr. C. G. Pringle.)

2 specimens from Hawaii. (By exchange with the Hawaiian Experiment Station.)

378 Californian plants. (Collected by Mr. A. A. Heller.)

530 plants from the Pacific coast. (Collected by Mr. A. D. E. Elmer.)

5,230 miscellaneous specimens from Jamaica. (By exchange with the Hon. Wm. F. Fawcett, Director of Public Gardens and Plantations.)

63 museum specimens from Cuba. (Collected by Dr. and Mrs. N. L. Britton and Mr. J. A. Shafer.)

10,100 specimens from Jamaica. (Collected by Prof. L. M. Underwood.)

1,585 specimens from Porto Rico. (Collected by Mr. F. S. Earle.)

2,330 herbarium specimens from southern Florida. (Collected by Dr. J. K. Small and Mr. J. J. Carter.)

4,000 ferns mainly from tropical America, being the herbarium of Geo. S. Jenman. (Given by Mr. D. O. Mills.)

47 museum specimens from Cuba. (Collected by Dr. and Mrs. N. L. Britton and Mr. P. Wilson.)

472 miscellaneous fungi from eastern North America. (Collected by Mr. F. S. Earle.)

152 Jamaican plants. (By exchange with the National Museum.)

84 museum specimens from southern Florida. (Collected by Dr. J. K. Small and Mr. J. J. Carter.)

1 museum specimen of *Pinus rigida* from New Jersey. (Collected by Dr. D. T. MacDougal.)

25 specimens of Crassulaceae. (By exchange with Dr. J. N. Rose.)

7 specimens of sedges from the southern United States. (By exchange with Prof. S. M. Tracy.)

25 miscellaneous specimens from the Island of St. Pierre. (Given by Brother Louis Arsene.)

1 specimen of *Fraxinus* from the Grand Cañon of the Colorado. (Given by Miss Alice Eastwood.)

252 specimens from Georgia. (Collected by Mr. R. M. Harper.)

87 specimens from Washington. (Collected by Miss H. B. Bailey.)

44 herbarium specimens from western North America. (Given by Prof. T. D. A. Cockerell.)

2,100 miscellaneous specimens, being the herbarium of the late Dr. O. R. Willis. (Given by Mrs. O. R. Willis.)

3 specimens tonka beans. (Given by Messrs. Dodge and Olcott.)

380 specimens from Central America. (Given by Captain J. Donnell Smith, for the Columbia herbarium.)

156 plant pictures from Michaux's Silva of North America. (Given by Miss A. M. Vail.)

1,087 herbarium specimens from Mexico. (Collected by Mr. C. G. Pringle.)

184 specimens from tropical America and Europe. (By exchange with the Botanical Institute, Montpelier, France.)

6,000 miscellaneous herbarium specimens. (By exchange with Jardin des Plantes, Paris.)

2 specimens of crude and pure Coumarin. (Presented by Messrs. Dodge and Olcott.)

18 specimens of woods from New Zealand. (Presented by Mr. L. Cockayne.)

1,930 herbarium specimens from Cuba. (Collected by Mr. F. S. Earle and Prof. L. M. Underwood.)

2,146 herbarium specimens from Hayti. (Collected by Mr. Geo. V. Nash.)

2,110 herbarium specimens from Dominica. (Collected by Prof. F. E. Lloyd.)

63 museum specimens from Hayti. (Collected by Mr. Geo. V. Nash.)

13 museum specimens from Florida. (Collected by Dr. N. L. Britton.)

235 herbarium specimens from Florida. (Collected by Dr. N. L. Britton.)

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EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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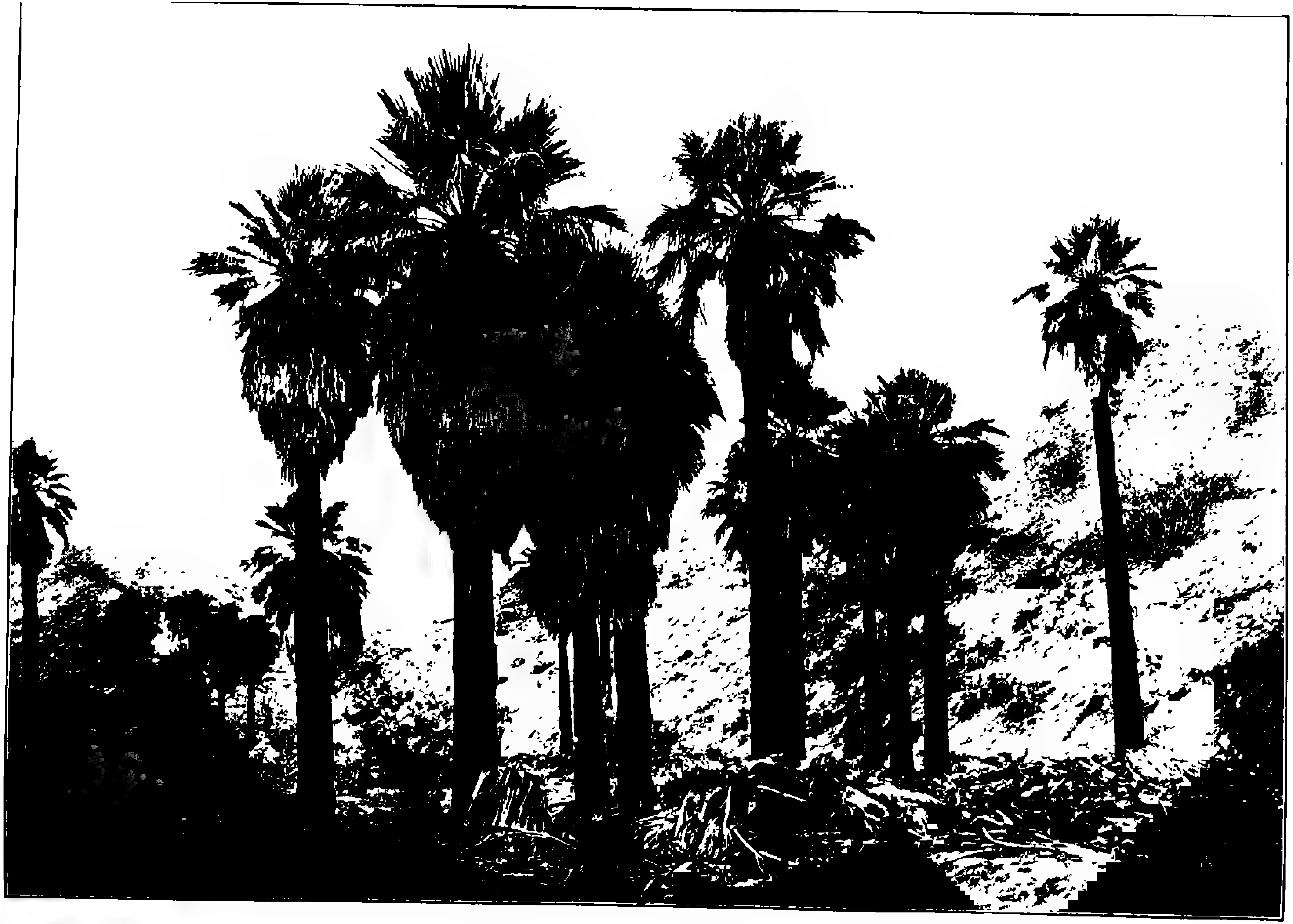

Neowashingtonia robusta in the California Desert

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GEORGE WASHINGTON'S PALMS.

The name *Washingtonia* was first proposed by Wendland in 1879 (Bot. Zeitung, **37**: 68) for the palm which had then been known for some years in Europe as *Brahea filifera* and *Pritchardia filifera;* Wendland showed that it was generically different from either *Brahea*, a Mexican genus of two or three species, and from *Pritchardia* of the South Sea islands.

This palm first became known in Europe from seeds obtained by the nurseryman Linden, of Ghent, apparently as early as 1869, but he does not seem to have recorded the source from which they came. It is stated in Revue Horticole, **48**: 373, 1876, that the plant was introduced into cultivation by Linden in 1871 under the name *Pritchardia filifera*, and that it was also listed in his catalogue no. 96 as *Brahea filamentosa.* It was exhibited as *Pritchardia filifera* at the quinquennial horticultural exhibition held at Ghent in 1873, by Linden, together with other palms new to cultivation. (See Illustration Horticole, **20**: 98; no description of it is there given, however.)

As to the origin of the seeds, Watson (Proceedings Amer. Acad. **25**: 136) cites evidence to show that they were collected in Cantilles Cañon, northern Lower California. Drude says, however (Botanische Zeitung, **34**: 806, 1876), that the plant then known as *Pritchardia filamentosa* was obtained by Roezl in northern Mexico, near Arizona, on the Colorado River; this origin is also given in Revue Horticole, **48**: 374, and the differences of the palm from either *Brahea* or *Pritchardia* are discussed.

This species has nearly upright leaves with narrow lobes which droop at the tips, and slender stalks which are slightly prickly, the prickles very short. We have only small specimens of it at the Garden as yet, raised from seeds obtained from a Californian nursery.

In 1883 (Garten Zeitung, **2**: 198) Wendland described a second species of the genus under the name *Washingtonia robusta*, from plants sent him by Van Houtte, of Ghent, which he says originated on the Sacramento River, California, which is unlikely, inasmuch as none of the group are known to grow naturally so far to the north; this species is much more fully described by Andre in Revue Horticole, **57**: 401–404, 1885, where it is also illustrated. It has spreading darker green leaves than the one first known, their stouter stalks armed with stout curved yellow prickles often half an inch long, the lobes of the leaves relatively broader and less abundantly provided with the characteristic fibrils which resemble those of palmettos (*Inodes*). It was almost certainly derived from southern California, where it grows plentifully in isolated oases in the desert in San Diego County. A view of one of these palm oases taken from a photograph secured by Dr. MacDougal and Mr. Coville while studying the best locality for establishing the Desert Laboratory of the Carnegie Institution is shown on the accompanying plate (Plate XX.); the trees are about fifty feet high, and their old leaves remain attached to the trunk for several years after wilting. The Garden has recently received as a gift from Mr. C. M. Hyde a very fine pair of these palms, with trunks about seven feet high and leaves four feet in diameter; they are exhibited in the central house of the public conservatories, and are represented on the accompanying plate made from a photograph (Plate XXI.).

This *Washingtonia robusta* of Wendland is the same plant as the specimen figured by Sargent in Silva of North America, **10**: 47, plate 509, as *W. filamentosa*. As yet there is no certain evidence that the original *W. filamentosa* occurs wild within the United States, though Watson remarks (Proc. Amer. Acad. **25**: 137) that it probably exists in the mountains bordering the Colorado River north of the Mexican boundary.

Neowashingtonia robusta in Conservatory, New York Botanical Garden.

This "Desert Palm" is said by Dr. Parry to have been noticed by the botanists of the Mexican Boundary Survey, and this would throw its first observation by plantsmen back to 1855, but the first reference to it in literature appears to be by Dr. Cooper (Smithsonian Report, **1860**: 342. 1861) who erroneously and doubtfully referred it to *Brahea dulcis* Martius, a South American palm. It was early planted at the missions. A very interesting account of it appears in Garden and Forest, **3**: 51, 1890, written by Mr. G. B. Parish. It is known in southern California also as Fan Palm and San Diego Palm, and additional notes upon it are given by Mr. S. B. Parish in the same volume of that journal (**3**: 542), where he discusses the probability of its being *W. robusta* and not *W. filamentosa.*

There is a fine specimen of the Desert Palm in the conservatories of the National Botanical Garden at Washington, with a trunk about 4 meters high, leaf-stalks 1 dm. wide at the base, the large leaves nearly 2 meters in diameter. Mr. Smith tells me that this plant is about 30 years old, and that he raised it from seed given him by a congressman from California.

Watson, in 1889 (Proceedings Amer. Acad. **24**: 79) described a third species from specimens sent by Dr. E. Palmer from Guaymas, Sonora, under the name *Washingtonia Sonorae*; this palm grew in secluded cañons in the mountains. Watson remarks that it differs from the others in its more slender leaf-stalks, paler leaves and smaller fruit; the leaf-stalks are described by him in the same journal the next year, from specimens collected by Palmer at La Paz, southern Lower California, as armed with stout curved prickles as in *robusta*, but these are partly covered with a web of woolly hairs. He records that the Guaymas plant reaches 8 meters in height with a trunk a foot in diameter, and that its fruit is used for food by the Indians. We have young plants raised from seed supposed to be of this species.

In revising the nomenclature of the arborescent flora of the United States, Sudworth noticed that the name *Washingtonia*, applied to these beautiful and interesting palms by Wendland, was preoccupied by its use for other plants by authors previous to Wendland; he therefore proposed for the palms the name *Neowashingtonia*, by which they are now known (Bulletin U. S. Dept. Agric., Div. Forestry, 14: 1897).

In order to ascertain the exact botanical characters of the group, and whether there are really three species, or the described forms are forms of a single species, complete herbarium specimens accompanied by photographs are desiderata. The cultivated plants seem to differ considerably in their leaves, and if the species are good, accompanying differences should be found in the flowers and fruit.

N. L. BRITTON.

THE ECONOMIC MUSEUM.

The recent building of additional exhibition cases has made possible a considerable development of the Economic Museum of the first floor of the museum building. The amount of case-space added to that previously occupied by the economic collections amounts to about one hundred per cent., and besides relieving the congested condition of the collections, the installation of this new furniture has given a much more balanced and finished appearance to the museum halls; about three fifths of the available space for cases on this floor is now occupied.

The standard cases are now grouped in rectangular blocks of four or six units. In the main east and west halls the blocks are composed of six units, while in the wings they are composed of four. The floor plan on the opposite page indicates the positions of the several blocks of cases.

The specimens contained in the original equipment of cases have been spread out into the new cases and a large number of specimens hitherto necessarily stored in the basement have been interpolated and are being permanently arranged as rapidly as the labels can be printed.

During this general rearrangement of the exhibits, there has been no change from the general plan previously adopted for this museum and already described in the BULLETIN of the Garden.*

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* Bull. N. Y. Bot. Gard. 2: 27 and 28.

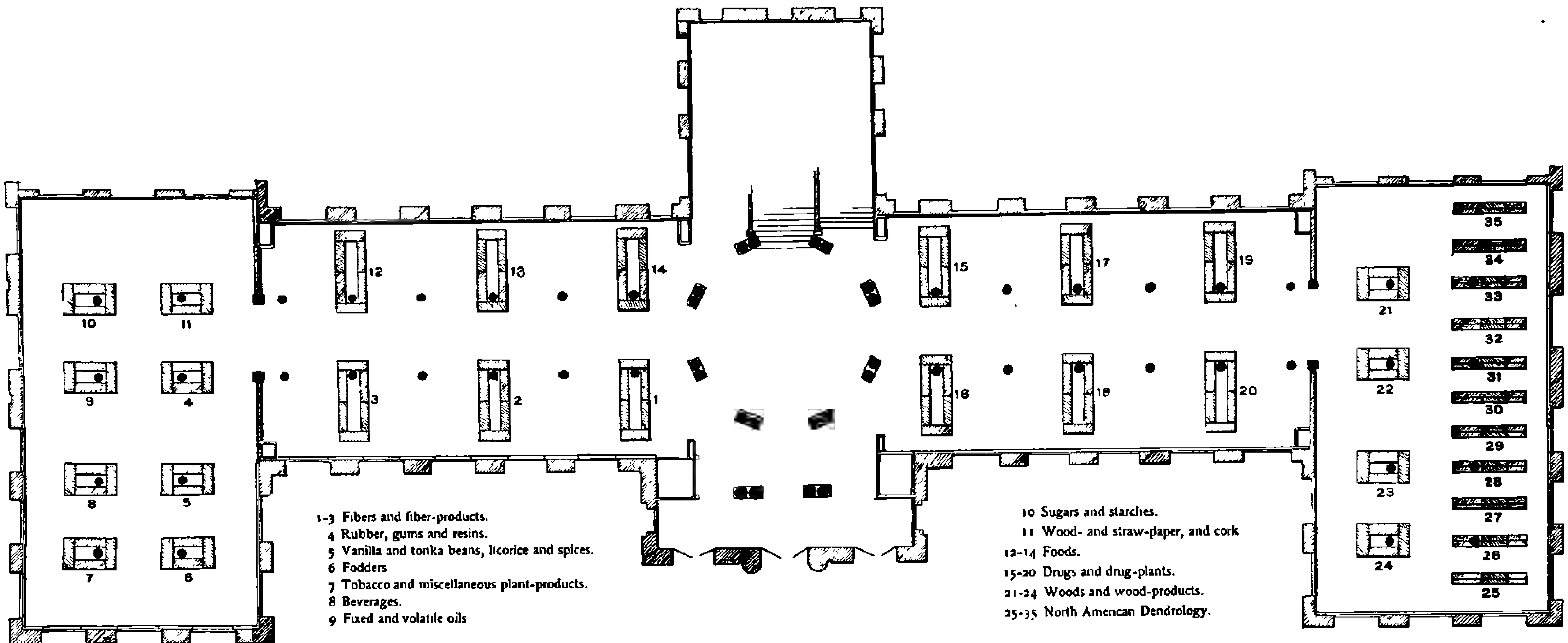

FIG. 8. Floor plan of Economic Museum.

Reference to the floor plan and its accompanying legend will indicate the relative position of the various groups of plants and plant-products now comprising the economic collection. Foods and fibers occupy the west hall; the former in cases on the north side, the latter on the south. The west wing is mainly given over to exhibits other than foods, fibers, drugs and woods. The east hall contains the drugs, while the east wing is set aside for the woods and wood products.

The contents of the museum may be briefly outlined as follows:* Blocks numbered 1, 2 and 3 contain fibers. The cases adjacent to the center of the building, and the entrance, are given over to cotton and cotton products, the most important of the fibers of vegetable origin, while in the succeeding cases are displayed various other economic fibers and fiber products arranged in the sequence of the natural families. Block 4 contains rubber and gums and resins. Block 5 is occupied by a fine collection of vanilla and tonka beans, licorice and spices. Block 6 is given over to fodders. Block 7 contains tobacco, masticatories and the miscellaneous plant products. Block 8 contains the various beverages. Block 9 is given over to the fixed and volatile oils, including the crude materials from which the oils are derived and their bye-products. Block 10 contains the specimens of sugars and starches. Block 11 is divided between specimens of wood- and straw-paper and cork. Blocks numbered 12, 13 and 14, consisting of the same number of units that are given over to the fibers, are occupied by the foods. Here as in the case of the fibers the same general plan of arrangement has been adopted, thus the cases adjacent to the center of the building are given over to the specimens of the cereals, which taken together represent the most important foods of vegetable origin, and following these are the other foods, mostly fruits, primarily divided, as nearly as possible into two groups, the dry and the juicy, each group arranged in the sequence of the natural families.

The six blocks numbered 15, 16, 17, 18, 19 and 20 contain the drug-plants and drugs. In these the specimens are divided

* The numbers of the blocks of exhibition cases used in the succeeding paragraphs refer to those on the floor plan accompanying this article.

into two series, which may be designated as crude drugs and prepared drugs. The crude drugs are arranged morphologically beginning with the roots and rootstocks and followed by stems, barks, leaves, inflorescences, flowers, fruits, seeds, and the whole plant.

The east wing is given over to the woods and wood products. Blocks numbered 21, 22, 23 and 24 contain specimens of woods from many parts of the world, while block 30 contains various wood products and carbons. Blocks 25 to 35 are made of cases of special design, devised to exhibit the North American trees by means of examples of the wood, accompanied by drawings, photographs, fruits and various other illustrative specimens.

J. K. SMALL.

INTERESTING PLANTS IN FLOWER IN THE CONSERVATORIES.

Among the bananas in house no. 4 is one which attracts universal attention on account of its stately tall stems and beautiful leaves, both more or less tinged with dull red. This is the red banana, called Ram-Kela in India, *Musa sapientum rubra*. The specimen referred to is now in full fruit for the first time. In this same house is also a large plant of the coral *Pitcairnia*, *P. corallina*, of Colombia, with its coral red drooping racemes just making their appearance. This will be a fine sight in the course of a week or two. Its leaves are five to six feet high, erect, and with a beautiful silvery under surface. In great contrast to this, and situated on the opposite side of the same house, is a large plant of *Dombeya Wallichii*, from Madagascar, with its large pendulous ball-like inflorescences of red flowers. Even in the necessarily restricted quarters of a conservatory it is an odd and attractive plant, with its large striking leaves and inflorescence, so what must it be in its native country where it can develop to its best!

In the immediate vicinity is another interesting plant, this time from the standpoint of economics. This is the chocolate tree, *Theobroma Cacao*, from which both chocolate and cocoa are manufactured. There is a group of four plants, three of which now bear nearly mature fruit, and one of them is also well in flower. Unlike most plants, this bears its flowers and fruit on the trunk or at the base of the branches, instead of near the end of the branches. The fruit contains five rows of seeds, a fully developed one having from 50 to 75 seeds. It is from these seeds, commonly called chocolate beans, that the economic products are produced.

Right across the path from this is a large plant of *Medinilla magnifica*, from the Philippines, now sending out a profusion of its large panicles of bright pink flowers and floral bracts. It promises to be a handsome attraction in a few days.

In no. 5, one of the succulent houses, several species of the aloes and gasterias are blooming. As these are all from southern Africa, where summer now holds forth, their flowering so freely at present is explained. One cannot refrain from expressing surprise that these homely but interesting plants should send forth such richly colored flowers. Another plant in this house, now in full bloom, is the odd *Kalanchoë marmorata*, from Abyssinia, with its long white flowers, quite exceptional in the genus, and fleshy marbled leaves.

In house no. 8 a number of interesting Begonias are in bloom, among them the unusual *B. nelumbiifolia*, from the West Indies, with its immense leaves and large panicles of white flowers.

Among the orchids in house no. 15, the most conspicuous for the past two weeks, and still continuing so, is a group of about a dozen plants of *Laelia anceps* in full bloom, their long graceful wand-like stems and rosy flowers making them very attractive. Not quite so showy, but much more unusual, is a large plant of *Cattleya granulosa Russelliana*. This was imported directly from Pernambuco, Brazil, the past summer, and is now in full flower with thirteen flowering stems containing an aggregate of thirty-five flowers. The yellowish-green petals and sepals with the small brown spots make quite a contrast with the white lip flushed with red, and also with the *Cattleyas* of the *labiata* type likewise now in bloom nearby. This variety *Russelliana* differs from the type in having the parts of the perianth marked with fewer and smaller spots, and in having the blade of the lip broader and more pronounced.

The Australian acacias, in house no. 13, are in full bloom. Conspicuous among these at present are: *A. longifolia*, with its yellow flowers borne in racemes; *A. cyanophylla*, with its drooping branches, blue curiously curved leaves, and balls of yellow flowers; and the dainty feathery *A. dasyphylla*, producing an effect quite unlike the others.

In the large palm house there are many plants which are always interesting, whether in bloom or not. Perhaps the one of unusual interest at the present time to the lover of these stately plants, is a small member of the collection, a native of the Sandwich Islands. This is *Pritchardia Martii*, which flowered for the first time with us during January. It sent out three large panicles of deep yellow flowers, which added much to its attractiveness. It is one of those plants which by the stately manner of bearing its leaves gives one the impression of greater size than it really possesses, for, tub and all, it stands only about eight feet high.

George V. Nash.

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BOTANICAL EXPLORATION OF THE PHILIPPINE ISLANDS.

In the autumn of 1903 the Board of Managers authorized the commencement of botanical exploration in the Philippine Archipelago, and made a preliminary appropriation for that purpose, and work was inaugurated in September by sending Mr. R. S. Williams to Manila to make collections in coöperation with the Insular Bureaus of Agriculture and Forestry; he arrived at Manila early in November and at once commenced making collections on the Island of Luzon; under date of December 5, 1903, he writes that his first shipment of specimens will be dispatched from Manila within a few days from that time and should reach the Garden during February; it is hoped that Mr. Williams will be able to remain in the Philippines for a year or more, conducting this important work, and that when he returns it will be possible to send another collector there so as to continue the exploration for a series of years. The Garden has recently received through Mr. Elmer D. Merrill, the botanist of the Bureau of Government Laboratories of Manila, several thousand specimens obtained by him in various parts of the Archipelago, and we had previously received through the United States National Museum a considerable collection made in the islands by Mr. A. Loher. In addition to this material, and that now being obtained by Mr. Williams, there is contained in the Columbia University herbarium, on deposit at the Garden, a set of the botanical collections made by Mr. Hugh Cuming, an English nautralist who visited the Philippines between 1835 and 1839, and whose collections have been studied by a number of European botanists. This collection is most important, as forming a basis for the study of the flora. The Columbia herbarium also contains a set of the specimens obtained by the United States Pacific Exploring Expedition under Captain Charles Wilkes, in the years 1838 to 1842, including many from the Philippine Islands.

In addition to the study of the herbarium specimens above described, the Garden will grow living plants and seeds obtained by Mr. Williams, who is also under instructions to secure and ship such specimens as he may be able to obtain for the Museums, the plan being to bring together all the plants and plant products of the Philippines that the means at our disposal will permit. At present the work will have to go forward slowly, but it is hoped that funds may be obtained to enlarge it as we proceed.

It is planned to keep the herbarium specimens in a series by themselves for a number of years, and thus bring them together in convenient arrangement for study. This part of the work has been put in charge of Mr. C. B. Robinson, a graduate of Dalhousie College, and sometime student at Cambridge, England, who has been a student at the Garden for some months, and has recently been granted a resident research scholarship.

N. L. BRITTON.

NOTES, NEWS AND COMMENT.

Dr. MacDougal left on January 13 for an inspection of the new Desert Botanical Laboratory of the Carnegie Institution at Tucson, Arizona, which was described and illustrated in the January number of the JOURNAL. He writes that the plans for the building and its equipment, prepared by Mr. Coville and himself at the request of the Carnegie Institution, were carried out in a very satisfactory manner, and that Dr. Cannon, the resident investigator, has already commenced a series of investigations on desert plants, and that the facilities of the laboratory are already being taken advantage of, Professor Volney M. Spalding, of the University of Michigan, being at work there.

Dr. MacDougal spent a day at Langtry, Texas, on his way to Tucson, and shipped from there a small collection of interesting cactuses, which have reached the Garden in safety. After the completion of his examination of the laboratory and consultation with Dr. Cannon he will go on west to Yuma, where arrangements have been made for him to explore botanically the valley of the Colorado River from that point to the mouth of the river, and also the western shore of the northern part of the Gulf of California. As the flora of this region is practically unknown, it is anticipated that his observations and collections will be of very great interest and value. The trip down the river and into the Gulf will be made by boat, and the return will be made overland by wagon. It is expected that Dr. MacDougal will return to the Garden by the first of March.

The longest and most expensive bridge to be built in the Garden was arranged for on December 30, by the award of a contract by the Commissioner of Parks to Mr. M. J. Leahy for the sum of $69,000, on plans and specifications prepared by Mr. John R. Brinley, landscape gardener. This bridge will carry the main east and west driveway across the valley of the Bronx River, at a point about 400 feet north of the present "Blue Bridge," at the north end of the hemlock forest; it will be built for the most part of rubble stone taken from the surplus rock excavations just east of the public conservatories, with granite trimmings, and its total length will be about 300 feet. There will be five arches, one over the river, two lateral ones to permit rapid passage of flood water, and two small ones near the two ends at the locations of paths. The time allowed to complete the whole work is 200 consecutive working days, so it is hoped that the structure will be completed by the autumn. The Telford foundation of the driveway connecting with it on the western side of the valley is laid up, but work has not yet been commenced on its approaches from the east, for which, in addition to other work, an appropriation is now being asked by the Commissioner of Parks from the Board of Estimate and Apportionment.

Stone for the foundation of paths in various parts of the grounds is being quarried in the rear of the museum building this winter and assembled along the lines which it is planned to build during the year, taking advantage of the frozen ground for cartage. These paths, it is proposed, shall include one from the herbaceous garden northeasterly along the western border of the woods and past the museum building to the lakes, one from the herbaceous garden southerly through the woods to the southern border of the Garden reservation, and a considerable portion of those planned on the fruticetum plain north of the museum building, perhaps extending one of them northward to the Newell Avenue Bridge at the northern end of the Garden now practically completed. The rock excavations in the rear of the museum building at the same time prepare the ground there for the grading necessary to establish the future court of that structure, for which drainage is also being provided by the building of a drain about 450 feet long from the museum building to the upper lake.

The collection of living orchids of the Missouri Botanical Garden at St. Louis, were completely destroyed by smoke, from an accidental fire in the cellar of the greenhouse containing them, on November 7, and many plants of great scientific value were killed in this way. It has been a great pleasure to contribute seventy-seven species of orchids from our duplicates, to help Professor Trelease in re-forming this collection.

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MUSEUMS AND HERBARIUM, JANUARY, 1904.

4 museum specimens of fruits for collection of North American Dendrology. (Given by Mr. L. R. Abrams.)

3 specimens of *Petasites palmata* from Massachusetts. (Given by Prof. F. E. Lloyd.)

100 specimens, "Fungi Columbiani," Century 19. (Distributed by Mr. E. Bartholomew.)

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28 specimens of woody fungi from Pennsylvania. (By exchange with Prof. D. R. Sumstine.)

69 herbarium specimens from central New York. (By exchange with Mr. H. D. House.)

12 photographs of western American trees. (Given by Professor E. O. Wooton.)

1 museum specimen, a black thorn cane. (Given by Mr. Wm. Gaynor.)

1 herbarium specimen of *Covillea* from California. (Given by Mr. C. De Kalb.)

13 museum specimens of medicinal plants of the Cheyenne Indians. (Given by Mr. Geo. B. Grinnell.)

205 herbarium specimens from western North America. (Collected by Mr. H. M. Hall.)

1 photograph of the tideland spruce from Oregon. (Given by Mr. E. P. Sheldon.)

3,003 specimens of Algae mainly from North America, Mauritius and Portugal. (Collected by Col. Nicolas Pike.)

1 specimen of *Corsinia marchantioides* from Italy. (Given by Miss C. C. Haynes.)

5,500 specimens of pteridophytes, being the herbarium of Professor L. M. Underwood.

25 plant photographs and plates. (Given by Miss A. M. Vail).

52 specimens of violets. (Given by Mr. Witmer Stone.)

17 herbarium specimens from the Bahamas. (Given by Mrs. J. I. Northrop.)

16 specimens of hepatics from Maine and Washington. (Given by Miss H. B. Bailey.)

2 museum specimens of *Hepaticae* from the Adirondacks. (Given by Miss C. C. Haynes.)

7 herbarium specimens from Florida. (Given by Mr. S. Rapp.)

1 specimen of *Chenopodium carinatum* from Texas. (Given by Mr. K. K. MacKenzie.)

225 specimens of European fungi. (Distributed by Messrs. J. C. Schmidt and G. Kunze.)

20 specimens of marine algae from Nova Scotia. (Given by Miss Evelyn Benedict.)

2 photographs of European pines. (Given by Mr. G. R. Shaw.)

3 specimens of *Karwinskia Humboldtiana*. (Collected by Dr. D. T. MacDougal.)

1 specimen of *Rhus littoralis*. (By exchange with the U. S. National Museum.)

1 specimen of *Frullania Eboracensis* from New York. (Given by Mr. H. D. House.)

5 herbarium specimens from New Mexico. (By exchange with Prof. T. D. A. Cockerell.)

31 herbarium specimens from Colorado. (By exchange with the Colorado College of Agriculture.)

5 herbarium specimens from Colorado. (By exchange with Mr. Geo. Osterhout.)

425 herbarium specimens from Illinois. (By exchange with Mr. F. E. McDonald.)

318 herbarium specimens from western North America. (Collected by Mr. C. F. Baker.)

1,006 miscellaneous specimens, being the herbarium of the late Dr. Theodore G. White. (Given for the Columbia Herbarium.)

3,600 herbarium specimens from Bolivia and Peru. (Collected by Mr. R. S. Williams.)

5 specimens of pines from America and Europe. (Given by Mr. G. R. Shaw.)

200 herbarium specimens from Jamaica. (Collected by Mr. Geo. E. Nichols.)

2 museum specimens, "nuts" juice, and fruit of *Genipa*. (Given by Messrs. D. T. Savimore & Co.)

55 herbarium specimens from the islands adjacent to California. (Given by Miss Alice Eastwood.)

PLANTS AND SEEDS, JANUARY, 1904.

2 plants for the conservatories. (By exchange with the New York Zoölogical Society.)

99 bulbs. (Purchased from Messrs. Suzuki & Iida, Japan.)

201 plants, mostly for the conservatories. (Purchased from Messrs. Suzuki & Iida, Japan.)

10 succulents. (By exchange with Dr. J. N. Rose.)

7 succulent cuttings. (By exchange with Dr. J. N. Rose.)

18 plants for the conservatories from Langtry, Texas. (Collected by Dr. D. T. MacDougal.)

1 packet of seed of *Musa textilis*. (By exchange with the Bureau of Agriculture, Manila.)

1 packet of seed from Georgia. (Given by Mr. R. M. Harper.)

1 packet seed from Langtry, Texas. (Collected by Dr. D. T. MacDougal.)

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EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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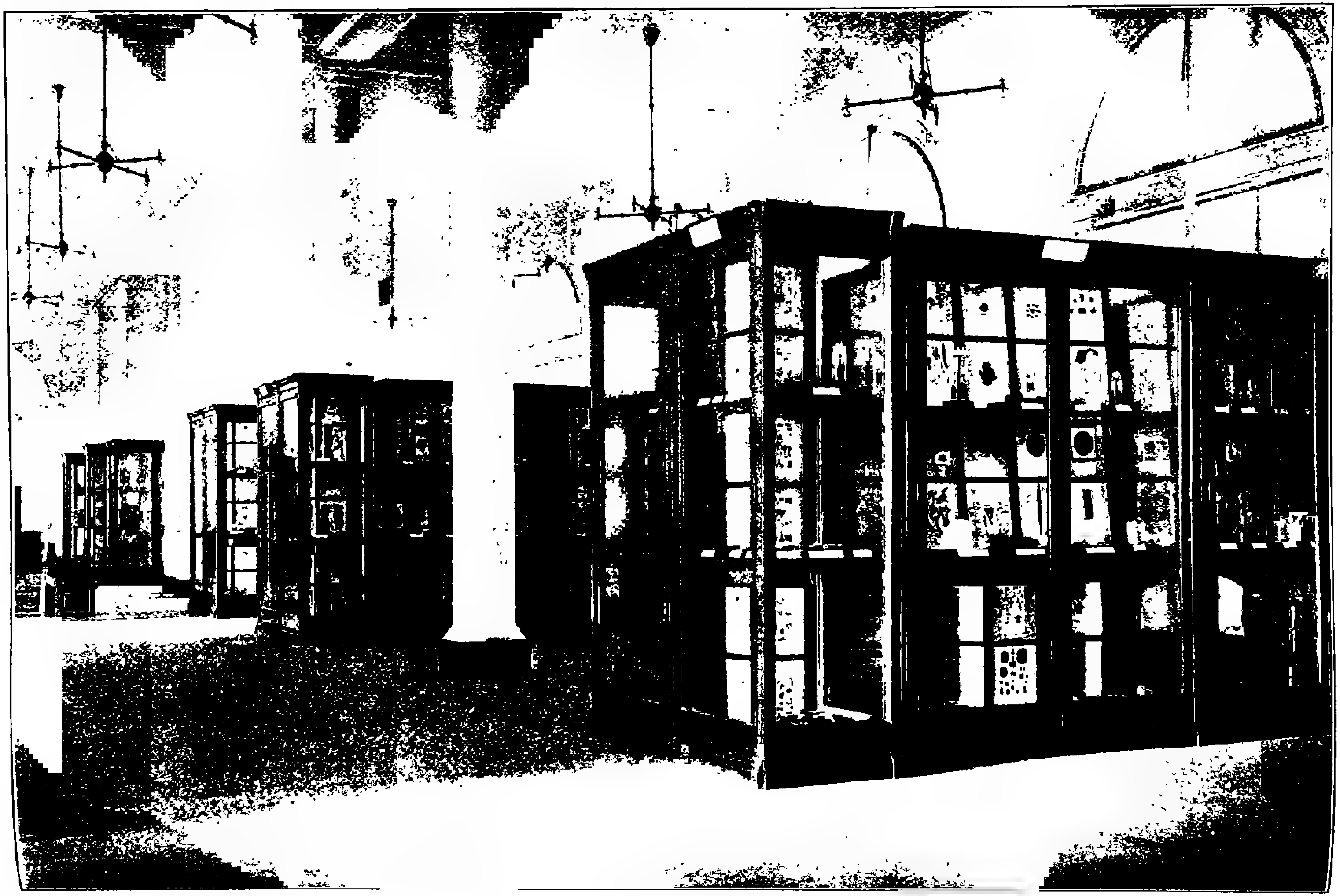

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Vol. V. March, 1904. No. 51.

REPORT ON EXPLORATION IN TROPICAL FLORIDA.

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

Sir: The undertaking of this trip was prompted by the lately developed conditions at the extreme southern end of peninsular Florida. The country southwest of Miami and its adjacent settlements, hitherto uninhabited is being opened to civilization. An examination of the flora of that unexplored region, in advance of settlement and the consequent eradiction of native species and the introduction of foreign plants, seemed very desirable in itself, if not necessary to the proper understanding of the relation of the flora of that portion of our country to the flora of the neighboring West Indies, the study of which is being actively prosecuted under the auspicies of the Garden.

By your permission I left New York City on the morning of October 26, 1903. Florida was reached on Tuesday the 29th. A stop of twenty-four hours was made at Daytona in order to examine certain herbaceous plants and the tree, *Persea littoralis*, discovered there on a previous trip to Florida. The desired observations were made, but further exploration was prevented by continuous rain. Miami, the objective point was reached during the night of October 28. This place served as a base for our excursions during the month of November.

I was fortunate in having the company of Mr. J. J. Carter, of Pleasant Grove, Pa., who arrived at Miami early in the first week in November and remained my constant and indefatigable associate during the remainder of the month. To his energy and knowledge of plants much of the success of the trip is due. For a part of the time we had the coöperation of Mr. A. A. Eaton, of the Ames Botanical Laboratory, who paid special attention to the collection of the orchids and ferns. I wish to thank Professor P. H. Rolfs of the Tropical Laboratory of the Department of Agriculture at Miami, who aided our operations in many ways and who placed the facilities of the institution of which he has charge at our disposal, and also his associates Messrs. McCulloch and Hendrickson whose assistance enabled us to spend a part of or the whole of each day in the field.

A little time, especially between the periods of the more extended excursions, was spent in the less known parts in the vicinity of Miami, but by far the most of our time and energy was devoted to the investigation of the flora of more distant and wholly unexplored sections.

A trip by boat of about fifty miles was made to the north in order to examine the flora of the country immediately back of the coast. Our route lay through the inland water way. We were thus able to make collection of plants on the narrow sandy island-like peninsulas on the eastern side and the low lands, pine lands and hammocks on the western side. In addition to finding rare species some of which had been collected only once heretofore, and extending the geographic ranges of other plants, we discovered several species not previously known to occur in the United States, and two undescribed woody plants, the one a small shrub, the other a larger shrub or a small tree.

Four conspicuously differentiated plant-formations impressed themselves upon one during this excursion : (1) The sand ridges near the coast supported a growth of gnarled shrubs and trees together with two cactuses, a spreading *Opuntia* and a *Cereus* with branched and interlaced stems often over twenty-five feet in length, to the exclusion of nearly all herbaceous vegetation ; (2) the low lands behind the ridges, upon which grasses, sedges and other herbaceous plants grew almost to the exclusion of woody vegetation ; (3) the characteristic pinelands,* and (4) the hammocks.*

* See Journal of the New York Botanical Garden, 3 : 32. 1902.

Another interesting section of country selected for investigation was a partially finished railroad grade about fifteen miles long between Miami and a point several miles west of Cutler. This grade has recently been constructed through an uninhabited region and it afforded an unusual opportunity to investigate a succession of low coral ridges consisting of either pinelands or hammocks, and arms of the everglades in the form of prairies reaching out to near the coast. The collections from this section contain several species of flowering plants not heretofore known to occur in the United States and six undescribed herbaceous species.

The more interesting field for exploration lay to the south and southwest of Cutler. There the topography is essentially the same as that about Miami.* However the pinelands are vast and the hammocks are few and small. Notwithstanding this practical similarity of country the flora rapidly changes to a more tropical type, especially West Indian, from Cutler towards Cape Sable.

Several excursions were made to Black Point south of Cutler and Longview Camp in the direction of Cape Sable. The farthest point reached was about Longview Camp nearly half way between Miami and Cape Sable.

Further advance was then impossible both on account of the wet condition of the everglades beyond Longview Camp and the necessarily improvised field equipment at our disposal. The collections from the country south and southwest of Cutler yielded fully nineteen species not previously known to occur on the mainland of North America and thirteen undescribed species.

In that section the coral ridges are thickly covered with pine trees, several species of palms, shrubs and herbaceous plants. A curious condition of plant distribution was apparent on all sides, that is, the exposed coral rock of the slight elevations maintain not only more species than the slight depressions where a certain amount of soil has accumulated, but also more individuals, or in other words the more eroded and acicular the con-

* For a description of the topography of this section see Journal of the New York Botanical Garden, 3 : 29–35. 1902.

dition of the coral rock with apparently barely enough soil to support plant life, the more diversified and abundant the vegetation.

In marked contrast to the pinelands which always suggest a condition of drought are the hammocks in their perpetual moist condition. These small isolated associations of deciduous-leaved trees, shrubs and woody vines, harbor an almost incredible growth of herbaceous plants of various categories. The growth of epiphytes is especially striking for in numerous cases the tree-trunks and the branches to their tips are completely clothed with air plants, and so prolific are the orchids and bromeliads that many individuals are forced to grow on the ground and the neighboring pine trees. There the epiphytic flora of tropical character reaches a conspicuously greater development than in the Miami district. In addition to this ponderous orchid and bromeliad flora, the hammocks support a luxuriant growth of ferns all of a tropical type. Some of the species are confined to the trees, others to the curious and treacherous sink holes of varying size and depth, with which the hammock-floor is often honeycombed, while the ground is often carpeted with filmy ferns bearing leaves sometimes less than a quarter of an inch in diameter or gigantic sword-ferns with leaves not rarely over ten feet long. In crossing patches of the sword-fern we were supported at a distance of three or four feet above the ground on the matted masses of the leaves. In one small hammock we discovered two new members for our arboreous flora, the one a nightshade not before known to grow to the proportions and size of a tree, the other a long-lost species of sumac.

The everglades between Cutler and Longview Camp consist of elongated prairies with a layer of sticky soil over the bed of coral rock. The vegetation comprises grasses, sedges, and other herbaceous plants, sometimes with a scattering of small or incipient hammocks.

In that region two things at once arrest the attention of the newcomer from temperate regions, first the absence of familiar plants, second, the prolonged or perpetual blooming periods of most of the species. The division of seasons so marked in temperate and some tropical regions, being but feebly manifested. Individuals of many or perhaps the majority of the species may be found in all stages of development, sometimes in a very restricted area, sometimes in a more extended area: for example in the vicinity of Miami the small silverleaf palm, *Coccothrinax Garberi*, was bearing mature fruit, with an occasional plant in flower, while in the pinelands thirty or forty miles to the southwest the plants were nearly all in full flower, those bearing fruit being about in the proportion as those in flower about Miami.

The relation of the flora of our southern points of exploration to that of the West Indies is clearly brought out by our collections and observations, and may be briefly stated as follows: Nearly all of the tropical species added to the North American flora were discovered in or about the hammocks which are essentially duplicated by similar formations in the West Indies. On the other hand nearly all of the undescribed species were found growing only in the pinelands which formations are not duplicated in the West Indies.

We left Florida about the first of December, with the satisfaction of having accomplished at least a general survey of considerable territory below Cutler and especially a rather careful examination of several of the small hammocks previous to their extermination which has been begun and which will be completed with the early advent of the homesteaders. Our only regret was in not being able to advance farther toward Cape Sable. However, if another excursion is possible during the coming spring, before the beginning of the rainy season, considerable territory beyond Longview Camp may be explored and many of the novelties now existing in the everglades and hammocks of that region brought to light, thus increasing our knowledge of the flora of Florida and its relation to that of the West Indies. The results of our field work amount to a total of about three thousand specimens representing nearly one thousand field numbers and somewhat fewer species. Two trees were added to our arboreous flora. About sixty species of plants were added to the known flora of the North American mainland, of these 55 per cent. are recognized West Indian species, while the remainder are undescribed.

J. K. Small.

NOTES ON PLANTS IN THE CONSERVATORIES.

The East Indian orchids, represented by the genus *Dendrobium*, are now in full flower. This genus is a vast one, and is restricted to the Old World. It comprises about 300 species, found over a wide territory, extending from India and the Malay region to Japan and China, Australia, New Zealand and the islands of the southern Pacific, reaching perhaps its maximum development in the Malay Archipelago. From Burma come *Dendrobium Wardianum* and *D. pendulum*, much resembling each other in habit and in general color of the flowers, which are white more or less colored with rose. *D. pendulum*, however, can be at once distinguished by the marked thickening of the nodes of the stem (a character which evidently suggested one of its synonyms, a name by which it is frequently known, *D. crassinode*) and the absence of the two eye-like spots of crimson magenta which mark the base of the lip in *D. Wardianum*. Both species are represented by several specimens in flower. Resembling these in its pendulous habit, but otherwise differing greatly, is *D. Pierardii*, from the Himalayan region. The delicately tinted flowers, with the sulphur-yellow convolute lip, form quite a contrast with the more decided colors of the preceding species. Another member of this genus, an old friend and one of the first orchids introduced into cultivation, is *Dendrobium nobile*. This is found all the way from Sikkim, in the Himalayas, to central China, and it is as variable in its colors as it is extended in its range; specimens are now in full flower, and also of the marked color variety *nobilior*, which differs in the deeper color of the petals and sepals and in their greater breadth. *Dendrobium aureum*, also from the Himalayan Region, adds charm to the collection of these plants; its yellow flowers make it at once noticeable; it is sometimes called *D. heterocarpum*. Additional interest is added to this last species, as well as to *D. nobile*, by the presence in the group of *D. Ainsworthii*, just passing out of flower, a hybrid between the two; the *nobile* blood, however, predominates, as the stems and flowers more strongly resemble that species; in fact, none of the yellow color of *D. aureum* is transmitted to the hybrid, the sepals and petals being a pure white, occasionally slightly flushed with pale rose.

In house No. 13 the oranges are in full bloom, and the delicious perfume of the flowers permeates the atmosphere, reminding one of more sunny climes and more genial balmy airs than have been experienced here for many weeks. Large plants of *Pittosporum Tobira*, in both the green and variegated forms, add their charm of fragrance and pure white blossoms. This species is a native of China and Japan.

In house No. 12, on the extreme south end of the side bench is a group of *Coelogyne cristata*, now in full bloom, a mass of snowy whiteness, broken only by the lines of yellow marking the lip. It is by no means rare in cultivation, in fact quite common, but its loveliness in flower is so charming that one cannot refrain from calling attention to it. It is from that country so famous for interesting plants, the Himalayas. In the same house is a plant from Southern Africa, now blossoming freely. It is *Polygala myrtifolia*, a shrub, with its slender graceful branches covered with rich purple flowers. Its habit is quite different from that of the little *Polygala paucifolia*, commonly called Flowering Wintergreen or Gay-wings, of our own northern woods, which so shyly peeps out from the old dead leaves. An examination of the flowers will show its relationship, however. Another plant near by is *Chorizema varium*, from Australia, equally graceful in habit, but with odd-colored flowers of a most unusual shade. A plant of the Gorse in full bloom will be of interest to those who have pleasant recollections of the Old World.

In house No. 4 the collection of bananas, on account of its over-towering size, is apt to dwarf and hide a collection of plants of much interest. This is a group composed of members of the aroid family, located on the westerly side of the house. It is to this family that our modest little jack-in-the-pulpit belongs, and here in this group will be found some of his more vigorous and tropical relatives, more sturdy than he in size but mere weaklings compared with him in their ability to withstand cold. Sometime ago attention was called to the large plant of *Anthurium Veitchii*, from Colombia, the central figure of this group. It is still increasing in size and vigor, and its long pendulous leaves, which are transversely marked with ridges and furrows, make it very imposing. Grouped around it are posts provided for some of the climbing members of this family, which make their homes upon trees in dense tropical forests, frequently entirely concealing the trunks with their large leaves. *Philodendron* is one of the genera given largely to this habit, and it is here represented by several species. Some of these are: *P. giganteum*, common throughout tropical America; *P. lacerum*, of the West Indies, with its curiously toothed leaves; *P. verrucosum*, from Colombia, with the leaves oddly variegated with purple and with the petioles densely hairy; and *P. radiatum*, from Mexico, quite different in appearance, with the leaves cut into many narrow linear segments. Of the same genus, but attaining tree-like proportions instead of climbing and with the trunks plainly marked with leaf scars, are two species from Brazil, *P. Selloum* and *P. speciosum*. The former is especially noticeable on account of its deep green foliage. Another climbing aroid in this collection is *Monstera deliciosa*, from Mexico and known there as Piña Anona; it is common in cultivation, its large lobed leaves, with their peculiar perforations, make it very effective in conservatory decoration; its fruit is edible and has a rich pineapple flavor.

Two other plants in this same house, to which reference was made in the JOURNAL last month, are now in full flower: *Medinilla magnifica*, across the path from the large plant of *Anthurium Veitchii*; and *Pitcairnia corallina*, a member of the pineapple family, on the opposite side of the house. Both are worthy of more general cultivation than they enjoy.

GEORGE V. NASH.

February 23, 1904.

THE MUSEUM EXHIBIT OF SEAWEEDS.

During the past year, the exhibit of algae in the synoptic collections of the public museum has been nearly doubled in volume and considerably improved as regards the character of the specimens displayed. The exhibit of marine forms has been specially increased, largely through the results of recent collecting expeditions to Florida and Porto Rico. Fifteen of the museum cases are now devoted to this display. So far as is practicable, it has been the design to illustrate each of the species chosen to represent the different families by a specimen dried and mounted after the usual herbarium fashion, by a specimen preserved with the aid of a solution of formaldehyde and exhibited in a museum jar, and by a plate or figures illustrating the structure of the plant or its appearance under magnification.

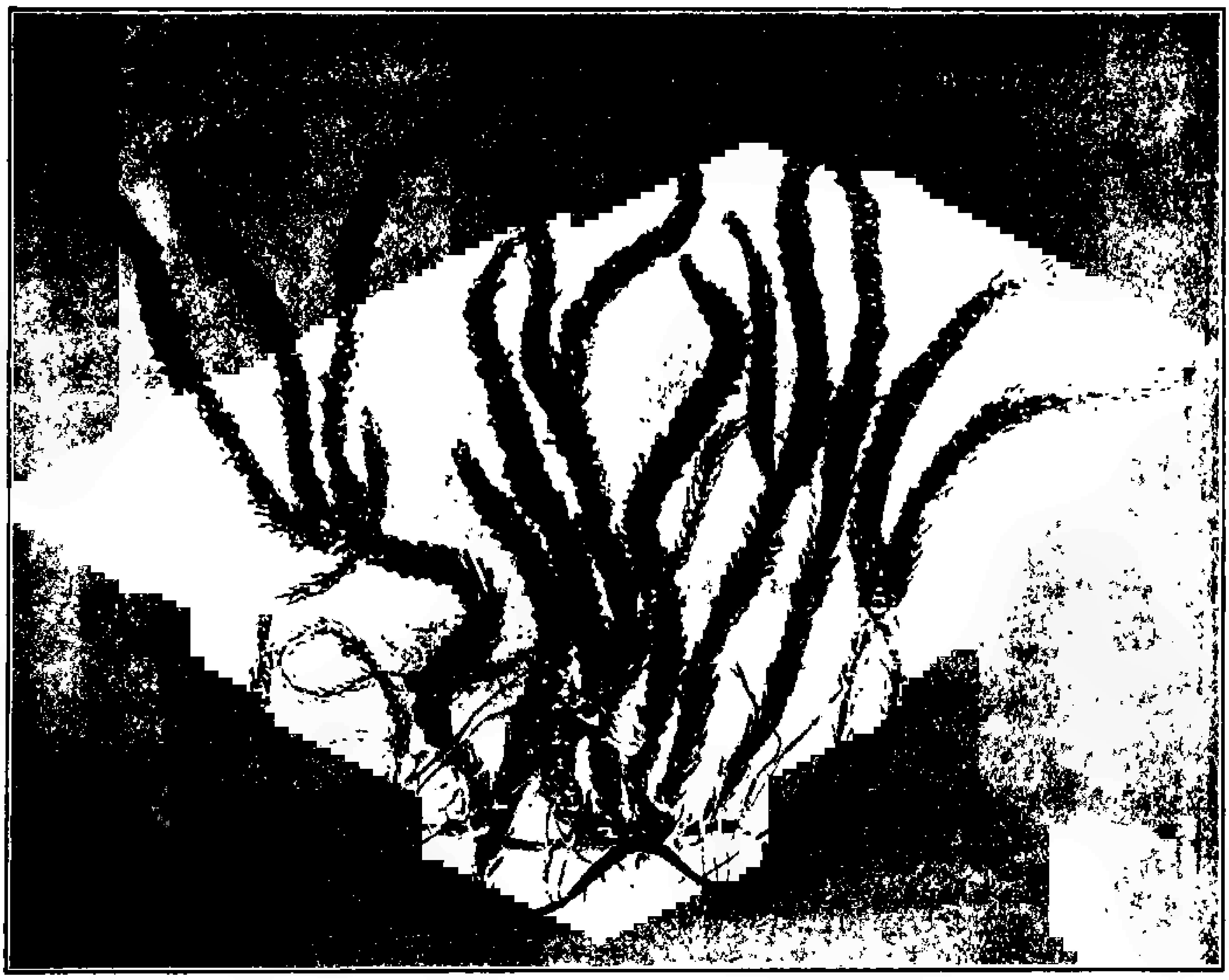

FIG. 9. *Caulerpa racemosa laetevirens* (Mont.) Web.-v. Bosse. From Bermuda. (About one fourth natural size.)

The first case of the series is occupied by representatives of the blue-green algae, as they are often called, and the diatoms. The plants of these two groups are minute, so much so that in most cases the individuals can be well seen only with the aid of a microscope. As one finds them in nature they commonly form slimy or oozy masses which are not particularly attractive to the naked eye, but under a compound microscope are of very great interest. The photo-micrographs and detailed enlargements which accompany the specimens exhibited in mass are designed to give the visiting public some idea of how these lowly organized plants look when viewed under certain degrees of magnification. The photographs of the diatoms illustrate not only the elegance and symmetry of form of these microscopic organisms, but also the beauty, regularity, and delicacy of the sculpturing which characterizes the siliceous shells of these minute one-celled plants. There are exhibited also samples of diatomaceous earths, which form extensive deposits in various parts of the world and consist almost wholly of the siliceous shell-like or box-like cell-walls of diatoms. These diatomaceous earths are sometimes soft and powdery but are often hard and rock-like. They are put to various economic uses, one of the principal being as an ingredient of polishing powders and scouring compounds. The minute flinty boxes constituting the shells of diatoms are brittle but their fragments are very hard and are well adapted for polishing stones, metals, etc.

The second museum case of the series contains some of the green algae, the group which includes the lower plants that are sometimes called the pond-scums, green slimes, green felts, green seaweeds, stoneworts, etc. Some of these are microscopic and the enlarged figures and drawings which accompany the specimens or are substituted for them, are therefore as a rule much more instructive to the visitor than are the specimens themselves. However, some of the green seaweeds attain a considerable size and begin to look a little more like what are popularly termed "plants." The Caulerpas, for example, — natives of the warmer seas — sometimes get to be three or four feet long, though the genus, as at present generally accepted, includes a wide range both of form and of size. The genus *Caulerpa* is represented in the public show cases by several species, illustrating the principal subdivisions of the group. Among the green seaweeds a curious plant that is always among the first to attract attention is *Penicillus*, sometimes called also the "merman's shaving-brush" from its very patent resemblance to certain forms of brushes. The most common species, *Penicillus capitatus*, grows in Bermuda, southern Florida, and the West Indies, for the most part in shallow quiet bays and usually on a rather sandy bottom. Its ordinary height is from two to eight inches. A close relative of *Penicillus* is *Rhipocephalus*. When living, the plants of this genus look somewhat like little spruce or fir trees growing on the bottom of the ocean. In tropical regions, especially in association with coral reefs, many of the marine plants are more or less coated or permeated with lime. This calcareous coating is exhibited among the green algae not only by *Penicillus* and *Rhipocephalus*, but also by the fan-shaped Udoteas the opuntioid or vertebrate Halimedas, the worm-like *Neomeris*, and the

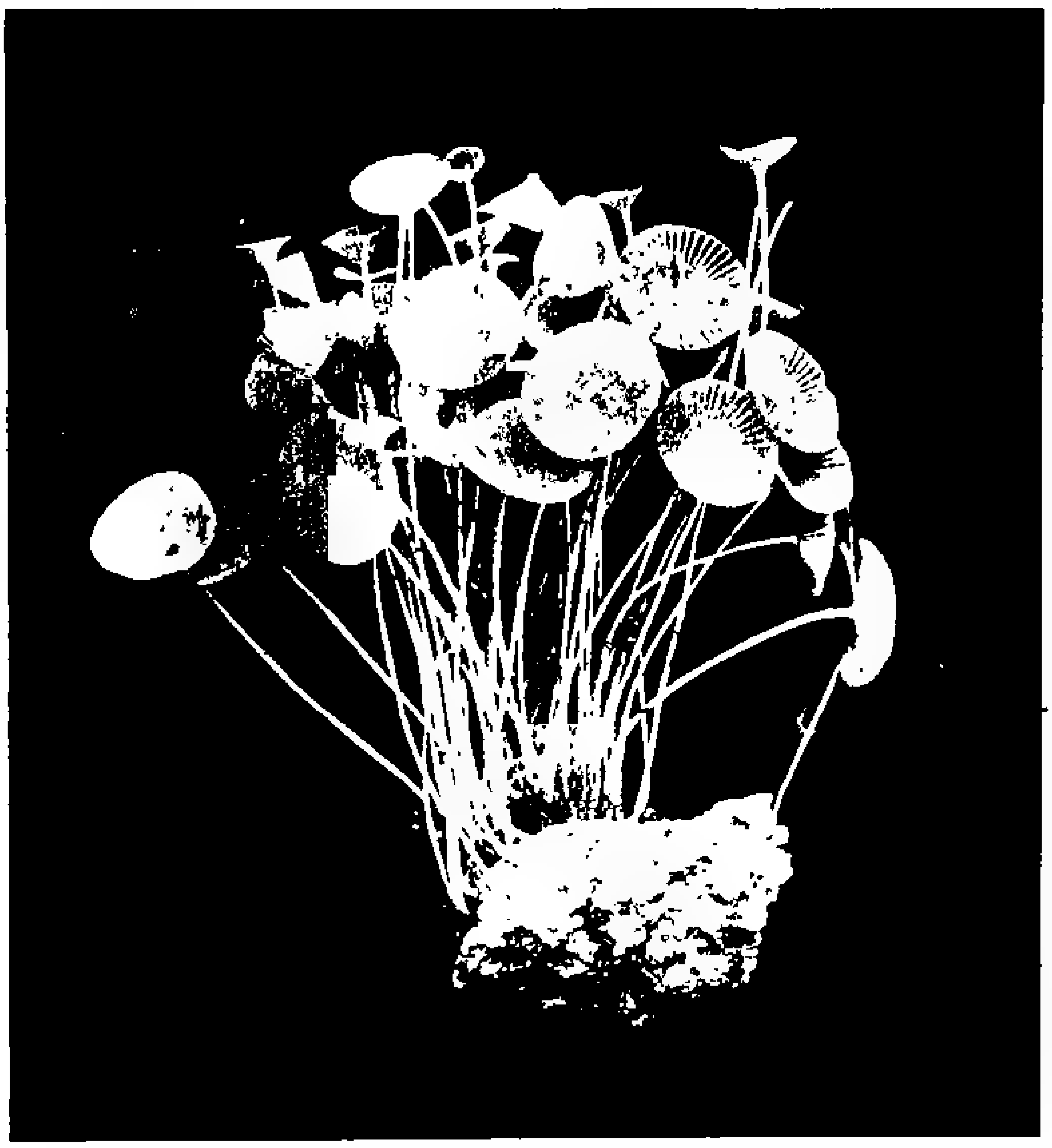

FIG. 10. The Mermaids' Wine-glass, *Acetabulum crenulatum* (Lamour.) Kuntze. From Bermuda. (Natural size.)

dainty *Acetabulum*. All of these lose their natural green color very soon after being exposed to the light and are left a chalky white. The most strikingly beautiful of these calcified green algae are doubtless the species of *Acetabulum*. The plants of this genus look like dainty mushrooms or like tiny everted umbrellas. In the American species illustrated by the accompanying photograph (Fig. 10) the individuals are mostly two or three inches in height. Each of the radial chambers composing the wall of the cup is in large part a spore-case, containing in *A. crenulatum* from four hundred to five hundred round reproductive cells known as spores. On germination, judging from analogy with a well-studied European species, each of these spores produces internally a number of minute motile cells which are sexual in nature. Fig. 11 shows a row of "sea-bottles," as they are often called — photographed from Porto Rican specimens now on exhibition in the museum. These grow especially under shelving rocks at about the low water mark, usually nestled in among seaweeds of the soft mossy kind. When living they are dark green and beautifully iridescent. The plant is

FIG. 11. "Sea-bottles" (*Valonia ventricosa* J. Ag.). From Porto Rico. (About one half natural size.)

simply a membranous sack filled with a semi-fluid protoplasm. In the natural process of decay or when preserved in a fluid and exposed to the light they become as clear and translucent as a quartz crystal and are as attractive then as when living.

In the exhibition cases adjacent to those containing the green algae we pass to the brown algae — the group which includes the largest kinds. The brown algae contain chlorophyl, like the algae in general, but they have one or more brownish pigments in addition, so that the resulting shade is commonly a brownish green or a dark olive-green. The brown algae are nearly all found in salt water and comparatively few of them are small and inconspicuous. Prominent among the types of this class selected for exhibition in the synoptic collections are two specimens of *Laminaria longicruris* from Nova Scotia, one of which when fresh measured thirty-two feet in length, including blade and stalk. The Laminarias are sometimes called "oar-weeds" or "devil's-aprons," or are more often referred to in a general way as "kelps." One species of kelp is found occasionally about New York City but they are more at home in more northern waters. They grow attached to rocks, stones, and wooden piers from just above the low water mark down to where the water is twenty feet deep or more at low tide. But the climax of all the marine plants in point of size is easily the plant known to botanists as *Macrocystis* — also often spoken of as the "great kelp," a name which it deserves even in comparison with the other kelps of giant dimensions. This plant, whose chief home is in the Pacific Ocean and especially along the western shores of the American continents, is attached to the bottom by a widely spreading and branching holdfast. It prefers water that is perhaps from thirty to seventy feet in average depth. From the strong holdfast a long naked stalk arises to the surface of the water, where floats the main part of the plant, consisting of a much elongated stem-like portion bearing large alternate toothed "leaves." Each "leaf" has a stalk of its own, a part of which is an inflated vesicle. The vesicles are filled with air or gas and keep the plant afloat. Growth in this plant is mostly in the apical region and it may continue to elongate here until it has reached an enormous length. Various more or less credible stories are told about it; the eminent botanist Sir Joseph Hooker, who enjoys an excellent reputation for accuracy and veracity, estimated the length of a single living individual once seen by him at seven hundred feet.

The olive-green rockweeds, familiar to all who are accustomed to visit our seacoast from New Jersey northward — especially where there are rocks and stones along the shore — belong with the brown seaweeds. The rockweeds are represented in the show-cases by several genera and species and accompanying plates illustrate structure and mode of reproduction. Fig. 12 is from a photograph of a species of *Fucus*, which is not uncommon from northern Massachusetts northward, growing usually on rocks near the low water mark. The genus *Sargassum* stands at the head of the rockweed family, both in number of species and in the highly specialized plant body. It is a species of this genus that is known to sailors as the gulf-weed or sargasso-weed — a species that is most frequently found in a free floating condition. This forms wide floating mats covering more or less

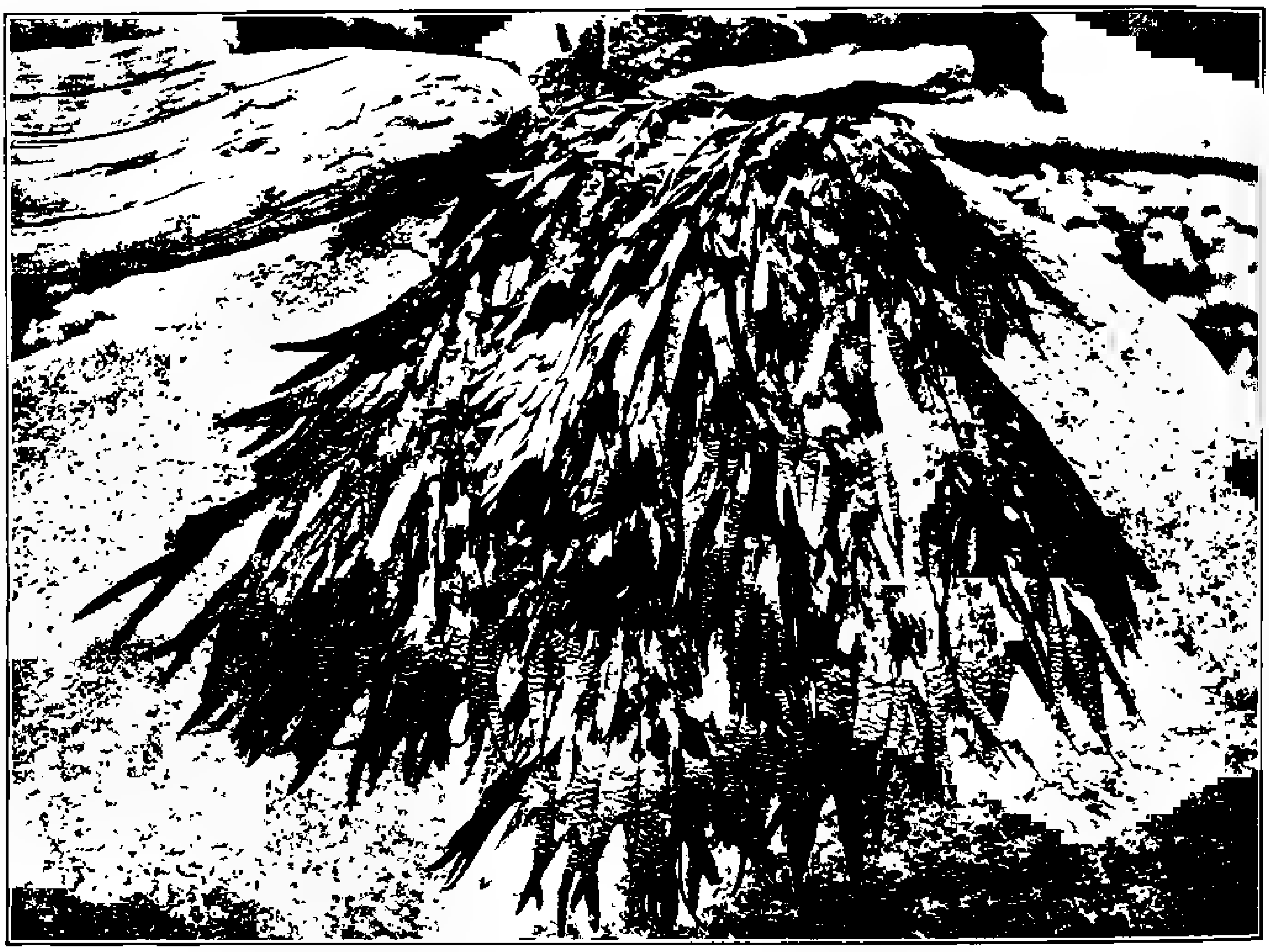

FIG. 12. A Rockweed. (*Fucus edentatus* De la Pyl.) From Nova Scotia. (About one eighth natural size.)

densely thousands of square miles in the Atlantic Ocean between the West Indies and the African coast. The plant is brought north by the Gulf Stream and is occasionally washed ashore on Long Island.

The exhibit of seaweeds culminates with the red algae, a group in which the plants commonly offer some shade of red, pink, or purple. The display of the algae of this class is particularly full, perhaps disproportionately so, eight of the cases being devoted to them. The red algae exhibit a marvelous range of form and color, which can be better appreciated by seeing than from any attempts at verbal description. Noteworthy among the larger specimens are mounts of *Gelidium cartilagineum*, *Callymenia perforata*, *Rhodymenia palmata*, *Nitophyllum latissimum*, *Delesseria sinuosa*, *Grinnellia Americana*, *Claudea elegans*, *Polysiphonia nigrescens* and *Halymenia Floridana*. Finally are four museum cases largely given to the group of red algae which are known as the corallines on account of their outward resemblance to the corals. These plants are thoroughly permeated with lime and are often as hard and stone-like as any coral. The corallines are widely distributed, being found in arctic as well as temperate and tropical regions. In the tropics they often accompany the true corals and doubtless play a part with them in the great work of building up the coral reefs.

MARSHALL A. HOWE.

NOTES, NEWS AND COMMENT.

Professor F. S. Earle, one of the Assistant Curators at the Garden, has gone to Cuba, on leave of absence, at the request of the Cuban Government for the purpose of aiding that Government in the establishment of a Department of Agriculture. The invitation to Professor Earle to perform this work which will be of enormous importance to American tropical agriculture and horticulture came to him through the U. S. Department of Agriculture. The plan contemplates the establishment of one or more thoroughly equipped and thoroughly manned agricultural experiment stations in Cuba, similar to those which have proved of such value in the development of the United States, together with an agricultural and botanical survey of the entire Island.

Dr. MacDougal has returned to the Garden from his expedition through the lower valley of the Colorado River and the shores of the Gulf of California. He has obtained a large collection of plants and specimens from this region, which will doubtless add much of value and interest to the collections.

The total precipitation in the Garden during January, 1904, amounted to 5.42 inches. Maximum temperatures of 36° on the 1st, 35° on the 9th, 37.5° on the 16th, 47° on the 23d, and 36° on the 30th were recorded; also minima of — 17° on the 5th, — 12° on the 6th, and — 6.5° on the 18th.

The temperature of the soil at a depth of 6 inches (15 cm.) fluctuated between freezing point and 35.5° F.

The total precipitation for February amounted to 3.44 inches. Maximum temperatures of 51.5° on the 7th, 33° on the 14th, and 48° on the 22d, were recorded; also minima of 2.5° on the 2d, 4.5° on the 10th, — 1° on the 16th, and 7.5° on the 26th.

The temperature of the soil at a depth of 6 inches (15 cm.) fluctuated between 30° and 35° F.

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EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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THE PROTECTION OF OUR NATIVE PLANTS.*

For ages Nature worked upon a great bare continent, and slowly, so slowly that a passing century saw no change, she won her victory. Great forests softened the outlines of mountains; vast reaches of waving grass made beautiful the monotony of plains, and everywhere flowers were scattered with lavish hand. She hid them in the deepest glades of the forest and sowed them broadcast on the meadows; she begirt the lakes, and bordered the streams, and hung the hillsides with their beauty.

And the making of a single flower! They were begun far back in the distant centuries, and some are not done yet; indeed, perhaps none of them are. It would seem as if in color and structure and form Nature had tried every possible combination; but the experiments are going on to-day with undiminished energy, and with the choicest results of the ages. For many were discarded long ago, some for reasons known to us, and more for those known only to herself.

While it is true that the resources of Nature are unlimited, still she may be sadly hampered; the results of the ages may be lost and the onward movement slackened. It took countless centuries to make this continent the land that Columbus found it, and in four hundred years, four trifling centuries, what havoc has been wrought! The tide of destruction rises higher with each succeeding year. To an alarming extent it has swept over the forests, and wherever it passes, the primeval vegetation is known no more.

* Awarded the first prize of twenty-five dollars, competition of 1904, from the Caroline and Olivia Phelps Stokes Fund for the Preservation of Native Plants.

In many localities, wild-flowers that bloomed in the familiar places of our childhood have disappeared from their haunts. The woodland blossoms went with the woodland; the violets and cowslips and Jack-in-the-pulpits died out soon after the wet corner of the meadow was drained; the fair colonies of hepaticas that for generations had flourished on the northern slope of the terrace went down forever before the relentless plough. These are the causes that cannot be controlled. The cutting of the woodland, the draining of the meadow and the cultivation of the upland are necessary and lawful results of advancing civilization. Because then so many of our native plants must necessarily perish, it behooves all who love them to put forth greater energy to stem the tide of needless waste and destruction that in many places is leading to their extinction.

While we welcome every indication of a growing appreciation of flowers among our people, it is with consternation and a tightening of the heart-strings, that the real lover of flowers beholds the victims of the massacre exposed for sale in our city streets.

Those poor little bunches of trailing arbutus! Who does not know them? All the beautiful green leaves cut away, and the poor little upturned blushing faces crowded together! Those of us who have tenderly brushed away the dry brown forest-leaves and found these "babes in the wood" awake and timidly peeping out, catch our breath and hurry by. The dainty little *Mitchella*, the partridge-berry, is by no means infrequently to be found at a flower-stand. The Christmas fern (*Polystichum acrostichoides*) is ruthlessly consumed by the florist; and the same may be said of the southern *Galax* whose beautiful shining leaves surround many a bunch of hothouse violets, a strange and foreign union to those who understand, and one as lacking in artistic feeling as would be a delicate La France rose with its foliage supplanted by sturdy oak leaves.

The gathering of these woodland treasures for the city market is largely the work of Italians who make it their regular business. With no thought beyond the present need, they are a dangerous foe to such plants as have a market value. The trailing arbutus cannot be transplanted with success. Surely it would be a matter of deep regret if, in the years to come, the "Mayflower" that welcomed the Pilgrims should live only in story and song.

This constantly increasing demand for the wild things from the country is one of the hopeful signs of the times. It should be met and met intelligently. A new industry, the raising of wild-flowers on their native soil will certainly arise in the near future. Wild flowers reach their culmination only under favorable conditions of heat and light, soil and water-supply, and some have fallen into the mycorhiza habit and are dependent on certain fungi in the soil. It is almost an impossibility to imitate these conditions and bring them about artificially. Man can do much, but he has yet to prove that he can make as good a sand-dune or peat-bog or pine-forest or birchen-slope as Nature.

With proper care, a patch of trailing arbutus might be made to yield quite a little annual income, and the same may be said of the *Sabbatia*, so familiar to the Plymouth tourist, the cardinal-flower, the fringed gentian, the columbine, the white pond-lily, the sand violets (*Viola pedata*), and some of our more showy native orchids that have a gregarious tendency, such as the pogonia, calopogon, arethusa and the lady's slippers. From one spot in a peat-bog in Michigan, last June, eighteen hundred of the showy lady's slippers (*Cypripedium reginae*) were gathered at one fell swoop. The writer herself was guilty a few summers since of turning a dozen children loose in an acre of pogonias near Bayville on the Maine coast. The little vandals fell upon them and slew them by thousands, and yet seemed to make no impression on the prevailing pink-purple tone of the meadow.

Such places might be made to yield a perpetual income. Transplanting and fostering young plants, distributing the seeds and discretion in harvesting, in a word, aiding instead of thwarting Nature, could not fail in valuable and financial results. Just as large tracts of once worthless land on the Maine coast now yield something like fifteen dollars per acre from the yearly cutting of young fir-trees for the Christmas season, and as many acres of undrained swamp in Michigan are being utilized for the growth and production of peppermint, so might the sand-barren and the peat-bog and even the stagnant pool be made to yield a wealth of flowers with an economic, an educational, and an esthetic value.

The college girl who would gladly return to her country home if only there were some way by which she might make her own spending money for books and magazines and the new wants that are one of the results of college education, might profitably and joyously enter upon this work. It would be difficult to find a more truly educational and benevolent field of usefulness. To send into the heart of a great city real bits of the real country! While it is true that ultimately a great majority of the flowers find their way into the homes of the rich, still the florist's window, like the month of June, "may be had by the poorest comer"; and the crowd pauses and lingers longest about the window where the first spring wild-flowers are displayed.

Also childhood is alike the world over, and while we cannot but deplore a condition where among sixty children in a certain grade of a school in one of the poorest and most crowded districts of New York City, no one child knew *all* of the four common flowers, the violet, clover, buttercup and daisy, still it is equally true that the children of the rich know but little of the charms of the country.

In addition to the market of the florist, there is growing up in our high-schools a demand for material that is in itself a problem. Some of our larger high-schools receive this material literally by the barrel. Unless there be some rational way of supplying this demand, the study of botany according to present laboratory methods will defeat its own purpose, for as now carried on in many places, it is a serious cause of the devastation of some of the most interesting of our native plants. Here again the training and experience of the college girl would be of inestimable value. Her flower-farm might coöperate with high-school work not only in the way of providing material, but of adding descriptions and photographs of the various habitats of the specimens used. When a pupil knows that his columbine was one of a group growing in the crevice of a rock in a certain photograph, it means vastly more than a columbine in the air without anchorage or environment.

Thus far we have considered the question largely from the industrial side, and have suggested means for supplying the reasonable demand for wild-flowers without lessening the number of species or even individuals.

Not till the property-owner realizes that there is a money-value in these things will the slaughter by the lawless collector cease. In France, one must pay to enter certain preserves where the scarlet anemones grow, and then he may gather for himself, and carry away but a limited quantity.

Probably the rarest of our plants have suffered quite as much at the hands of the collecting amateur botanist as in any other way. The old methods of high-school work requiring the preparation of an herbarium by the pupil have been supplanted by field-work which deals with the plant-association rather than the individual. The aim of the old was the recognition of the plant in the field; now simpler methods bring about the same result which has become the means to a higher end. Fortunately in the evolution of the botanist, the doctrine of phylogenesis holds, and the student of to-day passes rapidly through this phase, where, scarce a generation ago, the great majority halted. But all honor to those who by patient labor have made possible for us an easier path to a broader view.

To the ecologist, the student of physiographic botany, a new earth is revealed. Shore and swamp and meadow, upland, ravine and river-bottom take on a new meaning. From the flora of a region, he reads the past and prophesies the future. Because the problem is so mighty, reaching backward into the dim past, and forward into an unknown future, it is with a spirit of reverence and humility that he goes about his work. He treads softly lest he step upon some fragile flower; he stops to replace the vine whose tendrils caught his sleeve. This is Nature's own laboratory, and he looks upon the results of the long, long experiments with wonder and veneration. To break a branch, or pull a flower, or crush a seedling would be sacrilege.

It is in the cultivation of a spirit like this that the beautiful places of earth will be preserved. We must begin with the children. Here is the opportunity of the teacher of nature-study. The new hunting with the camera in place of the gun is already gaining ground; the new herbarium composed of mental pictures should find its way into our schools.

The child who can close his eyes, and describe accurately and vividly a plant and its surroundings, is started in the right direction. Last May, the children of the first primary grade of a school in Chicago were taken thirty miles to see the flowers on the flood-plain of the Des Plaines River. They had in a measure been prepared for this during the winter. It had been a favorite exercise for their nature-teacher to say, "Now we will all close our eyes. I see an elm leaf; can you see it?"

For a moment there would be silence, then a chorus of "I can see it!" "I can see it!" "Mine's notched," "Mine's notched twice," "Mine's one-sided," "Mine is, too"; then over in the corner a little wail — "Where is it? I can't see it anywhere."

"She wasn't here that day we had the elm leaves."

"I can make her one on the blackboard, may I?"

"I'll make a ripe one all dry and brown."

"I'd rather make a nice green, live one."

And it would end in each drawing the thing as he saw it, a present consummation of Kipling's view of a happy future.

There was quite a stock of leaves of various kinds, and even whole trees that could be seen with the eyes closed, but only teacher could see hepaticas and spring-beauties and bloodroots.

So it was a great and momentous day when we set out for River Forest. All had agreed to gather no flowers where it would spoil a picture, and because the teacher knew where the most beautiful pictures were, all were to keep close to her. The first picture was a colony of several families of hepaticas on the side of the terrace leading down into the basin. We noted the open blossoms, the nodding buds, the soft furry covering of the buds and young leaves, and the rich red-purple tones of the old ones. We looked and looked and closed our eyes and looked again. Then we went on to the great host of spring-beauties camping on the plain. Later, we tarried by a mass of purple phlox at the foot of a linden tree. The morning's work consisted in fixing these three pictures and a fourth which was the landscape, the general setting for them all, the old flood-plain with its magnificent elms and white maples then in blossom, the broad blue river on one side, the terrace on the other, and the sunshine over all.

Each then selected a *single flower* to take home as a souvenir and we hurried to the train. The children were perfectly satisfied with their one blossom; the beautiful scene was left unmarred, and to this day those little folks can close their eyes and see their four River Forest pictures. Had they gathered the flowers, their interest would have centered on that, the picture remaining would have been confused, and the final memory that of the faded flowers in their little hot hands. But the flowers that they really brought home are, dare we say, immortal?

In contrast with this, let us for a moment consider the cruel waste that is going on among the mountain flowers in the region of Colorado Springs. On certain days in the week, special trains run "flower-trips" which are largely patronized by tourists. They recklessly pull up and tear up the flowers, and return with great armfuls and basketfuls, and in their ungoverned enthusiasm, they often deck the cars and festoon the engine with them!

Beautiful places like these that are accessible to a great city should in some way be preserved. They might well become a part of the great park-system that in some states has become an important factor. Unfortunately in many of these reservations, no restrictions have been placed on the gathering of herbaceous plants, more than that the roots are not to be disturbed. The trees and shrubs are protected, and woe to him who breaks a twig! But he who plucks the last pink lady's slipper, perchance the last of a thousand generations, goes unchided. This is a sad mistake, for *ten thousand may look at a lady's slipper, but only one can pluck it.*

As a result of this negligence, many of the wild-flowers that were the glory of Middlesex Fells, one of the most beautiful of the reservations in the vicinity of Boston, have disappeared and their places know them no more. So long, however, as the policeman and eternal vigilance are necessary in order to insure protection, the word "negligence" is perhaps too strong a term. The guards at the Botanical Garden in New York may prevent the carrying away of flowers, but it is almost an impossibility to prevent their being gathered in those portions where it is desired to keep the wild and natural state. Signs are posted at short intervals, but not until our people have become educated into the spirit will they also keep the letter of the law.

Like many other evils, then, the final remedy lies in education. We must have more of the spirit of the poet who was content to "gaze upon the wild rose and leave it on its stalk." We may rest assured that he did not pick the "violet by a mossy stone," nor did he venture among the daffodils, those glorious daffodils that have made sunshine for a hundred years. Had he gone stumbling about among them, gathering the finest here and there and treading down their crisp green leaves, he could never have transferred the untouched vision to others.

Finally, the government has power to preserve in a large way the fine formations of this country. Tracts of virgin forest in different sections should be set aside on which Nature may continue her experiments unmolested, tracts that should forever be free from the axe, and so far as possible, protected from fire.

The climax-forests of the United States reach their highest development in the mountains of North Carolina and Tennessee. They are of the beech-maple type, and contain not only the greatest number of species of trees, but also of shrubby undergrowth and herbaceous plants.

On the East Shore of Lake Michigan, there are places where in a half-hour's walk, one may pass through a succession of sand-dunes showing all stages in vegetative development from the desert to the luxuriant forest. Close by the lake are the shifting dunes with never a plant upon them; back of these are the fixed dunes with a sparse vegetation of a xerophytic character; farther inland are dunes where the scrub-pine gives way to the white pine, and the black oak is supplanted by the red and then the white. Each successive dune shows a richer vegetation than the preceding till finally the last of all has become truly mesophytic, and shows a forest of elm and ash and maple with seedlings of the beech just coming in. Here are bloodroots and hepaticas, and even the delicate maidenhair fern, one of the most mesophytic of our native plants. Such a series can teach us more than we now know how to interpret, and once broken, it can never be replaced.

The Everglades of Florida have a most peculiar formation, absolutely without parallel. At the present time, they are being drained and used for the cultivation of pineapples.

Our noble sequoias, the "Big Trees" of the far West, are an endemic species, and more of them should be reserved.

Such characteristic formations as the above and others of equal importance should be preserved, and to this end steps should be taken at once, for changes are so rapid that it will soon be too late. Only by the prompt action of our State Legislatures and National Government will our country be saved from the fate of all countries of older civilization. Lloyd Praeger says in his "Irish Topographical Botany," "It is not easy to conjecture the primeval condition of the fertile portions of this country, before tillage, grazing, and drainage began to play their part. We can conceive great woods and thickets, open park-like land and grassy downs, but the details of the primitive vegetation we may never know."

The question of the preservation of our native plants is a vital one. It concerns all our people from the President of the United States to the little child of the kindergarten. Only by the hearty coöperation of all can the day be saved, and Nature come in to her own again.

MARY PERLE ANDERSON.

BEVERAGES OF VEGETABLE ORIGIN.*

At first thought it may appear a useless refinement to stop and consider the correct meaning of the term "beverage"; but on second thought we note that many substances are drunk under this name for other effects than those of a beverage proper. A beverage may be defined as something drunk for the purpose of satisfying or allaying thirst. Although thirst is specially manifested by dryness and distress of the mouth and throat, the

* Abstract of a lecture delivered at the New York Botanical Garden.

condition, *per se*, is a demand by the entire system for water. Water is therefore the typical beverage, and that sample of water is the most perfect beverage which is the freest from odor or taste, and from any other property than that of supplying the demand of the system for this liquid. Nevertheless, because the local distress of thirst is relieved by many things taken in the water we must extend our definition of beverages to include many modified forms of water.

It is thus both convenient and scientific to divide beverages into the simple and the modified. Simple beverages are those forms of water in which any existing modification is not intentional or desired, the water itself being the only element for which the beverage is drunk.

The slightest possible modification of the simple beverage is that in which some pleasant taste or odor has been imparted to the water. A little greater modification is that in which gum is added, which, by coating the fauces, decreases the amount of evaporation and consequent distress. An illustration is water with oatmeal stirred into it, or in which sassafras leaves have been macerated. An additional step is taken when carbonic acid gas is added to deaden the nerve-endings whose sensations of thirst distress us. A much longer step is that of adding alcohol, which stupefies the nerve-centers, rendering us insensible to the sufferings of our thirst. The stronger forms of alcohol, containing comparatively little water, are thus not beverages at all, but sense-paralyzing or stupefying drugs. Their continued use brings about profound derangements of the nervous system, functional and organic, from which arise a lessened ability to attain to pleasurable states, or even leading to positively painful states. These conditions in turn call for other drugs, intended to produce artificial pleasurable states, or to deaden us still more to our painful ones. These powerful drugs, taken in liquid form, are less often denominated beverages, but sometimes are, with obvious inaccuracy. Tea and coffee may be cited as illustrations of this class.

Considering these classes in order, it is to be noted that the civilized world has little knowledge of the extent to which practically pure drinking water is supplied by plants. In those parts of the world where a supply of drinking water is scanty or uncertain, the inhabitants usually, or at least commonly, know of some plant which accumulates supplies of water which can be pilfered. The coconut usually grows in marine districts, where fresh water is often unobtainable, except from the unripe fruits, which are full of delicious watery liquid, cool even when all around is disagreeably warm. Related palm-fruits are similarly utilized. I have stood on the tidal flats of Venezuela, with no fresh water supply within many miles, and filled a calabash with potable water from palm fruits about as large as goose-eggs. On the upper Madeira, where a great sandy plain provided no streams or springs within easy reach, the hollow stems of the bamboos could furnish water enough even to bathe in, without involving an excessive amount of labor in the collection. A resort to the hollow petioles of the traveller's palm for a supply of drinking water is common in the oriental tropics. Elsewhere, I have severed the woody stem of a tall-climbing bignoniaceous vine and caught potable water, which dripped freely. In the southwestern deserts of the United States, and in Mexico, the Indians commonly secure drinking water by cutting off the tops of the large plants of *Echinocactus*, and beating up the soft and juicy pulp until water can be wrung out of it for drinking. The use of the sap of the sugar maple and that of the Mexican maguey, is very well known. The two last named do, it is true, yield juices which are sweet and more or less flavored, which character introduces the simplest class of modified beverages. This class is best represented by those very juicy fruits which, by the lower animals, and primitive man, are consumed more for their thirst-quenching properties than as edible products. Of such fruits the orange and the watermelon are the best known to us; but in various parts of the tropics there are more striking examples. The caju is almost wholly a sweet acidulous liquid, there being the smallest amount of tissue that can possibly retain this juice. The unfermented juice of grapes and apples is of the same character, though expressed in quantity. Practically the same, though of different origin, is water flavored with fruit juices, fresh, like lemon juice, or in the form of the popular fruit syrups. Our forefathers used cranberries, barberries, sumach-fruits and *Eleagnus*-fruits for this purpose. These strongly acid beverages alleviate the sensation of thirst and excessive heat more than a corresponding quantity of pure water, hence a distinctly new element of beverage is here introduced.

Still another element is introduced when fruit juices containing sugar are allowed to undergo vinous fermentation, as grape-juice fermented into a sparkling wine, like champagne, or apple-juice converted into apple-wine or cider. The carbon-dioxide gas thus resulting deadens the ends of the thirst-nerves, at the same time that the contained water quenches thirst; thus a much smaller amount of the liquid satisfies the thirst than of pure water. Many persons object to the small amount of alcohol which also results from the vinous fermentation, so they artificially carbonate such fruit juices, as flavored waters. Assuming, however, that the fermented juices themselves are used, this brings us to the mildest class of alcoholic beverages, the sparkling class. A very great variety of substances are employed throughout the world, for this purpose. If seeds or grains are used, the product comes under the general head of beers or malt liquors. If juices of fruits, or of plants, are employed, the products are ciders, wines or *chichas*, as the Spanish call them. Almost every sort of grain known to us is employed for malting, besides many seeds of which we know nothing. In tropical America, a much-used beer is made from peanuts. The use, in Lower California, of the seeds of various species of *Salvia*, under the name of *Chia*, for grinding and stirring in water, does not relate to this subject. These seeds are mucilaginous, and water so treated prevents evaporation in the mouth and throat, to some extent.

The number of fruits used for the preparation of wines is too great for record, except in an encyclopediac article. One of the most delicious of such products is made from the fruit of the Brazilian, Assai palm. This is drunk, unfermented, as a lemonade substitute and also as a wine. On the Pacific South American coast, pineapple wine is very highly esteemed. Where plant-juices, instead of fruit-juices are employed, the product is the same, although in this case the source of the alcohol is cane-sugar, in the former, glucoses. Best known of all these, of course, is the fermented juice of the sugar-cane. More famous, perhaps, is the *pulque*, made by fermenting the juice collected from a cavity made by cutting out the bud, or head, of the century-plant when ready to flower. Many hundreds of pounds of this juice is often obtained, within a few weeks, from a single large plant. The liquid, at first clear, becomes curdy from coagulation of the albumen, during fermentation, and the pulque looks somewhat like thin buttermilk. The alcoholic strength of these beers and wines ranges from two or three per cent. up to nearly eighteen per cent., the limit of possible production of alcohol, since at that strength the alcohol kills the organism the activity of which produces it. The systemic effect of alcohol is almost purely a depressing one, though it is commonly called a stimulant. The distinction is however, in most cases, rather theoretical than practical. Most of our functions are presided over by an active agency and by another which is repressant or inhibitory. If the latter is depressed, the effect is to allow the former to act, thus yielding the effect of a stimulant, though not truely such. It is in this way that alcohol appears to stimulate. It depresses the nerves which cause the walls of the superficial arteries to contract, hence the latter enlarge and, engorging the surface vessels with warm blood, make us feel warmer. At the same time, it deadens the nerves which sense heat and cold. In the same way, it deadens the thirst-sensation and, in fact, most of our powers for feeling pain or discomfort. It is thus seductive. Its continued use tends to bring back, with increased emphasis, many of the unpleasant sensations which it temporarily diminishes, so the demand for it becomes more and more imperative. Then the stronger solutions of it become called for, and we distil off the alcohol, with a small part of the water, from the fermented beverages already described, and obtain spirits, of which rum, whiskey, brandy, mescal, arrack, etc., are familiar examples. In these, the alcohol ranges from thirty per cent. to fifty per cent. or even more. Here we see a steady departure from the true character of the beverage, and an approach toward that of the poisonous drugs.

For the most part, alcohol does not engender pleasant states, but only deadens unpleasant ones. It does do the former to a slight extent by depressing the conservative powers of the judgment, and allowing the imagination to roam. The alcohol habitué, however, soon craves a positive effect in the production of artificial pleasurable states. This introduces an entirely new group of nervines, miscalled beverages, in which caffeine is the most commonly occurring and important element. These drugs, with their intense action upon the heart and upon the brain cells, are far more injurious, and even deadly, than alcohol. This statement does not, of course, apply to the use of the weaker infusions of tea or coffee, taken as true beverages, for the sake of the contained water, and with the drug percentage so slight as not to produce more than a mild exhilaration. It does apply to the habitual use of very strong teas and coffees. Caffeine does not destroy cerebral equilibrium, like alcohol, and is, therefore, not really a narcotic. It improves and increases mental vigor, though the exhaustion is correspondingly greater, and increased rest and recreation are called for after the labor is past. As to the sloppy substances sold under the name of "postum," "cereal coffee" etc., they may be ignored entirely. They contain no element of harm and little of good, and it can be only a perverted taste that prefers them to pure water. Besides the well-known tea and coffee, the caffeine-group contains several members of the highest importance in their respective homes. Maté or Paraguay tea is the dried leaf of *Ilex Paraguayensis*, and is used generally as a tea substitute throughout Paraguay and the adjacent region. Those who learn to use it are said almost invariably to prefer it to tea. It contains only one to two per cent. of caffeine, about half the amount existing in tea. Almost throughout the Amazon valley the roasted and crushed seed of *Paullinia Cupana*, related to our horse-chestnut, is used as a substitute for coffee, under the name of *Guarana*. The moistened mass is made into sausage-like rolls. Usually, the grated powder is stirred into cold water, instead of being infused or boiled. *Guarana* contains more caffeine than either tea or coffee (about five per cent.), more in fact than any other known substance. In Africa, the *Cola* seed, related to the chocolate, is generally used by chewing, though beverages are sometimes made from it. It contains about as much caffeine as coffee (one to three per cent.). Chocolate, though it does not actually contain caffeine, contains the closely related substance theobromine, and exerts a mild caffeine-like effect upon the system. Last of this group, I refer to the leaves of the *Ilex Dahoon*, an Atlantic slope shrub, which was formerly largely used by the aborigines both of that region and of the interior, where it was carried in trade. Its percentage of caffeine is very small (about 0.5 per cent.), and it apparently contains other constituents having a pronounced effect upon the system.

Both tea and coffee are represented by various vegetable products used as substitutes in other parts of the world, containing no caffeine, but other substances having more or less active narcotic properties. *Mogdad coffee* is the small seeds of *Cassia occidentalis*. In the East the seeds of *Croton corymbulosus* are said to be used similarly, and the same is true of those of *Gymnocladus* and *Triosteum*. In Canada and elsewhere, the leaves of *Ledum* are used under the name Labrador tea; those of *Ceanothus* have been known as New Jersey tea, and *Solidago odora*, *Trilisa*, *Comptonia* and *Gaultheria* have all been used as tea substitutes.

Finally, we consider a class of so-called beverages, of local use, employed solely for the sake of the nervine effects of their constituents, some of them extremely powerful. Throughout the South Pacific islands the root of *Piper Methysticum*, related to the black pepper plant, is generally used under the name *Kava*. More than half of its weight is starch, hence it is a large alcohol yielder when fermented. But it contains peculiar and little known constituents capable of dulling irritable nerves, and bringing about a most comfortable state of the system. Incidentally, it appears to slightly stimulate pleasant imaginings. Far more active in the latter direction, indeed, more active than any other known substance, is *Cannabis Indica* or *Indian hemp* an extract of which is used in India under the name *Hasheesh* The extent and character of the agreeable visions and sensations experienced by its subject are truly remarkable, and almost exceed belief. But, in accordance with well-known laws of reaction "for every hill there must be a hollow" a correspondingly painful state follows; a period during which death would be a most welcome relief, when imaginary and ill-defined terrors are in control, and when a homicidal mania commonly developes. Among the Indians of the southwestern United States the upper part of the stems of several species of cactus (*Lophophorus*) is used for a somewhat similar purpose. The evidence regarding its effects is inconsistent and it would appear that the different species act quite differently. Perhaps, also, other substances are sometimes added. Several days are usually devoted to the orgy, a large number of persons taking part. The drug is commonly chewed, and the juice swallowed. The result is a condition of pleasant delirium, often lasting many hours, after which there is stupor which may continue one or two days, or even more, and from which, occasionally, the subject never recovers.

We thus see that the vegetable kingdom is capable of supplying every form of beverage, properly and improperly so called, from practically pure water to the most powerfully narcotic, even deadly substances. While the abuse of any of them is reprehensible, the properly controlled use of any is capable of producing very beneficial results, if only in medicinal forms. After all, the development of character is the greatest of all objects, and that character is the strongest and best that is capable of keeping within close and judicious control all the agencies of nature, or of art, which are capable of proper utilization.

HENRY H. RUSBY.

THE PIKE COLLECTION OF ALGAE.

The Garden has recently secured by purchase the algal herbarium of Colonel Nicolas Pike, which constitutes an important addition to the collections of algae now in the possession of this institution. This collection contains a little more than 3,000 specimens after the elimination of a considerable number that are not accompanied by data as to locality. Many of the specimens included in this enumeration are duplicates which, however, will prove valuable in making exchanges.

Colonel Pike, who is now enjoying a hearty old age in New York City, began the collection of marine algae in the earlier years of his long and active life. He supplied many of the specimens on which Professor W. H. Harvey based his classical Nereis Boreali-Americana, the three volumes of which appeared from 1852 to 1858. In dedicating to him the Californian genus *Pikea*, Professor Harvey alludes particularly to his "many contributions of materials to the present volume." Colonel Pike was United States Consul at Oporto, Portugal, for about ten years and afterwards, for an equal length of time (1866–1876) held a similar post in Mauritius. Notable collections of algae were obtained at both these points and his Mauritius gatherings were made the subject of a special paper by Dr. Dickie published in 1874 in volume 14 of the Journal of the Linnean Society of London. The Pike collection as it comes to the Garden is especially rich in Mauritius material. In 1886, Colonel Pike published in the Bulletin of the Torrey Botanical Club a "Check List of Marine Algae, based on specimens collected on the shores of Long Island, from 1839 to 1885." Most of the material which served as a basis for this list is represented in the herbarium now acquired, which is thus likely to prove of much value also in illustrating the local flora.

MARSHALL A. HOWE.

NOTES, NEWS AND COMMENT.

Dr. N. L. Britton, Mrs. Britton and Dr. M. A. Howe, carried out some explorations on the land and marine flora of the eastern coast of Florida with Miami as a base of operations during March and the early part of April. The living and preserved material obtained on this expedition probably contains a number of hitherto undescribed forms and yields many contributions to the geography of this interesting region.

Dr. Arthur Hollick has been granted leave of absence for three months, in order that he may continue work on the fossil flora of the Cretaceous (Island Series) formation in the vicinity of New York, for the United States Geological Survey. Dr. Hollick expects to accomplish considerable field work on Staten Island and Long Island and to add to the collections previously placed in his hands by the Survey for description and publication. In return for the use of library and laboratory facilities, the Garden will receive a valuable set of duplicate specimens representing the Cretaceous flora of Gay Head, Martha's Vineyard. These specimens, together with those personally collected by Dr. Hollick on Staten Island, Long Island and Block Island, will constitute a unique and interesting local collections.

The total precipitation in the Garden for March, 1904, amounted to 3.82 inches. Maximum temperatures of 47.5° on the 3d, 49.5° on the 9th, 51° on the 20th, and 65° on the 26th were recorded; also minima of 11° on the 5th, 18° on the 12th, 16.5° on the 17th, and 22.5° on the 28th.

The temperature of the soil at a depth of six inches (15 cm.), registered by a Hallock thermograph, ranged from 30° on the 4th and 5th to 33° on the 13th, and then stood within a degree of freezing point during the remainder of the month.

Dr. N. L. Britton will give the first lecture in the Spring Course at the Garden, at 4.30 P. M., April 30, in the Lecture Hall of the Museum. The lecture will be upon the "Cacti," and the general form, structure and distribution of this interesting family will be presented by the aid of living specimens and lantern slides. The second lecture in the course will be given May 6, by Dr. D. T. MacDougal, upon the "Vegetation of the Delta of the Colorado River and the Deserts of Baja, California," and will give the results of recent explorations in the regions concerned.

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DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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BOTANICAL EXPLORATIONS IN THE SOUTHWEST.

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

Sir: The following report of recent operations in Texas, Arizona, Sonora and Baja California is presented.

Starting from New York on January 13, 1904, Langtry, Texas, was reached three days later. At this point an examination of the flora of the "sotol" region was made, and a number of living plants secured for the collections. The sotol (*Dasylirion*) occurs very abundantly over an immense area, the geographical characteristics of which have been recently described by Professor Bray, and the area is also characterized by great numbers of lechuguilla (*Agave Lechuguilla*), *Fouquieria*, *Ephedra* and other xerophytic forms of extreme types of desert vegetation. Among other material secured from this place was some rope from the fibers of the leaves of lechuguilla, which is made chiefly by Mexican sheepherders when in need of cordage. This fiber has not made its way into commerce but deserves serious consideration.

Tucson, Arizona, was reached January 16, and in addition to a stay of a week at this time two days were also spent here late in February. During these periods I was in constant consultation with Dr. W. A. Cannon, Resident Investigator of the Desert Botanical Laboratory concerning the various researches being organized by that institution. Although the laboratory has been in existence but a few months yet new methods of research have been devised and highly satisfactory results in two or three problems connected with the development and physiology of desert plants have already been attained. A public lecture to the citizens of Tucson was given under the auspices of the Laboratory, and of the University of Arizona. At the invitation of Mr. J. J. Thornber, Botanist of the Agricultural Experiment Station, selections were made from the nursery of young indigenous plants on the university grounds and from Mr. Thornber's private collection, for shipment, and these have already been installed in the greenhouses increasing materially the already large number of accessions due to the kind coöperation of Mr. Thornber. Arrangements were also made to receive a large set of herbarium specimens from Arizona in exchange.

My plans included the descent of the Rio Colorado from Yuma, Arizona, to the Gulf of California for the purpose of making an examination of the vegetation of the great delta of the river, and of the deserts contiguous in Sonora and Baja California. By agreement with Mr. G. Sykes, civil engineer of Flagstaff, Arizona, he had proceeded to Yuma early in November and begun the construction of a small sloop of a design specially suitable for the work to be carried out. This boat was flat bottomed for floating over the hundred and fifty miles of muddy shallows that lay between us and the gulf, and was furnished with a centerboard to be used in navigating the deeper waters to be encountered there, and was rigged to receive a mainsail and jib.

A complete camping equipment, provisions, instruments and collecting outfit weighing in all about twelve hundred pounds was placed aboard the boat, which thus loaded had a draft of nine to twelve inches, about as deep as could be comfortably taken down the stream at this low stage of the water. The party also included Prof. R. H. Forbes, Director of the Experiment Station at Tucson, and an assistant.

A start was made from Yuma at noon on January 28, and six days were consumed in floating down the river a distance of a hundred miles to the last outpost of settlement, Colonia Lerdo, on the Sonora shore of the river. This slow rate of progress made it possible to go ashore frequently and examine the delta, and in three places the stream cuts directly into the gravelly deserts of Sonora, bringing the vegetation of the lowland and margins immediately in contact with that of the desert, a condition seen previously by the writer in the islands in the harbor at Guaymas.

The alluvial plain of the delta is about as large as the state of Massachusetts and supports a dense growth of mesquite (*Prosopis*), willow (*Salix*) and poplar (*Populus Mexicana*), which at this time were beginning to show the spring awakening. In the upper part of the delta, the newly formed low-lying land supports great plantations of a huge cane (*Phragmites Phragmites*) which in the lower part is replaced by a cattail "tule" (*Typha angustifolia*). A stop of four days was made at Lerdo for the purpose of making observations, rigging the sails and calking the boat. Interesting conditions were encountered along the Santa Clara Slough, which is a flowing salt stream winding its way through a sandy and gravelly desert plain.

In order to make a section of the entire delta Professor Forbes left the party at this point, and having secured horses rode northwestward a distance of eighty miles to the town of Calexico on the international boundary. Mr. E. C. Cushman, who was stationed at Lerdo on a mission to the Cocopa Indians for the Louisiana Purchase expedition joined the expedition and accompanied us to the gulf.

In descending the river the poplars were left behind a short distance below Lerdo, the willows extended some distance further, while below this were great stretches of flood plain bearing salt grass (*Distichlis spicata*), salt bush (*Atriplex*) and mesquite and still nearer the mouth of the river were great stretches of mud flats many miles in extent bearing only salt grass, and laced with a network of salt sloughs. This lower course of the river is subject to strong tidal waves, which sweep great expanses of plain and make navigation dangerous for river craft, and the record of the occasional attempts made to explore this region is a long retail of accident on water and privations on land.

After clearing the mouth of the river our course was laid for San Felipe Bay on the west coast of the gulf at a distance of about fifty miles, which was made without special incident. This bay is an indentation of the shore line with a small volcanic hill at the more abrupt northern end of the curve, giving shelter in all weather except in a southeast wind. Around the base of the hill numbers of hot springs were uncovered at low tide, and the rocks bore a number of species of algae. This bay is noted as the only point in the northern half of the gulf at which a boat may be safely anchored and water found. The water is obtained by digging in a sandy depression, between the dunes of the present beach, and an older one, which has been elevated several

FIG. 13. Flood plain of the delta of Rio Colorado. Range hill in background, 25 miles distant.

feet within comparatively recent geologic time. Here in a shallow pit, four or five feet deep water oozes up at a temperature of 85° F. which is slightly alkaline and salty. So prized is water in this desert however that the existence of this source of supply has been known by tradition among the wandering Indians of the contiguous territory for two centuries.

Immediately back of the beach began the slopes of the mountain deltas which led up gradually to the coastwise ranges at an elevation of 500 or 600 feet. These slopes bore evidences of an extremely low rainfall, and here many desert forms reached their maximum development, among which may be mentioned *Fouquieria splendens* (ocotillo) with its grotesquely crooked branches as much as twenty-five feet in length. *Parosela* here becomes a tree, (see Plate 23) and a belt midway between the mountain and the sea is occupied by the singular "copal quien" (*Veatchia*), while Opuntias and Cereuses of species unlike their northern rela-

FIG. 14. "Copal quien" (*Veatchia* sp.). Near San Felipe Bay.

tives find a foothold in the open intervals. Perhaps the most interesting point upon distribution of this lower plain is the presence of the great tree cactus (*Cereus Pecten-aboriginum*) of southern Sonora which probably finds its northern limit near here. *Pilocereus Schottii* also grows here in extensive groves.

Excursions afoot were made from the camp on the beach and the sloping delta explored for many miles. An outfit for a temporary dry camp was carried back to the foot of the outermost range, from which an ascent was made of a mountain about 4000 feet in height, consisting of disintegrating granite, with some volcanic rock. The loose texture of the rock and the very low relative humidity of the air gave extreme conditions of aridity, and a great variety of desert forms were noted and collected in the course of the ascent. As this mountain had probably not been climbed before, a small monument was erected in which a brass gun cleaner and a pair of spectacles were placed. *Ephedra*,

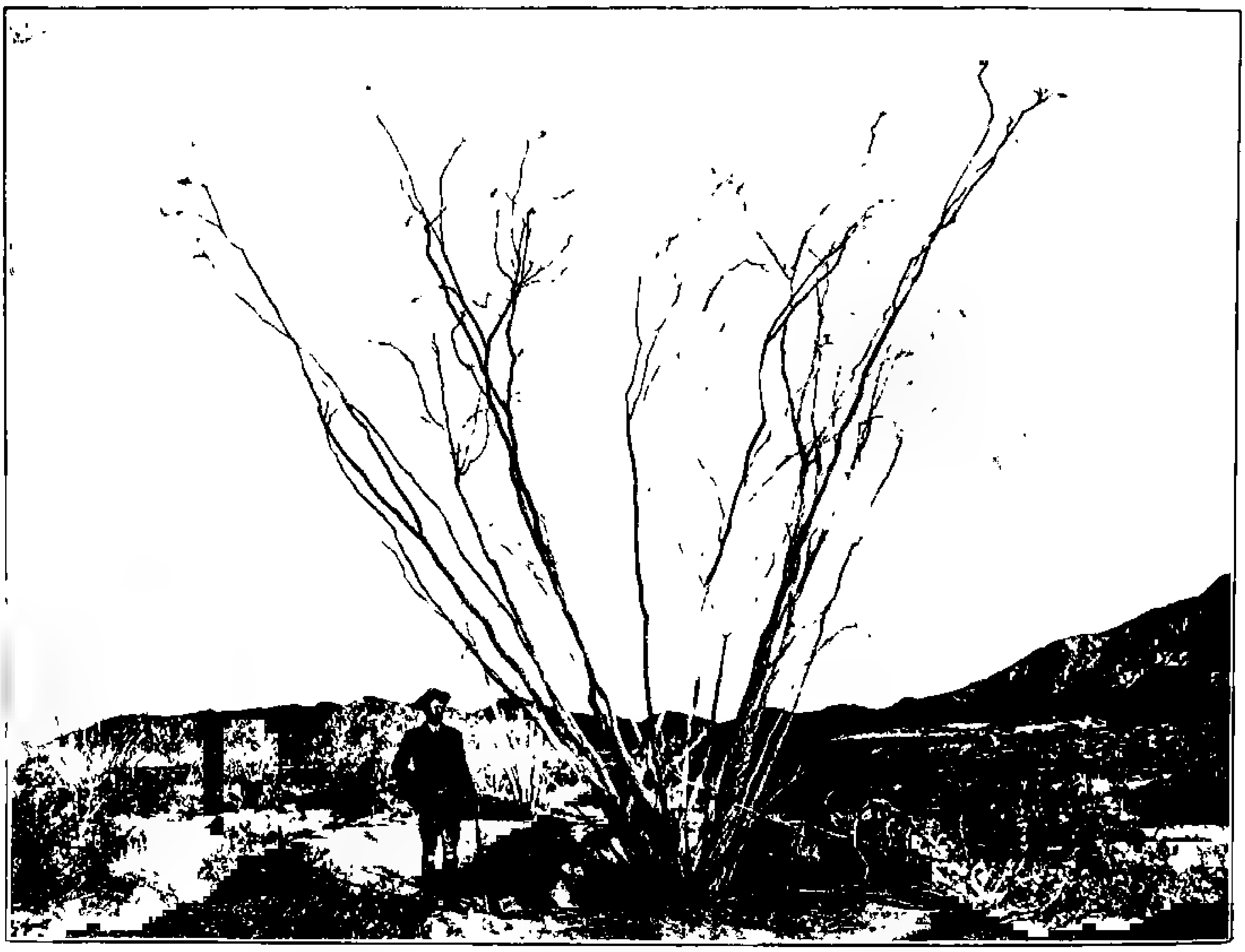

FIG. 15. Ocotillo (*Fouquieria splendens*) near San Felipe Bay, Baja California.

Euphorbia, *Asclepias*, *Opuntia*, and *Mammilaria* were encountered at the lower levels, while standing out on the sky line of the granite ridges were *Agave* and *Yucca*, the dry subtropical climate at the summit being more suitable for these plants than the warmer lower levels. The locality seemed to be characterized by a large number of plants with a latex or milky juice. A number of living specimens were secured at this place and have been safely brought to the Garden.

Starting on the return journey on February 16 we beat up against a northwest wind which finally freshened until we were compelled to land on the following day on a sandy beach fifteen miles north of San Felipe Bay on a lee shore. This maneuver was accompanied by some risk to the collection but was accomplished with only slight damage to the rudder of the boat. Additional collections were made at this place, and good views were had of the crest of the Tablita range, which constitutes the central ridge of the peninsula in the northern part. This range rises gradually from the Pacific shore by an easy slope of twenty-five to thirty miles to the crest finding its culmination in the peak of Calamahue, also known as Santa Catalina and San Pedro Martyr, at a height which has been estimated at over ten thousand feet. On the eastward slope the main range appears to fall away with cliff-like abruptness and to offer a labyrinthine series of minor ridges which occupy the region eastward nearly to the gulf. No passes are known in the Tablita range between its northern end and Agua Dulce a hundred and twenty-five miles to the southward. This region is an actual terra incognita, and no maps or plans are in existence that give any suggestion as to the topography, and it is doubtful whether even the Indian and the Mexican have made the toilsome traverse of its waterless ridges and burning plains. For two centuries this mountainous desert east of the Calamahue has stood as an open challenge to the explorer and the prospector, and the only information to be found on atlases is that obtained by the navigators of the gulf in aligning range marks in the distant peaks, the elevations having been obtained in the same manner. Perhaps no section of the country offers equal interest to the naturalist. A survey of its more prominent vegetative and topographical features might be safely accomplished by means of an expedition carefully organized with reference to the actual conditions to be encountered.

We succeeded in entering the mouth of the river on the 19th and were carried along by wind and tide nearly as far up as the mouth of the Hardy branch of the river. From this point to Colonia Lerdo progress was made chiefly by manning the sweeps and taking a tow-line ashore from the masthead, with which, by tracking, two or three miles an hour might be made. Lerdo was reached on February 22, and at this point the sloop was put in the hands of a small party of Indians to be towed up the river a hundred miles to Yuma, while the outfit and collections were

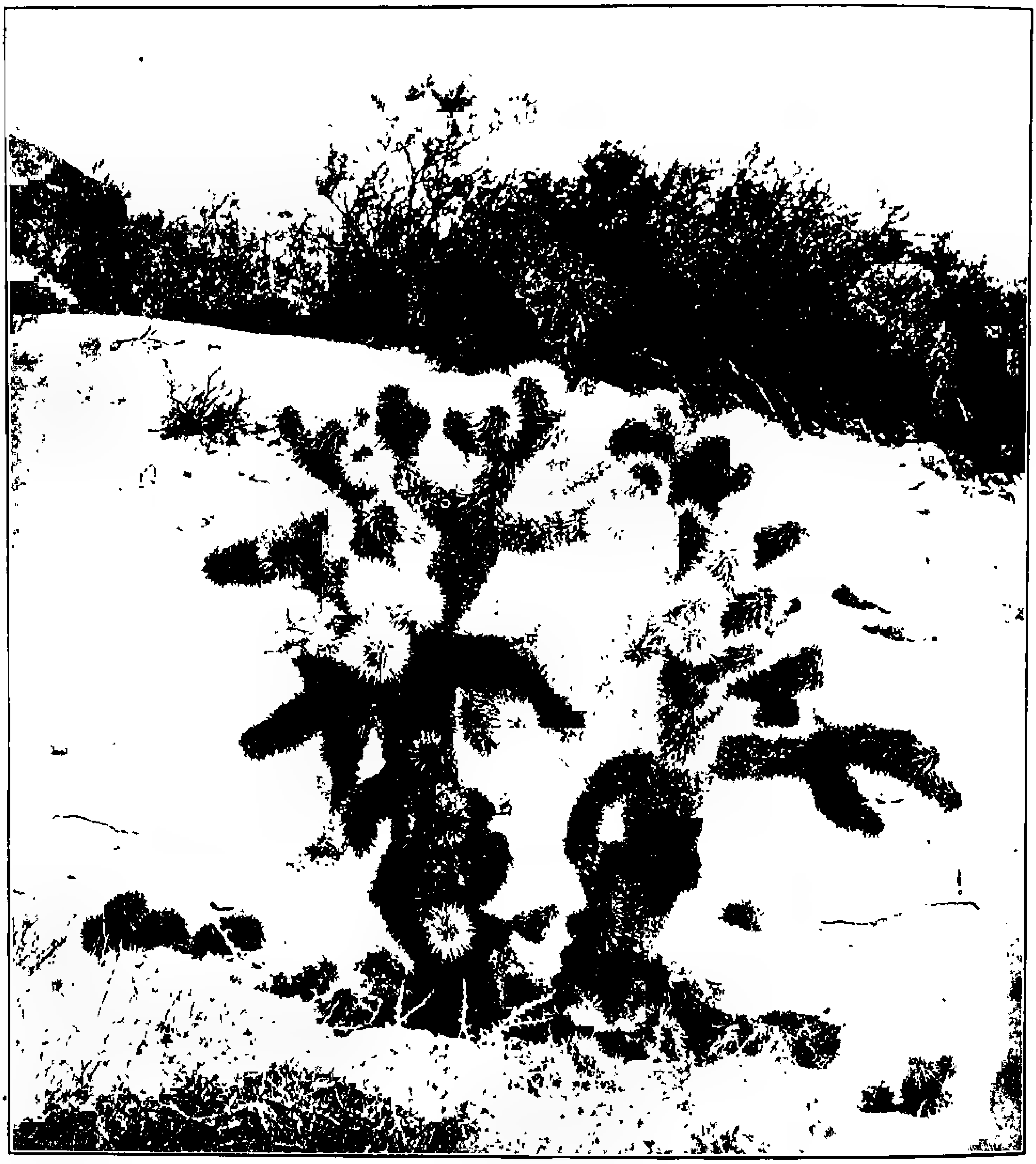

FIG. 16. *Opuntia* sp. with propagating branches on the ground near the base of the plant. *Lycium Torreyi* in background. Near San Felipe Bay, Baja California.

placed in a wagon drawn by four horses and carried to Yuma, the members of the party accomplishing the distance of 72 miles, chiefly afoot, in two days. This gave further opportunity for examination of the great Sonoran coast mesa or plain, which stretches far to the southward. The slight seasonal rise in temperature had started many deeply-rooted herbs and shrubs into

FIG. 17. Arrival of expedition at Colonia Lerdo, Sonora. Towing boat upstream by line to masthead. The farther shore is covered by a dense growth of young trees of *Salix*.

activity and many interesting additions were made to the collections.

During the entire expedition numerous records were made of the temperature and humidity, and the relative humidity of the air, even in the delta, was found to be extremely low. The consideration and presentation of this feature of the work of the expedition will form the subject of a paper now in course of preparation.

Incidentally our acquaintance with the Colorado River brought us face to face with a latent boundary question. The Gadsden Purchase treaty sets the line between Baja California and Arizona, from Andrade's Ranch to Yuma, as "thence up the middle of said river until it intersects," etc. The river really consists of a network of channels in places in which it is difficult to distinguish the main channel, and the stream may shift the chief flowage to another channel within a single season, with the result that large tracts of territory are within the United States one month and a few weeks later may form part of a district of Baja California. It needs but a slight appreciation of the value of the land involved to start a troublesome controversy.

Respectfully submitted,

D. T. MacDougal,

Director of the Laboratories.

THE PROTECTION OF OUR NATIVE PLANTS.*

(A Plea to Teachers.)

Again comes the cry, "Protect our native plants." The strongest economic and aesthetic reasons have been often and convincingly presented, but the need for protection continues. The people who destroy have not been reached. Why, can best be shown, in considering briefly the classes most destructive to our native vegetation.

Few people are willing to make money slowly enough to respect the rights of others now, or those of the next generation. Plants of direct or indirect economic value will need protection as long as there is competition in business; one might add they

* Awarded the second prize of fifteen dollars, competition of 1904, from the Caroline and Olivia Phelps Stokes Fund for the Preservation of Native Plants.

will never receive it until Americans cease to feel that Yankee genius will "find something else when that is gone."

Those who "love flowers" form a class following next in destructiveness. The aesthetic reasons which should appeal to this class fail because the desire for possession follows appreciation so closely. Many a little culprit stammers only, "I wanted it." It is not astonishing that love of the beautiful is so closely connected with crime; they are related as intimately as love and passion. This leads to most ruthless destruction. At Bronx Park last year large piles of flowers might be seen at the exit gates, left there by violators of conspicuous signs. Wholesale devastations may be witnessed by watching the returning crowds at some of the uptown ferries. Masses of fragile blossoms which will never revive are carried over on every boat in the early flowering season. And for what? A gentleman handed his wife a final addition to her floral spoils, saying, "Now you have a bouquet for every window," meaning, not their disposition in the house, but the customary and too hasty mode of exit from it.

As new towns develop we expect to lose many of our woodland treasures. It is one of the prices of civilization, without doubt. Yet need we lose our trees? Ignorant real estate officials are doing more to destroy these than we realize. How many of our new towns located on cleared woodlands are entirely destitute of trees! Often trees *are* planted; two or three years afterward one may see lines of dead trunks, with here and there a lone survivor, usually a foreign poplar, which affords neither shade, fruit, nor yet pleasure to the eye. Along the Hudson river acres of young native trees (not available for timber) have been so destroyed. Here at least ten thousand were destroyed for every one planted.

In this same district fresh air and other charitable societies have unconsciously aided in this destructive work. Hundreds from New York City are sent daily to a small crêche where the ground owned could only with difficulty provide *standing* room for the hordes brought there. The woodlands near by have consequently suffered heavily. Such societies should not transport more people than they can entertain on their own grounds, or more than they can control elsewhere. Guilds and societies for distributing flowers in schools and tenements are also responsible for much damage in this direction. A general appeal sent out in 1902 to the numerous branches near New York and Philadelphia asks for flowers and twigs, but gives no advice or warning about collecting these. The supply is evidently considered inexhaustible. There is no anxiety about future school and tenement children. One pamphlet states persuasively, "from *one* bush or tree the desired forty can be obtained." Would you like forty twigs taken from your lilac bush or forty terminal branches from any of your trees?

Briefly, these are the main factors with which we must cope. Something may be done with the last class mentioned, but the druggist, manufacturer and lumberman feel that they can not afford to listen to us; the real estate agent values graded lots above shaded ones, and will continue to do so as long as the former sell. But most discouraging seems the larger class of the careless, the selfish and the ignorant who will continue to despoil our hedges, meadows and woodlands. Most of them will never see our pamphlets nor hear our lectures. How can we reach them? How can we influence them? A child who lives in a paved, walled street will pick and pull the flowers at last within his reach until he can hold no more. How can we control this?

Answer this with another question. How do we propose to reach, control and elevate the masses brought into our country daily? We shall find our answers identical — through our schools. But we have no right to claim it here unless it be for the highest good of the child. Having shown that, it will not be too much to ask that all educational leaders should lend their aid to preserve the native plants.

The wholesale, ruthless destruction, the intantaneous gratification of desire, the ignoring of other and of future rights have undoubted effects upon the characters of all yielding to them. A bird in the hand is not worth two in the bush. A broken, bedraggled flower, lying limp in the hand, is not worth the sturdy growing one, with its bright, upturned face, at which price it was purchased. How little was gained by its momentary possession may be told by the speed with which the child discards it. Could he be made to feel this and the price of his fleeting sense of satisfaction, the safety of many of our threatened plants would be assured. Children are devoid of the higher appreciation of the beautiful. A little girl from New York looked long into the cup of a dainty, pink orchid, and then asked, "Why did He turn pink, Auntie?." Cannot this finer sense be used to advantage? It will not be difficult as we ignorantly assume. This desired preservation will mean unselfishness and forbearance or self-restraint. What higher individual aim than the first? What greater test of character than the second? Here temptation takes a visible form and the results are no less tangible. What better material is there for the work educators are striving to accomplish? The psychological values of these claims can but appeal to educational leaders and their co-workers. Is it too much to ask for concerted, definite action, leading ultimately to the development of the high, noble character described by Emerson when he wrote the following lines on forbearance:

> Hast thou named all the birds without a gun?
> Loved the wood-rose and left it on its stalk?
> At rich men's tables eaten bread and pulse?
> Unarmed, faced danger with a heart of trust?
> And loved so well a high behavior
> In man or maid, that thou from speech refrained,
> Nobility more nobly to repay?
> O' be my friend and teach me to be thine.

JEAN BROADHURST.

STATE NORMAL SCHOOL, TRENTON, N. J.

RECEPTION DAYS AND LECTURES.

The Director-in-Chief and other members of the staff will be pleased to receive members and their friends at the gardens at Bronx Park on every Saturday in April, May and June.

Train leaves Grand Central Station, Harlem Division, N. Y. C. R. R., at 2:35 P. M., for Bronx Park. Returning trains leave Bronx Park at 5:32 P. M. Excursion fare 25 cents.

Opportunity will be given for inspection of the museum, laboratories, library and herbarium, the public conservatories, the herbaceous collection, the hemlock forest, and parts of the arboretum. The walk planned will be a little over a mile.

The spring course of lectures will be delivered in the lecture hall, Museum of the Garden, on Saturday afternoons as follows :

April 30, "Japan, the Land of Lacquer and Bamboo," by Dr. C. F. Millspaugh.

May 7, "The Form, Habits and Relationships of the Cactuses," by Dr. N. L. Britton.

May 14, "The Vegetation of the Delta of the Colorado River, and of Baja California," by Dr. D. T. MacDougal.

May 21, "Explorations for Fossil Plants on the Yukon River, Alaska," by Dr. Arthur Hollick.

May 28, "Arctic and Alpine Plants," by Professor F. E. Lloyd.

June 4, "Carnivorous Plants," by Professor H. M. Richards.

The lectures will be illustrated by lantern slides and otherwise. They will close in time for auditors to take the 5:32 train from the Bronx Park railway station, arriving at Grand Central Station at 6:02 P. M.

The Museum Building is reached by Harlem Division, New York Central and Hudson River Railroad to Bronx Park Station, by trolley cars to Bedford Park, or by Elevated Railway to the Garden.

NOTES, NEWS AND COMMENT.

Dr. N. L. Britton and Dr. D. T. MacDougal have been appointed associates in botany to the Station for Experimental Evolution of the Carnegie Institution at Cold Spring Harbor, Long Island.

Professor Hugo de Vries, Director of the Botanical Garden at Amsterdam, Holland, is expected to be at the New York Botanical Garden during the second week of June for the purpose of making an examination of the experimental cultures being made to test the mutation theory of the origin of species.

Dr. Britton, Mrs. Britton, and Dr. M. A. Howe have returned from making a series of explorations out from Miami, Florida, to the Everglades, and from Nassau, New Providence, to the northern islands of the Bahamas. Dr. C. F. Millspaugh, of the Field Columbian Museum, Chicago, participated in some of this work and returned to the Garden in the latter part of April for the purpose of consulting the collections. Dr. Millspaugh also gave the opening lecture of the spring course on "Japan, the Land of Lacquer and Bamboo."

The total precipitation in the Garden during April, 1904, amounted to 5 inches. Maximum temperatures of 57° on the 2d, 65° on the 7th, and 75° on the 25th were observed; also minima of 29° on the 5th, 26° on the 17th, 24° on the 19th, and 42° on the 28th.

The fifth annual meeting of the Horticultural Society of New York will be held in the New York Botanical Garden, Wednesday, May 11. An exhibition of cut flowers, plants, ferns, succulents, orchids and vegetables will be held in the exhibition hall adjoining the lecture room in the Museum.

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BRONX PARK, NEW YORK CITY

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JOURNAL

OF

The New York Botanical Garden

EDITOR

DANIEL TREMBLY MACDOUGAL

Assistant Director

CONTENTS

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JOURNAL

OF

The New York Botanical Garden

VOL. V. June, 1904. No. 54.

PROFESSOR EARLE'S NEW POSITION.

The following letters record the beginning of a very important work in the development of tropical American horticulture and agriculture and are self-explanatory :

NEW YORK, April 29, 1904.

DR. N. L. BRITTON,

Director-in-chief, New York Botanical Garden.

My Dear Dr. Britton: Having as you know accepted the position of Director of the recently established Cuban Experiment Station, I must now formally resign as Assistant Curator of the Botanical Garden. Although my new position is so attractive that I could not do otherwise than accept it, I still feel real regret at severing my connection with the Botanical Garden. My stay there has been exceedingly pleasant and I feel that it has been exceedingly profitable as well. I appreciate the opportunities for study offered by the Garden so highly that I shall hope to be able to return for short periods from time to time in order to complete some of the work begun while officially connected with it. In closing allow me to thank you for the very considerate treatment I have uniformly received from you and to offer my heartiest coöperation in my new position with your work on the West Indian flora.

With best wishes for the Garden and for yourself, I remain,

Yours truly,

(signed) F. S. EARLE.

May 13, 1904.

PROFESSOR F. S. EARLE,
Agricultural Experiment Station,
Santiago de las Vegas,
Cuba.

My Dear Professor Earle: Your letter of April 29, in which you tender your resignation as an Assistant Curator of the Garden was duly received, and I submitted it at a meeting of the Board of Managers held May 12.

I was instructed by the Board to accept the resignation, and to express to you their high appreciation of the services which you have rendered the Garden during the time you have been officially connected with it, and also for the kind coöperation which you proffer in our studies of the West Indian flora. The Board further instructed me to express to you their best wishes for your success in the new and important position to which you have been called.

Yours very sincerely,
(signed) N. L. BRITTON,
Director-in-Chief.

May 27, 1904.

PROFESSOR F. S. EARLE,
Santiago de las Vegas,
Province of Havana, Cuba.

Dear Professor Earle: At a meeting of the Scientific Directors of the New York Botanical Garden held May 23, 1904, the following preamble and resolutions were adopted. The Secretary was instructed to forward them to you. I, therefore, have much pleasure in herewith complying with the instructions of the Board.

Very truly yours,
(signed) J. F. KEMP,
Secretary.

May 27, 1904.

WHEREAS: Professor F. S. Earle, who has served the New York Botanical Garden for a period of three years as an Assistant Curator of the Museums with especial reference to the care and study of the collections of fungi, which through his work have notably increased in value and importance, has resigned this position to accept that of Director of Agricultural Experiment Stations of the Republic of Cuba; and

WHEREAS: The scientific and economic results of Professor Earle's investigations upon fungi, as evidenced by his published papers, have contributed much to mycology and to its bearings upon horticulture and agriculture.

Resolved: That the Scientific Directors of the New York Botanical Garden hereby indicate their recognition of the contributions made by Professor Earle to science; and their hope and belief that his guidance of the modern development of agriculture and horticulture in the Republic of Cuba will be the means of adding wealth and happiness to its citizens and of contributing most important facts and conclusions to the knowledge of mankind; and

Resolved: That the facilities of the Garden for supplementing his investigations be and they are hereby tendered to Professor Earle, in the hope that he may be able to take advantage of them as opportunity offers; and

Resolved: That the proffered coöperation of Professor Earle in studies upon the West Indian Flora carried on by the New York Botanical Garden is gratefully accepted, and that the Director-in-Chief is hereby authorized to supply Professor Earle with such duplicate books and specimens as in his judgment may be useful in the equipment of the Cuban agricultural experiment stations.

BOTANICAL LABORATORIES IN ENGLAND AND AMERICA.

Perhaps no comment yet made upon the attitude toward scientific research in general, and upon the comparative botanical activity displayed, in England and America is more pertinent and interesting than that in a recent editorial article on "Laboratories for Botanical Research" published in *Nature* for April 7, 1904 (**69**: 538–539, 1904, London), which is quoted in full below.

"The publicity given to the opening ceremonials of the new science laboratories at Cambridge by the King and Queen on March 1 will, it may be hoped, do something to rouse those who are responsible for the welfare of the nation to a wider sense of their duties. The time has surely passed when the remarks of a well-known prelate and of a Prime Minister to the effect that they were born in a pre-scientific era could be received, if not with overt applause, at least with sneaking sympathy.

"Sluggish as we are, some progress has been made. Up to the middle of the last century, and for some time after, there was scarcely a botanical laboratory properly so-called in the whole country. Now we have the Jodrell laboratory at Kew, a very modest institution when compared to the necessities of the case or to the excellent equipment of other departments of this great national establishment. The Jodrell laboratory is not intended for instructional purposes, but chiefly for study and research, and much good work has been done there.

"At Cambridge, Edinburgh, Glasgow, Dublin, at University College, London, the Royal College of Science, and in many other universities, agricultural colleges and technical institutes, there are now more or less well equipped laboratories under competent direction. But these are mainly for the instruction of students. Research laboratories are still rare, and those willing and competent to utilize them are also few in number. This condition of affairs is largely due to the indifference and lack of encouragement on the part of those who ought to know better. The *cui bono* question is ever in their minds, and much too frequently on their lips. Abstract science does not appeal to their sympathies, or to their intelligence, unless some immediate practical result at once comes into view. When that happens, the commercial instinct may perchance be aroused, and they begin to ask, will it pay? Of course, no reader of this journal is likely to undervalue abstract science, and most of them are well aware of the enormous value of the practical results that may and do result from it. But even such persons must have been startled to find how the observations of Bower and others on the minute anatomy of the prothallus and spore-producing tissues of ferns, observations which might have been thought to be too abstruse and recondite to be of any practical value whatever, have directly led up to the extremely important researches of Farmer and his associates into the essential nature of cancer!

"Satisfactory as this undoubtedly is, we have only to look across the Channel to see how puny — numerically and financially speaking — are our efforts to promote original research. Our cousins across the Atlantic, a practical people if ever there was one, are even more energetic. Does a 'freeze' destroy or seriously injure the oranges of Florida, what matter? In a very short time a man of science and a man of resource is on the spot. He looks for and finds a hardy stock whereon to graft the tender scion, he puts the resources of hybridization to the test in the endeavor to procure hardy seedlings. All this is done at once by state or government agency. Here, if anything were tried in a parallel case, it would be with great deliberation and with little or no encouragement or support.

"Those familiar with what is done to promote research in the universities and colleges of the United States, as at New York, Chicago, Philadelphia, and in California, not to mention the older foundations of Harvard and Yale, must feel almost aghast at the progress that is being made, and at our own backwardness. In the Gardeners' Chronicle for January 30 is an article contributed by a well-known professor familiar with what is being done here as well as there. In that article he gives details as to the astonishing activity manifested in the American universities, mainly by the aid of funds provided by private individuals. We too have reason to know and appreciate what is done by the Government Agricultural Department, and by the very numerous experimental stations scattered all over the wide territories of the United States.

"As we write, there come to us a report of the establishment, under the auspices of the Carnegie Institution, of a 'Desert Botanical Laboratory, the purpose of such establishment being to study thoroughly the relation of plants to an arid climate and to substrata of unusual composition.' A laboratory has accordingly been erected near Tucson, in Arizona, under the management of Dr. W. A. Cannon, of the New York Botanical Garden, who has been appointed resident investigator in charge of the laboratory. What may be described as a sort of preliminary report has been drawn up by Mr. Coville and Dr. MacDougal, and a very interesting and copiously illustrated report it is.

"As some of our readers may care to see this publication we may add that it is issued by the Carnegie Institution of Washington, U. S. A. (publication No. 6).

"Vast as is their territory, and numerous as are their experimental stations and like institutions, our cousins are not yet satisfied. They have invaded British territory, in a most genial and friendly manner it is true, but still they have annexed, with our consent, a portion of the island of Jamaica, and there they have established, at 'Cinchona,' a botanical laboratory and research station open to the students of all countries. The direction is in the hands of Dr. Britton, of the New York Botanical Garden, in coöperation with Mr. Fawcett, the Director of Public Gardens and Plantations in the island. The policy of the 'open door' pursued by the Americans in these matters prevents us from doing anything but acquiesce in their proceedings. But why what should have been a plain duty for us should have been allowed to be undertaken by others is a mystery.

"We do not question the utility of ironclads and cruisers as protectors of our commerce, but it is obvious to those who are watching the proceedings of our neighbors and of our rivals that if we do not largely extend our scientific training and induce our wealthy citizens to follow the example of their American brethren in endowing science, the necessity for protection will vanish, and that not slowly."

PROTECTION OF THE WILD FLOWERS.*

Efficient protection of the wild flowers will be best accomplished, and most fully accomplished, when every lover of nature adds his mite of effort to the gracious task, demonstrating a widespread interest in the subject.

* Awarded the third prize of ten dollars, competition of 1904, from the Caroline and Olivia Phelps Stokes Fund for the Preservation of Native Plants.

The fields of endeavor must be as broad as the wildwoods that the Wild Flower Preservation Society of America would protect, and the methods of protection as numerous as the plants the society would preserve, and yet but one plan presents itself to me as preëminently important.

Enlist the services of the school teachers as the most serviceable of allies and through them reach the children with whom the future of the wild flowers rests in far greater degree than with their elders.

My school days were over long before the school teachers of New York were expected to convert each member of a most cosmopolitan class into botanist and geologist, artist and artizan, nature student and linguist, regardless of previous condition, nationality or temperament.

Consequently, my first introduction to botany was through the kindly offices of a young country school teacher, at an age considerably past the schoolboy period, when I could best appreciate real beauty of face and form and mind.

Let me confess she possessed all three to a marked degree. This I distinctly remember, but all that remains to me of her botanical instruction is the recollection that I armed her with a razor to aid in her researches afield on her return to her country charges.

Even then I loved the wild flowers too well to enjoy dissecting them and with the additional disadvantages of the teacher's absence, multiple regrets totally foreign to botany, and the impression that the delightful study was mainly based on the destruction of all things rare and beautiful to be studied, is it strange that botanical knowledge halted with me there?

I have since learned much on lines less destructive, and to me, far pleasanter. So would say, beyond all things urge the teachers to relegate the dissecting knife to the realms of tools of last resort, and their use to a period when the maturer mind of the pupil would lead him ever to preserve rather than destroy.

Of the necessity of the knife in the identification of a strange or puzzling fruit or flower I am fully aware; but placed in the hand of a child what surer guide could be afforded to the manifold habits of destructiveness afield that real lovers of the flowers so much deplore and the society is fighting so hard to overcome?

Magnitude and quantity, distinctive features of the age and typical to a degree of New York conditions, makes the work of the economist in any line especially difficult. In no department is this more true than along the lines of the self-imposed task of those who are urging saving ways in the enjoyment of the wild flowers.

Nature studies in the schools, where the classes average anywhere between forty and sixty pupils each, and the modern school house is a goodly town of from one to three thousand rising young citizens including their future wives and sweethearts, demand such quantities of living greenery and blossoms as cannot fail to impress the individual with the boundless prodigality of nature, rather than with the power of man to overcome even nature's bounteousness by his careless destructiveness.

Urge the teachers then to impress the scholar with the fact that every leaf and twig and blossom is far more beautiful in its native wild that he can possibly make it on paper, and is likely to have if not positively known to have, numbers of utilitarian purposes other than its needful subservience at times, to educational ones.

Above all urge the teachers to impress upon youthful minds the rare merit of unselfishness in their rambles through the wilds. If a favorite flower, and children early learn to know their favorite blossoms, is found blooming alone, teach the child the merit of leaving the dainty little recluse to fulfil the law of its being and multiply its kind; and no one will be more delighted than the child who, later on, discovers that the fragile little waif has succeeded, thanks to the lesson of human self restraint, and is no longer a lonely dweller among alien blooms.

If the favorite blooms are of more sturdy, prolific habit, teach the child the true kindness of leaving some of even the best beloved blossoms for the delight of later comers who may love them still more dearly. And last, but perhaps most valuable of the lessons afield, teach the children to know and love the flowers which can best withstand indiscriminate plucking and will best repay the task of carrying to city homes; for no lover of flowers, and least of all those who are striving to protect them, wishes to limit the delights of woodland rambles but rather to enhance them in all ways possible, and the most direct way is through the gateway of knowledge.

They would have all who best enjoy God's gracious gifts of sunny plain and wooded hill, of sylvan dales and laughing streams, know the flowers as they know the faces of their dearest friends. Then will the daintiest plants and blossoms which languish and refuse to be comforted amid alien surroundings, be enjoyed to the utmost in their native haunts while their sturdier brethren will be sought for with all the more eagerness for home decoration.

The ever graceful daisy ranks high among these latter flowers and so sturdy is it that the farmer would rise up and call him blessed who could eradicate it from his fields, while the army of those who love the star-like beauty of its golden-hearted, silver-rayed blossoms may rest content in the knowledge of its indestructible vigor.

And what more dainty than the violet of wayside and meadow, or more pregnant with the poetry of spring and the charm of the annual resurrection which few of us are yet so self-absorbed, or so case-hardened, by even the driving life of the greater cities, as to be totally oblivious to.

There are many others as beautiful as they are sturdy; but all this is merely suggestive and these are mentioned simply because they are so well known, and are so typical of such of the wild dwellers of wood and plain as can best withstand the demand for home decoration, and the almost instinctive and much cultivated desire to possess.

Home decoration is included in the lessons of the schoolroom; and the trend of thought on floral lines might well be directed towards the hybrids to the lasting benefit of their wild sisters. Man-made to a degree, and in many instances deprived of the power of reproducing their kind, a power which brings their wilder sisterhood thus much nearer their Creator, the creations of the horticulturist's art are in far nearer keeping with the artificial surroundings of the ball room, or the often but little less hybrid conditions of many city homes, than the wild flowers could possibly be.

Older pupils might be taught the utter incongruity of associating the dying glories of the woodlands' most delicate plants with the budding hopes and aspirations which should prevail in every feature of a wedding celebration. And this is no imaginary danger to the wild flowers, but, on the contrary, is a recent and rapidly-growing menace ; wild plants, and the daintiest of their kind, having been a marked, and, in some instances, an exclusive feature of the decorations at several recent weddings.

Of the pleasures of the cultivation of flowers as against the delights of merely picking them, only to watch their more or less rapid decay, there is but little to be suggested to the teachers, because already they are doing all in their power, as far as the limited facilities of class-rooms will permit, to cultivate a taste for living plants, while their endeavors in that direction have led to the suggestion of roof gardens or possibly a conservatory as additions to modern school buildings, to relieve the teachers of the trials and disappointments peculiar to window-gardening under most adverse conditions.

Now a word or two as to some of the conditions which confront New York members of the society in their endeavors to preserve the wild flowers. Difficulties increase with the increasing love of the children for flowers of every kind and quality and with their insatiate longing for them ; a longing which there are few opportunities of gratifying in a large city which is rapidly devouring the suburbs in its speedy growth.

This longing finds expression in frequent demands for "just one flower" made on any and everyone who carries a handful of blossoms through the city streets. A bouquet of bushel-basket dimensions would not outlast a half-mile walk if an attempt was made to satisfy this craving by the gift of a single blossom to every child that asks for one.

Is it strange, then, that every stretch of wild accessible to such flower-starved children should be denuded of every bit of bloom in a twinkling, or more singular that whole handfuls of such indiscriminately-plucked blossoms are almost as quickly discarded, because they incontinently wilt and die almost before they can be carried from the cool recesses of their native woods?

The parks, valuable as they are as breathing places, only partially satisfy this flower hunger, because in them the child may admire but must not pick, nor even handle, bud or blossom, leaf or fruit; almost as great a restriction as the glass windows of the florists' shops in the heart of the great city, through which they peer longingly at the fragrant treasures so far beyond their reach.

The larger and wilder parks in the northern suburbs, and notably the New York Botanical Garden preserve in Bronx Park, where the wild flowers are treasured beyond the showiest of hybrids, have felt the destructive effects of this craving for flowers to a marked degree. Warning signs are displayed, but have little effect, and the predominating excuse of older offenders: "I didn't think it any harm to pick a few wild flowers," gives but little promise of greater discretion on the part of children.

It must be confessed that the Director-in-Chief of the Botanical Garden has thus far not had the heart to attempt to enforce punishment upon the youthful offenders for satisfying a heart hunger so apparent. I certainly can offer no suggestion as to its cure although to even remedy it would be to accomplish much in the preservation of the wild flowers. I only know that it would require a fortune in a city of a million and a half of inhabitants, and executive ability of rare character to satisfy it.

Again I have only told of conditions in the hope that others may be able to suggest means to meet the evils. The most effectual way to discourage traffic in wild flowers and plants lies in the refusal of their friends to purchase them; but this was long since recognized and is being urged at every opportunity.

In conclusion let me suggest that if ever the time recurs when the now over-filled hours of the New York school teacher admit of leisure for those semi-social chats with the scholars which once gave opportunity for the inculcation of much valuable knowledge not mentioned in the curriculum, it might aid the cause of the wild flowers materially to tell the scholars of the widespread good accomplished by judicious use of the income of the Phelps Stokes fund.

The fund is a sum of $3,000 donated by Caroline and Olivia Phelps Stokes, on condition that the income of it be always devoted to the preservation of native plants. Much good has been accomplished in disseminating able essays paid for from the income of the fund, in giving wide currency to literature of like character, and by a course of equally able lectures in many cities, the expenses of which work were also paid for out of the fund income.

What more likely than that from the ranks of the merchant princes, the soldiers, sailors, and more humble toilers, or the few multi-millionaires now developing among the pupils some will in time swell the fund for the preservation of native plants.

This is certainly of most vital importance to the movement for in these days of strenuous endeavor all projects of importance must indeed be wafted toward the goal on golden wings to attain any very marked success. G. GORDON COPP.

THE SPECIAL FUND FOR SCIENTIFIC PURPOSES.

Subscriptions to a fund of not less than $10,000, for obtaining living plants, museum and herbarium specimens, and books for the library were authorized by the Board of Managers on October 4, 1902. This sum has now been obtained by the following contributions, and applied as indicated in the following tabulation :

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Fritz Achelis	98.55	$686.55
		$10,070.00

By means of the contributions made for the purchase of specimens for the museums and herbarium, the following noteworthy additions were made to the collections:

1. The herbarium of fungi formed by Professor F. S. Earle before he was appointed an Assistant Curator at the Garden.

2. The unique fern herbarium accumulated by the late Mr. Jenman in the West Indies and northern South America.

3. The extensive collections brought together by Mr. R. S. Williams in the Yukon Territory and in Montana.

4. An important collection of fossil plants from the Dakota group of Kansas, collected by Mr. Chas. H. Sternberg.

5. The herbarium of algæ formed by Col. Nicolas Pike.

6. Numerous smaller series of specimens purchased from various collectors.

The expenditure of the money applied to the purchase of books has resulted in the addition to the library of 1,123 volumes, many of them rare and expensive works, which our ordinary income would not have permitted us to secure.

By the aid of subscriptions used in exploration, important collections of living plants, seeds, and museum and herbarium specimens have been obtained as follows:

1. By Professor L. M. Underwood, who brought the most complete collection of ferns ever made in the island of Jamaica and in eastern Cuba.

2. By Professor F. S. Earle, who joined Professor Underwood in eastern Cuba and brought out a large general collection, the exploration being specially directed to the investigation of Cuban fungi.

3. By Dr. N. L. Britton in his exploration of central Cuba in the spring of 1903.

4. By Professor Francis E. Lloyd, who explored the island of Dominica, in the Windward Islands, and made an important general collection.

5. By Dr. Marshall A. Howe, who spent May and June of 1903 in investigating the algal flora of the island of Porto Rico.

6. By Dr. D. T. MacDougal, who collected many living plants, and obtained by exchange an important series of herbarium specimens in the island of Jamaica.

7. By Mr. George V. Nash, who brought one of the most important collections yet made from the island of Hayti.

8. The commencement of the exploration of the Philippine Archipelago, by Mr. R. S. Williams, who is still in that field, and has recently shipped large collections to the Garden.

9. By Dr. N. L. Britton, in his continuation of the exploration of Cuba during the autumn of 1903.

10. By Dr. D. T. MacDougal, during his exploration of the valley of the Lower Colorado river, and the shores of the Gulf of California, by means of which many interesting living plants and herbarium specimens were obtained.

11. The exploration of southern Florida and the Bahama Islands by Dr. N. L. Britton and Dr. M. A. Howe in the spring of 1904, during which many specimens illustrating additions to the flora of the continent were obtained.

The expenditure of money for the direct purchase of living plants has added much to the collections, both in the conservatories and out of doors.

The fund has been made up by the contributions of 150 different persons.

FIFTH ANNUAL MEETING OF THE HORTICULTURAL SOCIETY OF NEW YORK.*

The Horticultural Society of New York held its fifth annual meeting in the New York Botanical Gardens on May 11 and 12. The lecture was given by J. Horace MacFarland, who spoke on "Common Trees and Their Uncommon Flowers," illustrating his remarks by a magnificent series of lantern slides, showing the unfolding of the flowers of our more common native trees.

At the annual meeting of the Society the old panel of officers and directors was reëlected with one exception. The council in its report showed the membership well sustained and the invested funds increased. The Society has nearly $1,500 invested. Siebrecht & Son, New Rochelle, N. Y., made a wonderfully fine display in nearly all the leading plant classes and showed a great variety of well-grown specimens. Groups of crotons, palms and other foliage plants, foliage and flowering plants, orchids, ferns, from this firm formed the mainstay of the exhibition. In the cut flower classes these same exhibitors had a vase of Liberty roses which attracted considerable attention on account of the peculiar coloring, which may be described as approaching somewhat to the American beauty tint. They were well-grown flowers on long stems. Killarney was exhibited in good form; this rose is surely gaining recognition as a popular pink and will become a greater favorite as it is better known. The shade of the flower and the shape of the bud are strongly in its favor. Lovers of the rex begonia had plenty of specimens to feast on and a special certificate was awarded for a collection of new seedlings as well as for the Killarney rose.

Scott's form of the Boston fern was seen in a group of plants in all sizes and demonstrated its utility as a commercial decorative plant. Its more compact habit as compared with the type makes it really serviceable for house or piazza decoration and gives it an appearance of growing vigor that is very pleasing.

The yellow calla (*Elliottiana*) came from C. J. Roebling, Trenton, N. J. (H. T. Clinkaberry, gardener). J. H. Troy, New

* Adapted from "American Gardening," 25: No. 484, pp. 322. May 14, 1904.

Rochelle, exhibited the Dorothy Perkins rose for the first time, we believe, in New York. This is of the rambler type, producing freely large clusters of very double bright pink flowers, and looks as though it would be an attractive plant for Easter forcing as well as for outdoor planting on terraces, piazzas, etc. Collections of succulent plants filled a large space, collections coming from F. Weinberg and G. Padrock, both of Woodside, L. I. A new feature in the schedule this year was the collection of cut flowers of greenhouse or stove plants. Siebrecht & Son made the only entry, showing about thirty kinds, many of which are too rarely seen nowadays in general collections.

The usual prize of $50 for the best novelty was awarded to F. R. Pierson Company, Tarrytown, N. Y., for a remarkably heavily crested form of the Boston fern. This is a sport from *Piersoni* and the frond has exactly the same appearance from the front and from the rear. It is an interesting variation and time will tell what are its merits as a decorative fern. Collections of wild flowers filled one side of the hall, the Bedford Agassiz Association exhibiting a remarkably comprehensive collection. Vegetables were shown by two exhibitors, the prizes going to James Green and F. Weinberg in the order named.

NOTES, NEWS AND COMMENT.

At a recent meeting of the Board of Managers, Dr. D. T. MacDougal was advanced from the position of Director of the Laboratories to that of Assistant Director of the New York Botanical Garden.

Dr. W. A. Murrill, who has carried on extensive investigations upon the fungi at the Garden during the last four years has been appointed Assistant Curator in charge of the fungi to take the place of Prof. F. S. Earle, who recently resigned to take the position of Director of the Estacion Agronomica of Cuba.

Mr. Percy Wilson, Administrative Assistant in the Garden, has resigned to accept the position of assistant botanist of the Estacion Agronomica of Cuba. Mr. W. T. Horne, who holds a fellowship in botany at Columbia University, has been appointed assistant pathologist in the same institution.

Dr. Marshall A. Howe, Assistant Curator, has been given leave of absence and sailed for England on June 4th. He will spend the summer in examination of the collections of algae in the herbaria of Kew Gardens, The British Museum, The Museum of Natural History of Paris, and of other institutions.

Professor H. H. Rusby, of the Board of Managers, will carry on his studies of the flora of South America at Kew Gardens and at the British Museum during June, July, and August.

The total precipitation in the Garden during May, 1904, amounted to 4.11 inches. Maximum temperatures of 78 on the 5th, 88 on the 13th, 79 on the 22d, and 87 on the 24th were observed; also minima of 37 on the 3d, 41.5 on the 12th, 42 on the 16th, and 48 on the 22d.

The temperature of the soil at a depth of 3 inches (7.5 cm.) ranged between 48 on the 11th to 77 on the 25th with a total range of 29 degrees. The greatest daily variation amounted to 19 degrees, and this occurred on both the 12th and 13th.

The temperature at a depth of a foot (30 cm.) rose with minor fluctuations from 51 on the 1st to 64 on the 27th, after which a decrease ensued.

ACCESSIONS.

MUSEUMS AND HERBARIUM, MARCH, 1904.

42 museum specimens of India rubber and allied products. (Given by "The India Rubber World.")

1 section of trunk of *Rhus glabra* from Georgia. (Given by Mr. R. M. Harper.)

13 specimens of spurious logwood from Jamaica. (By exchange with the Department of Public Gardens and Plantations, Jamaica.)

1 museum specimen of maple sugar wrapped in birch bark, from Nova Scotia. (Given by Mr. C. B. Robinson.)

1 specimen of drug "Raiz de Abutua." (Given by Messrs. Lenman & Kemp.)

3 specimens of ash twigs. (Collected by Mr. Percy Wilson.)

2 museum specimens of *Paulownia tomentosa*. (Collected by Mr. Geo. H. Skene.)

299 specimens from West Virginia. (Collected by Mr. E. S. Steele.)

2 museum specimens of buckwheat. (Given by Mr. M. G. Straubel.)

4 specimens of twigs of trees. (Given by Mr. O. P. Medsger.)

586 specimens from Southwestern North America. (Collected by Mr. Metcalf.)

325 specimens from the Isle of Pines. (Collected by Mr. A. H. Curtiss.)

19 mosses from Michigan. (By exchange with Mr. E. N. Transeau.)

1,055 specimens from Java. (By exchange with Mr. E. D. Merrill.)

350 specimens from Colorado. (By exchange with Mr. Frank Tweedy.)

230 specimens from the Kadiak Islands, Alaska. (Given by Mr. Wm. T. Horne.)

17 specimens from Utah and Montana. (By exchange with Oberlin College.)

4 specimens of twigs of trees from Pennsylvania. (Collected by Mr. J. A. Shafer.)

5 miscellaneous museum specimens. (Given by Mr. F. Weinberg.)

1 photograph of Florida vegetation. (Given by The Burr Macintosh Monthly.)

2 specimens of Cyperaceae. (Given by Mr. S. B. Parish.)

2 specimens from New Jersey. (Given by Mr. Macy Cahart.)

28 specimens from Jamaica. (By exchange with the Department of Public Gardens and Plantations, Jamaica.)

1 specimen of *Ilex* from Indiana. (Given by Mr. Chas. C. Deam.)

837 miscellaneous specimens. (By exchange with the Royal Gardens, Kew, England.)

259 specimens from Washington. (Collected by Mr. H. S. Conard.)

PLANTS AND SEEDS.

1 orchid from South Bimini, Bahamas. (Given by Dr. C. F. Millspaugh.)

9 bulbs of *Hymenocallis* sp., from Crawley, La. (Given by Mrs. P. S. Lovell.)

2 Echeverias. (By exchange with Mr. F. Weinberg.)

18 plants from New Providence, Bahamas. (Collected by Dr. N. L. Britton.)

89 plants from south Florida. (Collected by Dr. N. L. Britton.)

6 plants of *Thrinax* sp., from Sands Key, Fla. (Collected by Dr. N. L. Britton.)

88 plants for the conservatories. (By exchange with Mr. J. L. Childs.)

29 coniferous trees and shrubs. (Given by Mr. John S. Holbrook.)

158 plants for the conservatories. (By exchange with Fairmount Park, Philadelphia.)

2 orchids. (Given by Messrs. Sander & Sons.)

16 orchids. (Purchased.)

50 packets of seed. (By exchange with the Botanical Garden, Zurich.)

18 packets of fern spores from Jamaica. (Given by Prof. L. M. Underwood.)

1 packet of seed. (Given by Mrs. M. E. Ross.)

2 packets of seed. (By exchange with Fairmount Park, Philadelphia.)

19 packets of *Crataegus* seed. (Given by Mr. Benj. H. Smith.)

1 packet of seed from Bahamas. (Collected by Dr. N. L. Britton.)

5 packets of seed from Florida. (Collected by Dr. N. L. Britton.)

5 packets of seed. (By exchange with Mr. F. Weinberg.)

93 packets of seed. (By exchange with the Botanical Garden, Hamburg, Germany.)

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No. 51. Notes on Bahaman algae, by Dr. M. A. Howe.

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EDITOR

DANIEL TREMBLY MACDOUGAL

Assistant Director

CONTENTS

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The New York Botanical Garden

Vol. V. July, 1904. No. 55.

EXPLORATIONS IN FLORIDA AND THE BAHAMAS.

To the Board of Managers,

Gentlemen: With the approval of Mr. D. O. Mills, President of the Board of Managers, I was absent from the Garden for the period between March 15 and April 13, occupied in botanical exploration in subtropical Florida and the Bahamas. I was accompanied by Mrs. Britton, and by Dr. Marshall A. Howe, Assistant Curator of the Museums. Mrs. Britton aided me in the collecting and care of specimens; Dr. Howe devoted himself to the study and collection of algae, and to photography. In pursuance of the exploration of the little known portion of peninsular Florida commenced by Dr. Small, Curator of the Museums, and Mr. Nash, Head Gardener, in the autumn of 1901, and continued by Dr. Small in November, 1903, Miami was chosen as the base of operations, it being the most southern point yet available for outfitting, and having the further advantage of the subtropical laboratory of the United States Department of Agriculture; Professor P. H. Rolfs, the director of this important scientific station gave us great assistance in continuation of his previous valued coöperation with representatives of the Garden while at work in this field, and much of the success in collecting in southern Florida is due to his aid and advice. I have expressed to him the high appreciation of the garden of his kindness and courtesy, which included the setting aside of a room at the laboratory for our use and much assistance in the care of specimens, and a contribution of some 80 living plants for our conservatories.

Several days were given to work within four or five miles of Miami, inasmuch as our previous collecting there had been done at other times of the year, and this included a visit by boat to the southern end of Virginia Key.

The period from March 23 to March 28 was occupied by an expedition by teams and on foot to Paradise Key, a large hammock in the everglades about forty-five miles southwest of Miami, and

FIG. 18. Road through Addison Hammock, Cutler, Florida.

some twenty miles beyond permanent human habitations; Professor Rolfs organized and directed this trip in a masterful way, and shared the interest and excitement of the discovery of many rare and interesting plants, some of them new to the continental flora and some hitherto unknown to science. The penetration of the everglades by teams is a simple proposition for about twenty miles south of Miami, a very good road extending to the hamlet of Cutler, about fifteen miles, but the twenty-five miles beyond is a road only in name, a mere trail made by wagons over the roughest kind of rough coral rock, broken by teams of the surveyors, causing us to do more walking than riding and requiring constant attention to hoofs ; indeed, the loss of a horse's shoe, not immediately noticed, nearly defeated the expedition at one

FIG. 19. Roots of Mangrove (*Rhizophora Mangle*), shore of Biscayne Bay, Miami, Florida.

point. Specimens were taken all along this road both going and coming and short trips made to both sides of it. The objective point, Paradise Key, known also as "Royal Palm Hammock" was reached by a four-mile walk across the everglades from Camp Jackson, a surveyors' hut, the end of possible transportation by wagon ; a survey line running toward Cape Sable, rendered walking relatively easy, however, and at this time the water-level of the everglades was some two or three feet below the general surface, as shown in sink holes; this hammock is a most interesting spot both as a landscape feature and from a botanical standpoint; it is about a mile long and half a mile wide, completely surrounded by the grass and sedge plain (prairie). The noble Royal Palms, here native, tower high above the dense thicket of low trees and tall shrubs which form the undergrowth and are visible across the everglades for many miles. It is with

FIG. 20. Bromeliads on the live oak, Miami, Florida.

pleasure that I learned of an attempt now being made to set this unique tract aside as a reservation for the protection of the palms and of the many other interesting plants which inhabit it.

Returning to Miami the period from March 28 to April 1 was given over to an expedition by boat to the northern Keys of Biscayne Bay. We touched at Cape Florida, the southern end of Biscayne Key, examined in detail the plants of the small Soldiers' Key, collected on both the bay and ocean sides of Sand's

Key and landed at three points on Elliott's Key ; also on Caesar's Rock, a small island on Caesar's Creek ; time prevented our going further south. The rock of Sand's Key and of Elliott's Key differs from that of the mainland in that it is the practically unaltered coral reef, elevated slightly above high water, while that of the mainland south of Miami is a coral-rock sandstone formed by the comminution of the original reefs and the redeposition of the detritus and its sorting and stratification by wind

FIG. 21. The solitary remaining individual of Sargent's Palm (*Pseudophoenix Sargentii*), on Elliott's Key, Florida.

and water. This soil difference causes a considerable difference in the vegetation.

Several days were given to the care and packing of the collections and to local exploration about Miami, including an examination of the banks of the Miami River up to its rapids where it leaves the everglades a few miles west of the town ; at this point the characteristic Antillean flora of the coast is largely replaced by plants of more northern distribution. A visit was also made to a hammock between Lemon City and Little River which contains a few royal palms apparently doomed to destruction by lumbering operations.

One of the objects of our trip was to obtain information and specimens to aid in the comparative study of the flora of southern

FIG. 22. Border of the everglades west of Cutler, Florida; a "prairie" in the background.

Florida with that of the Bahamas and of Cuba, in coöperation with the work of Dr. C. F. Millspaugh, Curator of Botany at the Field Columbian Museum of Chicago, who is conducting an important investigation of the northern limits of the Antillean flora. Dr. Millspaugh reached Miami on April 6, and Dr. Howe and I accompanied him the same day by steamer to Nassau, New Providence, and the time between April 7 and 9 was devoted to a reconnaissance of the vegetation of that island. In this work we had the cordial assistance of his excellency, Sir Gilbert Thomas Carter, Governor of the Bahamas, and of Mr. Herbert A. Brook, registrar of the colonial government, and were enabled to make considerable collections, and to learn the general features of the interesting and varied flora. The rock of New Providence is essentially identical with that of the Florida mainland south of Miami, and there are many species of trees and shrubs common to the two regions, as well as to Cuba, while on the

FIG. 23. Pine (*Pinus Elliottii*) and Scrub Palmetto (*Serenoa serrulata*) association, near Cutler, Florida.

other hand numerous species appear to be endemic in the three regions. To continue the Bahaman study Dr. Millspaugh and Dr. Howe remained at Nassau, having arranged an expedition by sloop from that point to the Bimini Islands which are located on the western edge of the Bahama bank about forty-five miles east of Cape Florida, and which have not hitherto been visited by botanists.

I returned to Miami on April 10, and after caring for the collections proceeded to New York by rail, accompanied by Mrs. Britton.

From this hasty glance at the Bahaman flora and from a general knowledge of previous collections made in this field, I now strongly recommend that at the first opportunity, we organize a botanical survey of the Bahaman archipelago. The northern islands and many of the smaller keys are botanically unknown, while many of the others have simply been touched upon by botanists ; the plants are known to be very unevenly distributed, some species being apparently restricted in distribution to a single island or key and it is certain that many species unknown to science await discovery.

Our collection of land plants during the whole trip is represented by 645 field numbers and include about 500 species illustrated by some 2,000 specimens for the herbarium, museums and conservatories. The report of Dr. Howe, to be published in the JOURNAL for August, describes his work on the algae.

Respectfully submitted,

N. L. BRITTON,

Director-in-Chief.

EFFECTS OF THE PAST WINTER ON SHRUBS.

Well is it for the lovers of shrubs that a winter so severe as that just past rarely visits this region. Not only here, but to the north and west of New York City, and even south, come complaints of the winter-killing of many shrubs which hitherto have enjoyed immunity from damage by the cold. The weather conditions which resulted in so much injury in the Garden will be discussed below.

The large number of shrubs in the fruticetum collection affords an excellent opportunity for a study of the comparative hardiness of different species when subjected to the same conditions. An element enters into the problem here, one which must be borne in mind to some extent, and it is that the shrubs in this collection were all transplanted recently — those families up to and including the Calycanthaceae during the fall of 1902, and the remaining families in the spring of 1903. What effect, if any, this may have had upon the plants and their ability to withstand an unusually severe winter, cannot be definitely gauged. In some cases, species grown in the fruticetum occur in other collections which have not been moved, and such cases may help in forming an estimate.

As the plants in the fruticetum are grouped in families, this subject will be discussed in the sequence of their arrangement.

Among the willows, some thirty species of which occur in the collection, there was no mortality, the ready adaptability of these plants to varying conditions forming a safeguard to the extreme cold. In the Myricaceae, to which belong the waxberry, *Myrica Carolinensis*, and *M. Gale*, and the sweet fern, *Comptonia peregrina*, all of which are in the collection, no unusual damage took place. The birch family, Betulaceae, presented but one shrub which proved for some reason unable to repel the cold; this is *Betula humilis*, a native of northern regions, and for this reason its being damaged was more of a surprise. Other species of this family, subjected to the same conditions and not affected, were: among the alders, *Alnus rugosa*, common in a wild state on the grounds, *A. tenuifolia* and *A. Alnobetula;* among the hazelnuts, *Corylus Americana*, *maxima purpurea*, *Avellana*, *rostrata* and *Pontica;* and among the birches, *Betula glandulifera* and *B. pumila*. As stated above, these were all transplanted in the fall of 1902, and it is puzzling to tell why *Betula humilis* should be so badly affected, and others from regions equally as cold, should be immune. In the Fagaceae, the beech family, the following came through safely: *Castanea pumila*, the chinquapin; *Quercus prinoides* and *Q. nana*.

In the elm family, Ulmaceae, the Asiatic *Ulmus pumila* is grown, and this was not harmed. The mulberry family, Moraceae, is illustrated by the Asiatic *Morus Tatarica*, which proved perfectly hardy. In the crowfoot family, Ranunculaceae, of the two species grown, the shrub yellow-root, *Xanthorrhiza apiifolia*, and *Paeonia Moutan*, only the latter was partially killed back. Of the species representing the Magnoliaceae, *Magnolia gracilis* was partly killed back, but no worse than in previous years, in fact a slight improvement was noted this spring over its appearance of the preceding spring. The very desirable *Cercidiphyllum Japonicum*, a native of Japan, a member of the Trochodendraceae, proved entirely hardy. It is very gratifying that such has proved the case, for it is a handsome and ornamental object, one of our best exotics; it usually attains a height of 20–30 feet and is also grown as a tree.

The barberry family, Berberidaceae, is shown by about seventeen species, and most of these have proved perfectly hardy. Those damaged in the genus *Berberis* are: *B. concinna* and *B. aristata*, both natives of the Himalayan region, killed back to the snow line. Other species growing in the fruticetum and remaining unharmed are: the ever and justly popular *B. Thunbergii*, from Japan; *B. buxifolia* and the variety *nana*, from the lower part of South America; the common barberry, *B. vulgaris*, and its purple-leaved form *atropurpurea*; *B. stenophylla*, a hybrid between *B. Darwinii*, a native of Chili, and *B. empetrifolia*, from the region a little further to the south; *B. Neuberti*, also a hybrid; and *B. emarginata*, *Amurensis* and *Sieboldii*. In the related genus, *Mahonia*, the three species grown here were not so exempt from injury. These were *M. Japonica*, *M. Aquifolium*, and *M. Nutkana*, of which the first received the worst damage, being killed back nearly to the base.

In the Calycanthaceae, the members of the genus *Butneria*, or *Calycanthus* as it is sometimes called, were more or less killed back; these were *B. fertilis* and *B. florida*. *Chimonanthus fragrans*, from Japan, was killed back to the snow line. Plants of this in the nursery, in a more protected situation, were just as badly affected by the cold. In the Lauraceae, the single species grown, *Benzoin Benzoin*, the spicebush, a native of the grounds, from which source our plants were derived, was untouched. In the Hydrangeaceae, most of the shrubs were not affected. The one most seriously hurt was *Deutzia crenata*, and its horticultural forms, including *D. Wellsii* and *D. Watereri*. All of these were killed right down to the ground, shrubs six feet high being thus affected. *Deutzia gracilis* only had the ends of the branches killed. *Hydrangea radiata, H. arborescens* and *H. quercifolia* were all harmed, the first and last killed to the ground but breaking nicely from the base, and the second with many of the larger branches destroyed, at least part way. Other shrubs growing here and not affected are: *Deutzia Lemoinei, Hydrangea paniculata grandiflora, Philadelphus hirsutus, microphyllus, inodorus, coronarius, Lemoinei, pubescens* and *Zeyheri*. The Virginia willow, *Itea Virginica*, of the Iteaceae, was killed back about one half way.

Among the members of the gooseberry family, Grossulariaceae, only two of several species were affected. These are: *Ribes villosum* and the variety *atrorubens* of *R. sanguineum*, both from our western states; they were killed almost if not quite to the ground. The other species under cultivation and remaining unharmed are: *Ribes longiflorum, cereum, curvatum, sanguineum, Americanum, rotundifolium, Cynosbati, Diacantha, nigrum*, and *fasciculatum* and its variety *Chinense*. In the witch-hazel family, Hamamelidaceae, that plant so frequently cultivated, *Corylopsis spicata*, from Japan, and usually quite hardy, was killed back to the snow line. Both species of the genus *Fothergilla, F. Carolina* and *F. major*, proved hardy. Our own native witch-hazel, *Hamamelis Virginica*, did not succumb, but the quite unlike representative from Japan, *H. arborea*, was entirely killed. This latter has not shown itself, however, very hardy in former winters, and it was not a surprise that the past severe winter should be its undoing.

In the Rosaceae, the rose family, quite a number of species were damaged. Among the roses themselves, *Rosa micrantha* and *R. Watsoniana*, that odd rose with the long narrow leaflets, were both killed about one half way back; *R. stylosa* and *R. microphylla* were both badly killed back, the latter to the snow line. In the genus *Rubus*, the following species were killed to the ground but are breaking nicely from the base: *R. crataegifolius, rosaefolius, spectabilis* and *phoenicolasius*, the Japanese wineberry. *Rubus biflorus* was entirely killed in the fruticetum, while in the nursery, in a more sheltered position, one plant survived and is breaking rather weakly from the base. Other species under cultivation which were barely, if at all, hurt are: *Rubus rhamnifolius, nigrobaccus* (the common highbush blackberry), *deliciosus, parviflorus, Allegheniensis, odoratus* and *parvifolius.* That showy shrub, *Exochorda grandiflora,* from China, was badly hurt. There are two specimens in the fruticetum; one of these was killed almost to the ground; while in the other some of the stems are alive way up to the tip, and others killed almost to the base. This same species is growing in the border at the approach to the elevated railroad, a somewhat more sheltered position, where it was not at all injured; these plants moreover were set out in the fall of 1902 and have not been disturbed since; these two factors may account for their apparent greater hardiness. *Stephanandra flexuosa,* from Japan, was killed nearly to the ground. In the border referred to immediately above are several plants of this species, and these were also badly damaged, being killed about one half way back. *Kerria Japonica,* also a Japanese plant, in both the single and double-flowered forms, was killed almost to the ground, both in the fruticetum and at the elevated approach. *Rhodotypos kerrioides,* another Japanese shrub, although subjected to the same conditions in the fruticetum as were the kerrias, escaped entirely. *Neviusia Alabamensis,* known only from a small area in Alabama and one of the rarest of shrubs, was somewhat hurt, but not as much as some of the Japanese things referred to above, which one would expect to be more hardy. Among the spiraeas, *Spiraea Japonica* and its varieties, ranging from the Himalayan region to Japan, *S. longigemmis,* from China, *S. canescens,* from the Himalayan region, and *S. Bumalda,* a hybrid between *Japonica* and *albiflora,* were all killed back to the snow line; while *S. Douglasii* was killed back about one half way. The spiraeas which escaped are: *S. alba, latifolia, prunifolia* (the double-flowered form), *crenata, bracteata, Billardii, Margaritae, albiflora, pubescens, arguta, Menziesii, tomentosa, Thunbergii, Van Houttei, Pikoviensis, Cantoniensis* and *trilobata.* Two plants related to the spiraeas, and often included with them, were also considerably damaged; these are *Sorbaria sorbifolia* and *S. Lindleyana,* both from the Himalayan region. The first named was also badly affected in places other than the fruticetum. *S. Lindleyana* was represented by two plants, one of which is entirely dead, the other breaking nicely from the base. *Sibiraea laevigata*, commonly included under *Spiraea*, from Siberia, was not touched. This shrub is well worthy of cultivation, its light green foliage giving it an unusual appearance among its neighbors. *Holodiscus dumosus*, from the western United States, sometimes classed with the spiraeas, was but little hurt.

In the apple family, the Pomaceae, the cotoneasters suffered the worst. Many of these are from the Himalayan region, and among these under cultivation in the fruticetum are: *C. microphylla*, *C. Uva-ursi*, of which *C. rotundifolia* is a synonym, *C. Simonsii* and *C. bacillaris*, all killed back to the snow line. *C. thymifolia*, also from the Himalayan region, was almost entirely killed, while *C. buxifolia*, from the same country, escaped, probably owing to its being a low shrub, not over ten inches high, and so protected by the snow mantle. *C. Cotoneaster*, from Europe and Asia, and *C. nummularia* escaped, while *C. pannosa*, from Yunnan, was entirely killed. *Cydonia Sinensis* met with varying results; small plants about two feet high were entirely killed, while plants somewhat larger were destroyed to the ground but are breaking well from the base. *Cydonia Maulei superba* had only the ends of the branches killed, but this was a low growing plant and perhaps was protected by the snow. The four species under cultivation of *Amelanchier*, *A. Botryapium*, *Amelanchier*, *rotundifolia* and *Asiatica* proved hardy. *Aronia atropurpurea*, *A. arbutifolia* and *A. nigra* proved hardy and are in a vigorous condition. The hawthorns, as a rule, proved themselves equal to the occasion. Small plants, 2–3 feet tall, of *Crataegus spathulata* were killed to the snow line, while larger plants came through unharmed. *Malus Halliana* proved equal to the strain.

In the Drupaceae, the cherry family, six species suffered: the double-flowered form of *Amygdalus Japonica* was killed to the snow line; *A. Mume*, one plant almost entirely killed, the other for the upper half; *Prunus Besseyi*, killed almost to the ground; *P. maritima*, partly hurt; *P. mollis*, dead; and *P. cerasifera Pis-*

sarai, partly killed back on some of the branches. Among those which escaped damage are: *Amygdalus incana* and *A. nana*, and *Prunus Padus*, *Americana*, *tomentosa*, *subhirtella*, *fruticosa* and *Virginiana*.

The genus *Cercis*, of the Caesalpinaceae, is represented by four species. Of these, *C. occidentalis*, in small plants, was nearly killed; *C. Siliquastrum*, the European Judas tree, small plants 3–4 feet high, was badly damaged; *C. Chinensis*, from China and Japan, was next in order of hardiness, trees of an equal size being killed only on the tips of the branches; while *C. Canadensis*, the American Judas tree, proved itself entirely hardy.

In the pea family, Papilionaceae, *Lespedeza bicolor*, from China, was killed to the ground, but is breaking out from the base. This is usually more or less harmed during our winters, but never so badly as at present. *Colutea arborescens*, from Europe and the Orient, was killed to the snow line. *Coronilla Emerus*, from southern Europe, as might be expected from its southern home, could not withstand the cold of the past winter and was killed back as far as the snow line. Of the genus *Cytisus* five species are represented. Of these *C. hirsutus*, *C. biflorus* and *C. capitatus* were killed to the ground, but are breaking from the base; *C. scoparius*, the common broom of Europe, while usually cut back pretty badly during the winter, was all but killed during the past winter, plants 4 to 5 feet tall having but a few branches alive and these only below the snow line. I fear this plant will not adapt itself well to conditions as they exist in this region; it is a pity too, for it is most attractive in its wealth of yellow flowers. The caraganas, *Caragana microphylla*, *arborescens*, *Chamlagu*, *frutescens* and *pygmaea*, all have stood the winter well. *Amorpha virgata*, *A. montana* and *A. fruticosa* have also proved their ability to withstand cold by remaining unharmed during the past winter. *Robinia hispida* is also perfectly hardy. *Sophora violacea* is alive to the ends of its branches.

In the family to which the orange belongs, the Rutaceae, the little trifoliate orange, *Citrus trifoliata*, native to Japan, has succumbed entirely to the cold, and is dead to the very roots. It has always with us been just on the borderland of hardiness, so that its being finished by the severe weather encountered last winter is not a surprise. *Xanthoxylum schinifolium*, from China and Japan, while in past years it has not proved entirely hardy, this winter was killed to the ground, but is now breaking somewhat from the base. *Xanthoxylum Americanum*, the prickly ash, is as vigorous as ever, as is *Ptelea trifoliata*, the three-leaved hoptree.

In the box family, Buxaceae, the various forms of the common box, *Buxus sempervirens*, are badly killed above. Almost all of these are alive higher up on the southern side than on the northwestern, a feature which will be discussed below. Small plants of *B. Harlandi* and *B. Japonica* were entirely killed. The Coriariaceae are here represented by *Coriaria myrtifolia*, of the Mediterranean region. This is always cut back to the ground during the winter and it of course met with the same fate again, but shoots from the base are coming up good and strong. In the Anacardiaceae, the sumacs seemed to hold their own, with the exception of *Rhus aromatica*, one of two plants of which was killed. *Cotinus Cotinus*, the old world smoke tree, was killed almost to the ground, although frequently in the fruticetum it is badly nipped on the ends of the branches. *Rhus copallina* and *R. glabra*, from our own country, and *R. Osbeckii*, from China, are as vigorous as ever; the last mentioned is a particularly strong grower and a very showy member of the genus.

In the holly family, Ilicaceae, *Ilex crenata*, from Japan, was the worst to suffer, it being badly killed back, practically to the snow line, not only in the fruticetum, but in other parts of the grounds likewise. *I. decidua*, *monticola* and *verticillata*, all of the eastern United States, fared much better, and were barely if at all touched. *I. serrata*, an Asiatic species, was badly killed on some branches. Among the Celastraceae little if any damage was done. Under cultivation here are: *Euonymus Bungeanus*, *Europaeus*, *alatus*, *Japonicus* and *radicans.*

In the Staphyleaceae the only species to succumb was *Staphylea Coulombieri*, which was killed to the ground, but is now sending up shoots from the base. Other species under cultivation, *S. Bumalda* and *S. trifolia*, the latter quite common in a wild state in the grounds, were unharmed. *Aesculus parviflora*, the only representative in the fruticetum of the Hippocastanaceae, or horse-chestnut family, proved hardy even to the end of the branches. *Sapindus marginatus*, of the Sapindaceae, or soapberry family, always a doubtful proposition, was not harmed as much as it has been in past winters. *Xanthoceras sorbifolia*, from China, of the same family, was more seriously affected than usual, being killed about one half way back.

In the buckthorn family, Rhamnaceae, the genus *Rhamnus* furnished a victim in *R. alpina*, a native of Europe, one plant being killed to the ground but breaking from the base, while the other has been entirely destroyed. *Zizyphus sativa*, of the Mediterranean region and temperate Asia, was killed to the ground, but sent up basal shoots, and the variety *inermis* met with a similar fate. The New Jersey tea, *Ceanothus Americana*, fared about as usual. *Rhamnus Dahurica*, from northern Asia, *R. Frangula* and *R. cathartica* met with no reverses. The rose of Sharon, *Hibiscus Syriacus*, the only representative of the mallow family, Malvaceae, was not injured in any way. The sole representative in the collection of the tea family, Theaceae, *Stuartia pentagyna*, met, if anything, with better success than formerly, for it seems to be in a little better condition this spring than last.

In the Hypericaceae, or St. John's-wort family, the mortality was great, all being badly injured or killed. *Hypericum prolificum* is having a hard struggle to recover, although plants but a short distance away in the west border seem to have fared much better; the latter, however, were somewhat more protected on the north. *H. aureum* and *H. elatum* both succumbed to the cold, and *H. lobocarpum* all but died, only one plant showing life. All of the representatives of the Tamaricaceae, tamarix family, *Tamarix parviflora*, *Odessana* and *Indica* were severely killed back to the ground, but are breaking nicely from below. In the Thymeleaceae, *Daphne odora*, from Japan, was killed to the ground, but is now breaking from the base, while our own *Dirca palustris*, the leather-wood, which in former winters has sometimes suffered considerably, escaped without injury, even to the ends of the smallest branches. *Daphne Cneorum* is also unharmed.

In the Elaeagnaceae, the genus *Elaeagnus* has furnished the most victims : in *E. umbellata*, from Japan, one individual is killed to the snow line, while the other has some of the stems alive away out to the end ; in *E. multiflora*, of which *E. longipes* is a synonym, also from Japan, small plants two feet tall were partly killed, while larger ones suffered no hurt whatever ; *E. commutata*, known commonly as *E. argentea*, was killed to the snow line. The genus *Hippophaë* is represented in two species : one of these, *H. rhamnoides*, from Europe and temperate Asia, and quite common in cultivation, was unharmed, but the rarer one from Nepal, *H. salicifolia*, of which we had but a single large specimen some five feet tall, is dead. *Lepargyraea argentea*, the buffalo-berry of the northwestern United States, is in a flourishing condition.

In the Araliaceae nothing was injured. There are growing in the fruticetum : *Acanthopanax Maximowiczii*, *A. spinosum* and *A. sessiliflorum ; Aralia Chinensis canescens ;* and *Eleutherococcus senticosus.* In the dogwood family, Cornaceae, little damage was done, only *C. glabrata* being partly killed back. Other species of *Cornus* growing in the fruticetum and unharmed are : *C. macrophylla*, *circinata*, *stolonifera* and its variety *flaviramea* with yellow-green branches, *candidissima*, *alternifolia*, *brachypoda*, *sanguinea*, *Amomum* and *alba Sibirica.* It is interesting to note in this connection that the common flowering dogwood, *Cornus florida*, so common in the garden grounds, had, so far as the writer examined them, but two bracts to the involucre this year, the outer two bracts either being entirely wanting or much reduced, with evident indications of having been injured by the severe winter. This deficiency gave the so-called dogwood flowers a very peculiar and meager appearance. A friend in New Jersey told me the dogwoods were so affected in his neighborhood, and an examination proved the same state of things to exist here.

Clethra canescens, in the Clethraceae, was badly killed back, only a few of the stems being alive to the tip, but the plants are sending up good strong breaks from the base. The common sweet-pepper bush, *Clethra alnifolia*, being a native, suffered no harm. In the heath family, Ericaceae, plants which proved hardy are: *Pieris Mariana*, from the United States, and *P. Japonica*, from Japan; *Azalea arborescens*, *nudiflora*, *viscosa*, *occidentalis* and *canescens*; *Enkianthus Japonicus*; and *Kalmia angustifolia*. *Biltia Vaseyi*, commonly known as an azalea or rhododendron, did not survive. Among the rhododendrons the only harm occurred to the hybrids, while our native wild species, *R. Catawbiense*, *maximum*, and *punctatum*, were not injured.

In the Styracaceae, *Pterostyrax hispida*, a native of Japan, was barely touched. *Styrax Obassia*, also from Japan, in plants 2–3 feet tall, was killed almost to the ground, and *S. Japonica* from the same country, and *S. Americana* were killed to the ground, but are perpetuating themselves in vigorous shoots from the base.

The Oleaceae presented some surprises. The plant most affected was the California privet, *Ligustrum ovalifolium*, not, however, a native of California, as its common name would indicate, but from the country of the Mikado. This was represented in the fruticetum by two specimens. These appeared entirely killed for many days after other vegetation was in full force; finally some of the stems sent out a few straggling breaks, while from the base much stronger shoots are making their appearance; these latter may in time transform the plants into good bushy specimens again. Plants of the same species in an ornamental bed near the railroad station were all killed, so that it was necessary to remove them; these had been undisturbed for over four years and were large well-established plants 6–8 feet tall. In the border at the approach to the elevated station it was also badly killed back, but is breaking from the lower portion. This will be a severe blow to the use of this shrub for hedges. The winter of 1902–3 proved very disastrous to this species in the region to the north of us, but plants at the garden were not harmed in the least. Other species of the genus *Ligustrum* were much more hardy. *L. ciliatum* and *L. Ibota* with its variety *Regelianum*, all also natives of Japan, were unharmed, coming through in fine shape. Small plants, only one foot high, of *L. lucidum* were entirely killed and similar plants of *L. Quihoui* were killed back to the snow line. With the exception of *Syringa villosa*, from China, which was badly killed, the lilacs remained unharmed. In addition to the above *S. vulgaris*, *Pekinensis*, *Japonica*, *Chinensis*, *Josekae* and *villosa Emodi* are in the collection. The Forsythias were not seriously damaged, only the flower buds being killed above the snow line, so that the shrubs presented a very queer appearance with their fringe of flowers only at the very base where the snow had protected them. Other shrubs of this family which proved hardy are: *Adelia acuminata* and *A. ligustrina*; *Chionanthus Virginica*, the fringe tree; and *Fontanesia phillyraeoides* and its variety *angustifolia*, the latter somewhat killed back.

The Loganiaceae are represented only by the genus *Buddleia*. *B. Japonica* was killed to the ground, but is breaking well from the base; this is also the condition of *B. Lindeyana*. *B. variabilis* was killed to the ground, but is breaking strongly from the base, and will entirely recover.

In the verbena family, Verbenaceae, not a plant was left unharmed, and in many cases shrubs were entirely killed. In the case of *Vitex Agnus-castus*, from the Mediterranean region, one plant was entirely killed and the other is breaking from the base; *V. cannabifolia* is dead. *Callicarpa Japonica* and *C. purpurea* were both killed to the ground, the former a native of Japan, while the latter is from China. *Caryopteris Mastacanthus* is killed, and *Clerodendron serotinum* dead to the ground, but sending up basal shoots.

In the honeysuckle family, Caprifoliaceae, but little damage was done. Some plants of *Viburnum Opulus*, the bush cranberry, were badly cut back, while others were not touched, yet apparently subjected to the same conditions. The compact dwarf-growing form of this, *V. Opulus nanum*, presents a most vigorous appearance after its hard winter. The other species of *Viburnum* grown and which show no signs of the cold are: *V. acerifolium*, *prunifolium* (very common in a wild state on the grounds), *cassinoides*, *Lentago*, *pubescens*, *dentatum*, *nudum*, *Lantana*, *dilatatum*, *tomentosum* and its variety *plicatum*, *Sieboldi*, *phlebotrichum* and *venosum*. *Abelia Chinensis* is killed back pretty badly, but this happens nearly every winter. Among the honeysuckles proper little damage occurred. The following were affected: *Lonicera*

Ledebourii, killed back to the snow line; *L. Standishii*, somewhat killed back; and *L. Maximowiczii*, killed to the ground but breaking from the base. The species unharmed are: *Lonicera coerulea, fragrantissima, Xylosteum, Morrowi, Alberti, gracilipes, Periclymenum Belgica, coerulescens, floribunda, chrysantha, Segreziensis, Caprifolium* and *Japonica aureo-reticulata*. *Weigela grandiflora* was killed to the snow line. The remaining species of this genus were unharmed: *Weigela florida, hortensis, Japonica, praecox*, and a number of horticultural forms and hybrids. In the related genus *Diervilla* none of the three species grown was injured: these are: *D. Diervilla*, the bush honeysuckle, *D. sessilifolia* and *D. rivularis*. Three species of *Symphoricarpos* withstood the cold: *S. Symphoricarpos, racemosus* and *occidentalis*.

There are few hardy shrubs among the Compositae, so the family is not largely represented in the fruticetum. *Artemisia Abrotanum* was partly and unevenly killed, smaller stems surviving while larger ones were killed to the base. Three plants of *Baccharis halimifolia* represent this species; of these one had but the small branches killed, another was killed back about one half way, and the third was killed to the snow line. All were subjected apparently to the same conditions and environment.

It will be noted in the above account that in the great majority of cases the damage extended to what I have called the snow line, that is a distance of eight or ten inches from the base of the plant. This of course would vary in different places, depending largely upon the extent to which the snow had drifted. In most cases the shrubs, when affected at all, were entirely killed down to this point, but the members of the genus *Forsythia* form a conspicuous exception to this, for these shrubs, in all parts of the grounds, remained unharmed, so far as the foliage buds were concerned, but the flowering buds were all killed above the area which was protected by the snow mantle. It formed an odd sight to see these big bare bushes with a mere fringe of yellow at the base in place of the usual wealth of showy flowers adorning them in all parts. Perhaps it was in the genus *Buxus* that the protective quality of the snow was most in evidence. On the side to the northwest, and hence that exposed to the cold winds, the damage was much more evident. It would be on the southerly side that the snow would naturally drift and thus form greater protection, and that this was the case was indicated by the shrubs being alive much higher on that side than on the north, so that the live foliage was limited by an obliquely ascending line, higher on the southerly side.

Some unexpected results obtained in the matter of hardiness. For instance, one would expect *Neviusia Alabamensis* to be more affected by the cold than *Exochorda grandiflora* or *Stephanandra flexuosa*, all three growing within a few feet of each other and having received identical treatment, but the opposite of this was the case, the *Neviusia* proving hardier. The soapberry, *Sapindus marginatus*, native from South Carolina to Florida, proved itself more hardy the past winter than in previous years, and was not as badly hurt as was its near neighbor, a member of the same family, *Xanthoceras sorbifolia*, which has hitherto stood the cold much better. Other instances might be mentioned, but these serve to illustrate my point.

Now as to the weather conditions which resulted in this havoc among the shrubs. Other winters have been cold, but it appears to have been the long-continued cold which occurred at various intervals during the past winter which did the great damage. The following was drawn from the thermographic records of the garden. We had our usual cold weather incident to November and the early part of December, but it was not until December 28, 1903, that the long cold spell began which is responsible for the results as indicated in the earlier part of this article. On that date the maximum temperature, which occurred about noon, was 18° above zero, and the mercury remained below the freezing point until the afternoon of January 1, when it went to 36°, the minimum temperature in the meantime being about 5° above zero. It went down continuously from that time to the night of the third, when it reached a minimum of 1.5°, followed on the fourth by a maximum of 2°. On the fifth came the lowest temperature of the winter, — 17°, followed on the sixth by — 12°, and it was not until noon of the ninth that the temperature got above the freezing point. This was followed by another drop to below the freezing point which continued for thirteen days, or until the twenty-second, with the exception of a rise to a little above the freezing point during a short time in midday on three occasions. So that from December 28 to the afternoon of January 22, a period of almost four weeks, the mercury did not rise above the freezing point but five times, and remained there but a few hours each time. During this period a snow mantle covered the ground. On the afternoon of the twenty-second of January the temperature rose to 47°, and remained about in that neighborhood until the evening of the following day when it again dropped, and by Sunday afternoon, the twenty-fourth, it again went below the freezing point, and remained there, with one exception on the thirtieth, when it rose to 36°, until February 6, another period of fourteen days, with continuous freezing weather excepting on one day. A snow blanket still covered the soil. A period of about thirty-six hours of warm weather ensued, with a maximum temperature of 51.5°, followed by a rapid decline, the freezing point being again reached early on February 8, and remaining considerably below the freezing point, with a minimum of 4.5°, until the fourteenth, when a maximum of 33° was reached, followed by another decline to far below freezing (with a minimum of — 1°), which persisted, with a rise to 32° on the twentieth, until the twenty-first, when a sudden rise occurred, the temperature advancing from about 6° to 40° in about four hours, thus putting a final stop to this long period of almost unprecedented cold weather which has done thousands of dollars' worth of damage to shrubs in this region.

Now to epitomize: from December 28, 1903, to February 21, 1904, a period of fifty six days, the mercury only rose above the freezing point, excepting for the two intervals of warm weather referred to, on seven days, and a range of temperature was exhibited during this period of — 17° to 51.4°.

A feature greatly increasing the damage done by this cold period was the high winds which prevailed for a great part of the time. These penetrated all places not protected, and had it not been for the covering of snow which covered the ground for all or the greater part of this bitter cold weather, the damage must have been much greater. That this is the case is evidenced by so many shrubs being alive below the snow line, and even in those cases where particularly tender shrubs were killed right to the ground, the snow undoubtedly prevented their entire destruction by protecting the roots. If the damage were the result of cold earlier in the season, before the snow covering was present, this would be shown by the killing of the shrubs to the ground; but from the fact that most of the damaged shrubs were unharmed below the snow line, and that the severest weather occurred during the presence of this snow, it seems to be clearly indicated when the destruction took place. GEORGE V. NASH.

NOTES, NEWS AND COMMENT.

Professor Hugo de Vries, Director of the Botanical Garden at Amsterdam, Holland, was a visitor at the garden from June 9 to 14, and made an examination of the mutant species now in cultivation in the experimental grounds. Professor de Vries received the degree of doctor of science from Columbia University at the annual commencement exercises on the ninth. He also delivered the dedicatory address at the station for experimental evolution at Cold Spring Harbor, on June 11. Professor de Vries will remain in America until about October 1, making a tour which will include a visit to the Desert Laboratory at Tucson, Arizona, a course of twenty five lectures at the University of California, five lectures at the University of Chicago, and an address before the congress of botanists at St. Louis in September.

Professor F. E. Lloyd, of Teachers College, is at the Desert Botanical Laboratory, where he is engaged in some special investigations on the transpiration of desert plants.

Dr. J. H. Harshberger, of the University of Pennsylvania, visited the garden for a few days during June for the purpose of consulting the library and the collections of algae.

Professor W. C. Coker, of the University of North Carolina, was in residence at the garden during June for the purpose of completing some investigations on the flora of the Bahamas.

Miss W. J. Robinson, instructor in biology in Vassar College, and Miss M. M. Brackett have gone to the Cinchona Laboratory of the garden to carry out some embryological investigations. Mr. G. W. Collins, of the U. S. Department of Agriculture, and Mr. Wm. R. Maxon, of the U. S. National Museum, and Mr. Louis Agassiz Fuertes, of Ithaca, New York, have also recently carried out certain studies at Cinchona.

Professor E. Mead Wilcox spent a month at the garden during June and July, in the furtherance of some work upon the castor oil plant.

Dr. H. H. Rusby, of the Board of Managers, sailed for Europe on June 25. He will spend three months in the herbarium at Kew, in the study of 2,000 undetermined specimens from U. S. of Columbia collected by Herbert A. Smith, and of some material from Bolivia secured by Mr. R. S. Williams.

Dr. J. N. Rose, of the U. S. National Museum, visited the garden during the second week in June for the purpose of consulting with Dr. Britton concerning coöperative researches on the Crassulaceae and Cactaceae.

Professor Howard J. Banker, of the Southwestern Normal College of Pennsylvania has recently been elected professor of biology in DePauw University at Greencastle, Indiana. Professor Banker was a student in the Garden in 1899–1900, and is spending the present summer in the laboratories preparatory to taking up his newly assumed duties.

The total precipitation in the Garden during June, 1904, amounted to 2.6 inches. Maximum temperatures of 88° on the fourth and sixth, 85.5° on the sixteenth, and 95° on the twenty-sixth were recorded: also minima of 52° on the second, 44° on the eleventh, 45° on the fifteenth, and 55° on the twenty-fourth.

The temperature of the soil at a depth of 3 inches (7.5 cm.) ranged from 50.5° to 79°. The temperature at a depth of a foot (30 cm.) varied from 60° on the first to 67° on the sixth, 61° on the eleventh, and 71° on the twenty-sixth, the last named temperature occurring during the period when the air rose to 95° F.

ACCESSIONS.

MUSEUMS AND HERBARIUM, APRIL AND MAY, 1904.

2 mosses from Vermont and Massachusetts. (By exchange with M. A. Lorenz.)

22 herbarium specimens from Montana and Utah. (By exchange with Oberlin College.)

2 museum specimens of *Myrtus communis* leaves. (Given by Mr. J. A. Shafer.)

2 mosses from Maine. (Given by Mr. J. F. Collins.)

6 herbarium specimens from Colorado. (By exchange with the Colorado College of Agriculture.)

24 North American mosses, for the Columbia University Herbarium. (Distributed by Mr. J. M. Holzinger.)

1 photograph of *Cereus Greggii.* (Given by Dr. D. T. MacDougal.)

51 plates of ferns. (Given by Professor L. M. Underwood.)

4 museum specimens of tobacco from Canada. (Given by Mr. G. Straubel.)

1 museum specimen of Mexican rubber bush. (Given by Mr. Chas. H. Brumley.)

16 herbarium specimens of Polyporaceae, from western Pennsylvania. (Given by Mr. H. J. Banker.)

94 herbarium specimens from Sonora and Lower California. (Collected by Dr. D. T. MacDougal.)

1 specimen of rope, made from the fiber of *Agave lechuguilla.* (Given by Mr. W. H. Dodd.)

20 specimens of rubber, illustrating the manufacture of the fountain pen. (Given by the L. E. Waterman Co.)

8 museum specimens from Texas and Mexico. (Collected by Dr. D. T. MacDougal.)

4 museum specimens. (Collected by Mr. G. A. Skene.)

3 museum specimens for the drug collection. (Given by Mr. J. A. Shafer.)

35 specimens of matting and *Juncus effusus* fiber. (Given by the Goodall Matting Co.)

96 herbarium specimens of marine algae from the Kadiak Island, Alaska. (Given by Mr. Wm. T. Horne.)

2 specimens of Hepaticae from Washington. (Given by Mr. Henry S. Conrad.)

2 museum specimens of cauliflower. (Given by Mr. Jas. Green.)

3 museum specimens of horseradish. (Given by Mr. Frank Weinberg.)

3,080 herbarium specimens of marine algae from Florida and the Bahamas. (Collected by Dr. M. A. Howe.)

3 specimens of Hepaticae from New York. (Given by Mr. Wm. T. Horne.)

4 specimens for the drug collection. (Given by J. A. Shafer.)

2 museum specimens of fruit of *Alnus rugosa.* (Given by Mr. R. C. Schneider.)

2 specimens of *Thrinax* fiber and hat from the Bahamas. (Acquired by Dr. M. A. Howe.)

7 museum specimens of Indian corn. (By exchange with Prof. H. F. Roberts.)

29 specimens of twigs of North American trees. (Given by Mr. W. W. Eggleston.)

3 specimens of Para rubber and rubber type. (Given by Mr. A. Aarons.)

2 specimens, stem and seeds of *Aristolochia macrophylla.* (Given by Mr. J. A. Shafer.)

160 museum specimens of marine algae from Florida and the Bahamas. (Collected by Dr. M. A. Howe.)

1 specimen of *Trillium discolor* from Georgia. (Given by Mr. A. Cuthbert.)

20 specimens of fungi from Ohio. (Distributed by Prof. W. A. Kellerman.)

12 specimens for the systematic museum. (Collected by Mr. J. A. Shafer.)

4 specimens of fruits for the collection of North American dendrology. (Collected by Mr. J. A. Shafer.)

LIBRARY ACCESSIONS FROM APRIL 15 TO JUNE 15, 1904.

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EDITOR

DANIEL TREMBLY MACDOUGAL

Assistant Director

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JOURNAL

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Vol. V. August, 1904. No. 56.

REPORT UPON FURTHER EXPLORATION OF SOUTHERN FLORIDA.

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

Sir: I submit the following report on botanical explorations in southern peninsular Florida, during a period of twenty days last May. By your permission Mr. Percy Wilson, Administrative Assistant, and the writer, left New York City for the field on May 2nd. We reached Miami the following Wednesday night. At the invitation of Professor Rolfs, who is in charge of the Subtropical Laboratory of the U. S. Department of Agriculture at Miami, we established our headquarters in the laboratory building of that institution on Thursday morning, and I wish here to express our thanks to Professor Rolfs and his associates for their hospitality and for the assistance generously given for furthering our plans. I also take this occasion to thank Mr. J. S. Frederick, Civil Engineer, of Miami, for tracings of maps of lately surveyed portions of the Homestead country, which greatly facilitated our investigations.

Immediately after establishing our headquarters we secured provisions and a team of horses. During the afternoon of the same day we set out for the field and at ten o'clock that night pitched camp in the heart of the Homestead country. We planned to divide our time principally between two points of special interest, the one Long Key, an isolated portion of pineland and hammock formation surrounded by the Everglades, the other Camp Longview and vicinity, situated several miles farther north on the edge of the Everglades.

Our field work was inaugurated by a spell of heat and rainy weather probably the most severe of the year. Both these conditions added greatly to our discomfort in the field, and interfered to some extent with our prearranged plans. In that region the heat is markedly intensified by the peculiar growth of the pine trees which form a generally unbroken forest; the trees grow in too spindling a manner to afford shade and the innumerable trunks are so thickly set that they prevent the circulation of air in any manner suggestive of a breeze. The rain fell so continuously and in such torrents that we were forced to reduce our bivouacs to from three to six hours, in order to cover the territory selected for investigation before the intervening portions of the Everglades became filled with water and consequently impassable.

An early start on the morning of May 6, and continuous traveling through a drenching rain during the day, enabled us to reach Camp Jackson, an abandoned survey camp consisting of a single log cabin, situated on the edge of the Everglades, about forty-five miles by trail southwest of Miami, before sunset. The eastern end of Long Key is situated three miles directly west of Camp Jackson. Structurally, Long Key may be described as a repetition of the elevated ridge of coral sandrock extending from Miami to Camp Jackson, but on a smaller scale, and with its long axis running directly east and west, instead of north and south. Like the larger reef referred to, it is oblong in shape and is intersected by narrow arms of the Everglades at right angles to the long axis and has its greatest hammock development at its eastern end, as the other reef has at the corresponding northern end. It is more rugged than the larger reef and the vegetation, especially in the case of the trees, is of a more stunted and ragged character. Our first attempt to reach the Key was rendered unsuccessful by encountering a slough * just

* One mile below this point the slough forks and runs on either side of a hammock called Paradise Key which was visited in 1903 by Mr. A. A. Eaton and earlier during this year by Dr. Britton and Professor Rolfs. Before reaching the field it was part of

east of the Key filled with six feet or more of water and mud, in addition to being the home of alligators and water moccasins. These conditions and the weight of our camp outfit, rendered wading and swimming not only inadvisable, but out of the question. We were thus forced to retrace our steps to Camp Jackson for the purpose of securing the remains of a disintegrating steel boat abandoned there by surveyors. After carrying the boat over a ragged coral reef and dragging it over the partially submerged everglades for the distance of three miles, there was sufficient of the craft left to enable us to cross the above-mentioned slough in safety, and thus reach our objective point. We found the eastern end of the Key surrounded by an exceedingly dense hammock growth; in fact the vegetation there is penetrable only by the vigorous use of an axe. The hammock formation extends for a considerable distance from the margin of the Key, and instead of ending abruptly on a line where the growth of pine trees begins, the hardwood trees of the hammock and the pine trees grow intermingled, the former giving way only gradually to the latter until the pines finally predominate, and the typical rocky pineland is reached. The pinelands were too parched to yield much of interest, not yet having been brought back to their normal condition by the rains, but the hammocks, less seriously affected by the drought, yielded rare and interesting ferns, orchids and bromeliads. The hammocks of Long Key differ conspicuously from all the others investigated in the neighboring region, on account of the copious growth of the long moss which is noticeable on the trees at a distance of two or three miles. This tract may be explored advantageously in the autumn only.

The latter portion of the time at our disposal was devoted to an investigation of the lower portion of the Homestead trail and

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our plans to go to Cape Sable by way of Long Key, but on reaching Miami we learned that the character of the country and the great distance forbade us to attempt to carry out that part of our plan with the field equipment we had at our disposal. Cape Sable (Middle Cape) is 38 miles in a direct line from the eastern end of Long Key or from Paradise Key and 46 miles by the survey, and not 15 miles as lately recorded by Mr. Oakes Ames (Contributions from the Ames Botanical Laboratory, No. 1, page 9.

the vicinity of Camp Longview which is situated about four miles north of Camp Jackson. We revisited several of the more interesting hammocks investigated last year, and found that the fears expressed in a previous report* concerning the probable destruction of these hammocks were in several cases well founded. The larger trees of a few of the more important hammocks have been cut out; thus by letting in the direct sunlight, several men have destroyed in a few days, the results which it took nature thousands of years to accomplish. However, in these ruins we were rewarded by finding species of West Indian flowering plants not previously collected on the North American mainland as well as considerable cryptogamic material which had not yet been wholly parched by the sun.

Our recent explorations in that previously little known portion of Florida have acquainted us with many interesting and useful facts connected with plant relationships and distribution in addition to enriching the collections of the museums, herbarium and conservatories of the Garden. Some of the facts seem to be of sufficient general interest to record here.

In considering this region one should remember that it consists of a slightly elevated ridge scarcely over 40 miles in length and from two to six miles in width, bounded on the east by Biscayne Bay and on the west by the Everglades. Compared with the 59,268 square miles of the state the area of this ridge is insignificant and up to the present only portions of less than 75 square miles have been botanically explored; but this restricted area has yielded nearly 800 species of flowering plants, or fully one fourth of the 3,000 species of flowering plants known to grow naturally within the state. The flora is strikingly different from that of the rest of the state, even from that of the contiguous territory, and is to some extent endemic. For example, such relatively large families both well represented and generally distributed in the state, as Melanthaceæ, Caryophyllaceæ, Ranunculaceæ and Ericaceæ are wholly wanting or represented by a single species. Such widely distributed genera as *Ranunculus* with 9 species in the other parts of the state, *Cratægus* with 47

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* Jour. N. Y. Bot. Gard. 5: No. 51, 1904.

species, *Baptisia* with 11 species, *Oxalis* with 9 species, *Viola* with 12 species, *Rhexia* with 12 species, *Phlox* with 10 species, and *Plantago* with 7 species are here wholly unrepresented. On the other hand such families as Orchidaceæ, Fabaceæ, Convolvulaceæ and Rubiaceæ are strongly represented both as to the number of the genera and species.

The actual and comparative distribution of the plants inhabiting the coral sandrock ridge under consideration, brings out sev-

FIG. 24. PINELAND. — This formation greatly predominates on the coral sandrock ridge. The characteristic plant is *Pinus Elliottii*, and with it are abundantly associated several species of palms and a species of *Zamia*. Here occur the great majority of endemic species of flowering plants, while fungi, hepatics, mosses and ferns are relatively scarce. About 43 per cent. of the species of flowering plants known to grow naturally in the region under consideration occur in the pinelands.

eral points of interest. To illustrate this more clearly I have introduced cuts * of the three main factors of plant distribution on the reef, namely, the Pineland, the Hammock and the Everglades. † The area occupied by the Hammock formation is in-

* From photographs furnished by Prof. Rolfs and Mr. L. H. McCullough.

† These formations were described in a previous report on exploration in Florida. Journ. N. Y. Bot. Gard. 3: No. 26. 1902.

significant as compared with that of the pineland, yet there are nearly as many species of flowering plants growing within the bounds of these small scattered hammocks as there are in the vast pinelands. The intersecting arms of the Everglades maintain less than one-half as many species as either the hammocks or the pinelands. The comparative distribution of the species of

FIG. 25. HAMMOCK.—The total area of this formation is relatively insignificant when compared with the pinelands. The hammocks consist of isolated groups of hardwood trees, shrubs, vines and herbaceous plants in the pinelands. The dense, often almost impenetrable, growth excludes the direct sunlight and maintains a high degree of moisture, both conditions being favorable to the development of fungi, hepatics, mosses and ferns, representatives of which occur in great abundance. Here occur the great majority of the flowering plants now known to be common both to the West Indies and the mainland of North America, while nearly as great a percentage (42 per cent.) of species occur in this formation as in the much more extensive pinelands.

flowering plants in the three formations is as follows: Pinelands, 43 per cent.; Hammocks, 42 per cent.; contiguous portions of the Everglades, 15 per cent.

To one not acquainted with that region this statement made long ago by Dr. Perrine, "the sterility of the soil is made up for by the fertility of the air" is of course unintelligible; but a glance at the epiphytic flora and jagged rock of the surface of the ridge at once brings out the force of Dr. Perrine's statement. In the case of most of the hammocks the epiphytic flora reaches a considerable or even an excessive development. It consists chiefly of representatives of the fern-plants, bromeliads and orchids. About 30 per cent. of the 28 species of fern-plants now known to occur in that region inhabit trees, all the 13 species of bromeliads are epiphytic and nearly 50 per cent. of the 30 species of orchids are tree-inhabiting. We encountered one hammock of about an acre in extent that is actually being destroyed

FIG. 26. EVERGLADES. — This formation partially surrounds and intersects the coral sandrock ridge. Structurally it consists of a marsh with scattered hammock-islands, while its flora consists of plants mainly of a different character from those found in either the pinelands or the hammocks. The more conspicuous elements of the flora are grasses and sedges, and among these occur many aquatic and mud-inhabiting plants; the vegetation is of a more northern character. About 15 per cent. of the species of the flowering plants now known to grow naturally on the coral sandrock ridge including the intersecting and contiguous portions of the Everglades occur in this formation, or less than one half as many as in either the pinelands or in the hammocks.

by the excessive development of the epiphytes. The hammock has the appearance of being choked. The plants of the epiphytic bromeliads and orchids, having taken possession of every available bit of surface of trunks and branches of the larger trees, have prepared the way for the ready development of wood-destroying species of fungi which in turn have caused the trees to rot and fall to pieces. The epiphytes thus brought to the ground have completely covered the floor of the hammock and have now taken possession of the smaller trees which appear to be doomed to the same fate which overtook the larger ones.

J. K. Small.
Curator of the Museums and Herbarium.

COLLECTIONS OF MARINE ALGAE FROM FLORIDA AND THE BAHAMAS.

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

As a supplement to your report relating to our expedition to southern Florida and the Bahamas in March and April, I would respectfully submit a brief account of my special work in connection with collecting and studying the marine algae of that region.

I was in Miami, Florida, for a single day, on October 22, 1902, on my way to Key West, and when we reached this point on March 17, 1904, it was of interest to note that several species of algae, notably two species of *Acetabulum* and one of *Coccocladus* which were very abundant on the former visit, were now — six months earlier in the year — equally abundant and in practically the same stages of development. Very little is definitely known about the life-periods and seasonal variations of the marine algae of our subtropical waters and the opportunity of comparing the marine flora of this locality in spring and autumn was a valued one.

An impressive feature of the marine vegetation of the mainland shore of Biscayne Bay is the profusion in which the graceful *Acetabulum crenulatum* occurs. When I have met with this species elsewhere — in Bermuda, Key West, Porto Rico, and the Bahamas — it has been rather sporadic and in limited quantity. Here, it often covers areas twenty feet or more in diameter to the exclusion of nearly everything else, mostly in water that is from one to six feet deep at low tide.

The visit of three or four days to Cutler, fifteen miles south of Miami, did not result in the collection of much that was different from what occurs in the immediate vicinity of Miami, but the expeditions to Virginia Key and later to Biscayne Key, Soldiers' Key, Sand's Key, and Elliott's Key, brought us into closer relations with the open ocean and the Gulf Stream and yielded results of much interest. Caesar's Creek, south of Elliott's Key, proved to be a particularly rich collecting ground.

Five days were spent on the island of New Providence, Bahamas. The south shore of this island, with its wide stretches of shallow water, was the most interesting of any part visited and I regret that only one day was given to it. On April 11, Dr. Millspaugh and I having chartered at Nassau the sloop-rigged yacht "Cynosure," began a westward voyage of exploration with Miami, about one hundred and eighty miles away, as the prospective terminus. Our first stop was at West End Bight, New Providence; afterwards, we touched and made collections at Joulter's Cays, Gun Cay, North Cat Cay, and the Bimini Cays, returning then to South Cat Cay, from which we took our course across the Gulf Stream to Miami. In the Bimini harbor, a feature of special interest was the development of the genera *Penicillus* and *Rhipocephalus*, which include the so-called "merman's shaving brushes." Four species of *Penicillus* and two of *Rhipocephalus* were found growing in this harbor. Extending eastward from the harbor proper are extensive sand flats which are widely exposed at low water; the portion which lies between the tide-lines is almost destitute of plant-life, but the region from low water mark down to a depth of six feet seems particularly well adapted to the members of the *Penicillus* group.

Ten days were occupied in the cruise from Nassau to Miami. The only misadventure, if it may be called such, of the voyage was our meeting with two or three dead calms at sea, which delayed our schedule by about three days. One almost breathless day on the deep waters of the Gulf Stream resulted in carrying us forty or fifty miles north of our course. These experiences served to emphasize the superior value, for future expeditions, of a sailing craft with an auxiliary engine. However, a dead calm on a Bahaman bank covered with only ten or fifteen feet of water is not without its compensations to any one who is interested in the animal or vegetable life of the sea-bottom. There are considerable stretches of these banks that consist of almost barren white sand, but there are other wide areas that are rich in varied forms of plant and animal life. The crystal-clearness of the water permits one, on a calm day, to diagnose from the deck of a boat with some degree of certainty, the larger species of algae that are to be seen at the bottom, and with a long-handled rake or a sponge-hook it is a simple matter to secure them for specimens. The dominant algae of the banks, or at least of those parts of the banks that came under our observation, are species of *Penicillus*, *Rhipocephalus*, *Sargassum*, *Laurencia*, *Udotea conglutinata* and *Microdictyon crassum*.

The algae obtained on the trip as a whole are represented by 616 collection numbers, many of these including fluid-preserved as well as dried material.

Respectfully submitted,

MARSHALL A. HOWE.

Assistant Curator.

THE SUMMER MEETING OF THE HORTICULTURAL SOCIETY OF NEW YORK.

The June meeting of the Horticultural Society of New York on Wednesday and Thursday of the second week in June was an unqualified success. The display was not only large, but remarkably representative and also of high quality; the attendance was good, and a large number of prominent horticulturists and amateurs were seen during the two days. The exhibits of peonies, which are referred to in more detail in the notice concerning the Peony Society, were large and fully representative of the varieties in cultivation. That the peony is rapidly growing into public favor is very evident.

Collections of herbaceous perennial plants made a fine showing, in which the honors went easily to a highly meritorious collection sent by the Blue Hill Nurseries, South Braintree, Mass. It is the first time that we can recall that this firm has attended a New York show. Roses were but poorly represented, it being a pretty hard matter to strike the exact day for them. The collection of H. Nichols, gardener to Mrs. J. B. Trevor, Yonkers, N. Y., received the first prize for general quality, although the competing collection had a larger number of varieties. The schedule called for hybrid perpetuals and hybrid teas, but both exhibitors erred in including varieties which cannot be classed in either of these groups. The moss roses are members of the Provence group; and a polyanthà rose in the second prize collection was inexcusably included. The exhibitors should certainly pay closer attention to the actual demands of the schedule. Madame Plantier exhibited in the other is hybrid noisette, and is very doubtfully to be included under the term of hybrid tea.

Siebrecht & Son, New Rochelle, N. Y., who received the second prize in the foregoing class were the only exhibitors of rugosa roses, showing six varieties. Remarkably fine were the collections of native plants from the Bedford Agassiz Association which time and again produces at these shows such exhaustive collections of native plants; grasses, flowering plants, and ferns were all represented in great numbers. They had the field to themselves for the native flowers, but would have been hard to eclipse. They came second to Siebrecht & Son in the display of ferns, both exhibitors showing about thirty species.

Collections of hybrid rhododendrons and azaleas from F. R. Pierson Co., Tarrytown, N. Y., and James Wood, Mt. Kisco, N. Y., attracted considerable attention, and prizes were awarded in the order named. Messrs. Pierson's exhibit was interesting for its range of variety, especially in the Azaleas and for the fact that everything had its name attached. The prizes for strawberries were won by H. Nichols, who showed Marshall as the best berry for home use and Nick Ohmer as the market variety. The same exhibitor also led in the collection of vegetables with a very clean lot well finished, James Wood being a close second.

A number of miscellaneous exhibits unclassified were staged by Mr. Wood. These included native azaleas, sweet peas, a few flowering shrubs, etc., all of which added to the interest of the show. F. Weinberg had a collection of dwarf Japanese plants and a rich crimson-colored *Phyllocactus*, and Siebrecht & Son staged a chaste collection of cut orchids.

The next regular meeting of the society takes place the second Wednesday in October. (Extracted from American Gardening, 25: 488, pp. 387–388.)

NOTES, NEWS AND COMMENT.

Work has recently been commenced by the Borough Department of Highways in the construction of the Southern Boulevard, from the southern entrance of the Garden to the Zoölogcal Park and beyond. The desirability of this improvement was pointed out in this Journal last year, and its completion will be a great boom to both business traffic and pleasure driving, the old roadway having been in bad condition for several years, Its sidewalks will furnish additional paths for pedestrians between the Zoölogical Park and the Garden.

Under a contract of the Department of Parks with Springsted and Adamson, two commodious public comfort stations at the approach to the Elevated Railroad Station were completed and opened on July 1. The structures were designed by Mr. R. W. Gibson, architect, and are of the most approved modern construction throughout. Paths leading to them have been finished and the surroundings partially planted; additional planting here may be carried out in the autumn. The completion of these public comfort stations, of the steam subway from them to the power house, and of their sewage and water-supply connections has made it practicable during the last few weeks to complete the grading, drainage, roads and paths about the power house, and of the space between that building and the Elevated Railroad station.

Satisfactory progress is being made in the construction of the stone bridge across the valley of the Bronx River on the line of the new driveway which will cross the Garden from west to east north of the museum building and the hemlock forest. The rubble masonry of this work is well advanced towards completion ; the stone used here is the surplus from excavations east of the public conservatories made necessary by grading operations for paths and plantations. The foundations of this bridge rest immediately upon the stratum of gravel which underlies the valley. The contract of the Park Department for this bridge is with Mr. M. J. Leahy ; its design is by Mr. John R. Brinley, landscape engineer.

Progress may also be reported in the work of building the cut granite steps at six points along the terrace of the public conservatories and of the two large concrete-steel tanks for aquatic plants in the court of those structures, both works under the contract of the Park Department with Guidone and Galardi ; the path approaches to this terrace are being completed as rapidly as the contract work on the steps permits ; the paths within the court, which will surround the tanks, may be commenced in a few weeks, and their completion will conclude all heavy construction work about these conservatories.

A contract of the Park Department with Hitchings and Co. for the construction of the greenhouse needed to complete the range of propagating houses at the nurseries is nearly completed, and the building will be ready for operation early in August.

Members of the Garden staff took part in the field meeting of botanists arranged by the Philadelphia Botanical Club at McCall's Ferry, on the Susquehanna River, in southeastern Pennsylvania, during the week of July 4, and considerable collections of both herbarium specimens and living plants were obtained. The occasion was a very enjoyable one and may form the basis of an annual event, different regions being visited each year. About twenty-five botanists were present at the meeting at one time or another during the week, and much mutual advantage was gained by the discussion of various topics, short meetings being held in the evening for the formal consideration of observations made during the day.

The total precipitation in the Garden for July, 1904, amounted to 3.59 inches. Maximum temperatures of 82° on the 1st, 93° on the 5th, 85.5° on the 17th, 93° on the 19th and 84° on the 31st were recorded; also minima of 52° on the 3rd, 56° on the 9th, 53.5° on the 14th, 58° on the 25th, and 50° on the 30th.

The temperature of the soil at a depth of 3 inches ranged from 54° to 81°; at a depth of 1 foot from 65° to 73°.

The first shipment of the collections being made by Mr. R. S. Williams in the Philippine Islands, consisting of two large cases of herbarium specimens and seeds, reached the Garden in good order a few weeks ago, and is now being studied, in connection with collections sent by the Forestry Bureau at Manila, by Mr. C. B. Robinson, under the direction of Dr. Britton. The specimens were all obtained on the Island of Luzon. Mr. Williams is continuing his work on that island, and writes that he has shipped another box of specimens. He proposes to move to one of the southern islands within a few months.

Mr. John A. Shafer, Ph.G., Custodian of the Museum, received the degree of Doctor of Pharmacy (Phar.D.) from the University of Western Pennsylvania, at the commencement held in Carnegie Hall, Pittsburg, June 16, 1904.

Prof. E. Burgess, of Normal College, was given the degree of D.Sc., by Hamilton College at its last commencement in recognition of his extensive botanical investigations.

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EDITOR

DANIEL TREMBLY MACDOUGAL

Assistant Director

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JOURNAL

OF

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THE AUTUMN LECTURES.

The Director-in-Chief and other members of the staff will be pleased to receive members and their friends at the grounds in Bronx Park on every Saturday in May and June. Train leaves Grand Central Station, Harlem Division, N. Y. C. R. R., at 2:35 P. M., for Bronx Park. Returning train leaves Bronx Park at 5:32 P. M. Excursion fare 25 cents.

Opportunity will be given for inspection of the Museums, Laboratories, Library and Herbarium, the public Conservatories, the Herbaceous Collection, the Hemlock Forest, and parts of the Arboretum. The walk planned will be a little over a mile.

The following lectures will be given in the lecture hall of the Museum at 4:30 o'clock.

October 1, "The Origin of Species as Illustrated by the Evening Primroses," by Professor Hugo de Vries.

October 8, "The Results of Botanical Explorations of the Bahamas," by Dr. N. L. Britton.

October 15, "A Summer at the Desert Laboratory," by Professor Francis E. Lloyd.

October 22, "Life-history of a Fern," by Professor L. M. Underwood.

October 29, "Botanizing in the Austrian Tyrol," by Dr. W. A. Murrill.

November 5, "Fossil Plants of Vicinity of New York," by Dr. Arthur Hollick.

November 12 (subject to be announced later), by Dr. H. M. Richards.

November 19 (subject to be announced later), by Dr. D. T. MacDougal.

A VISIT TO THE DESERT BOTANICAL LABORATORY.

During the present summer I have had the privilege of spending two months in research at the Desert Botanical Laboratory of the Carnegie Institution, at Tucson. I take this opportunity of presenting a brief account of my visit, and of the laboratory and its surroundings.

I arrived at Tucson, in company with Professor Hugo de Vries, on the evening of June 20, being met and escorted to the hotel by Dr. W. A. Cannon, Resident Investigator, in whose immediate charge the laboratory stands. The two days following, comprising Professor de Vries' visit to Tucson, were spent in a general reconnaisance of the region. We were able during this brief period, to visit the Laboratory and examine the vegetation of the hill upon which it is situated, and to drive over considerable extent of the mesa in three directions. At the close of Professor de Vries' visit, I established myself at the laboratory, and began my work.

The building is situated upon the gentler northern slope of a hill of volcanic rock, overlooking the valley of the Santa Cruz, some two miles from the town of Tucson. The soil is a fine adobe, or clay, with a very generous admixture of stones and boulders. The vegetation of the range of hills and mountains, of which the laboratory hill is an outpost, is in general that of all the rocky hills and ridges which one sees from the train between El Paso and Tucson, with the difference, however, that the saguara or giant cactus (*Cereus giganteus*) is a strong element which is lacking in the more easterly situations. On the other hand, one misses the agave and yucca. Yet the vegetation is rich in desert types, of good vigorous growth, and affords abundant material for investigation.

The most notable elements in point of size and form, and the plants which fix the attention on approaching the hill are the above mentioned cactus, *Cereus giganteus*, the ocotillo (*Fouquieria splendens*) and the palo verde (*Parkinsonia microphylla*), so called on account of its bare green stems. The distinctly green note in the color effect of the hill during the dry season is due to this small tree, which here occurs in considerable numbers.

At the time of my arrival, the giant cactus was at the end of its flowering season, and the earlier matured fruits were bursting.

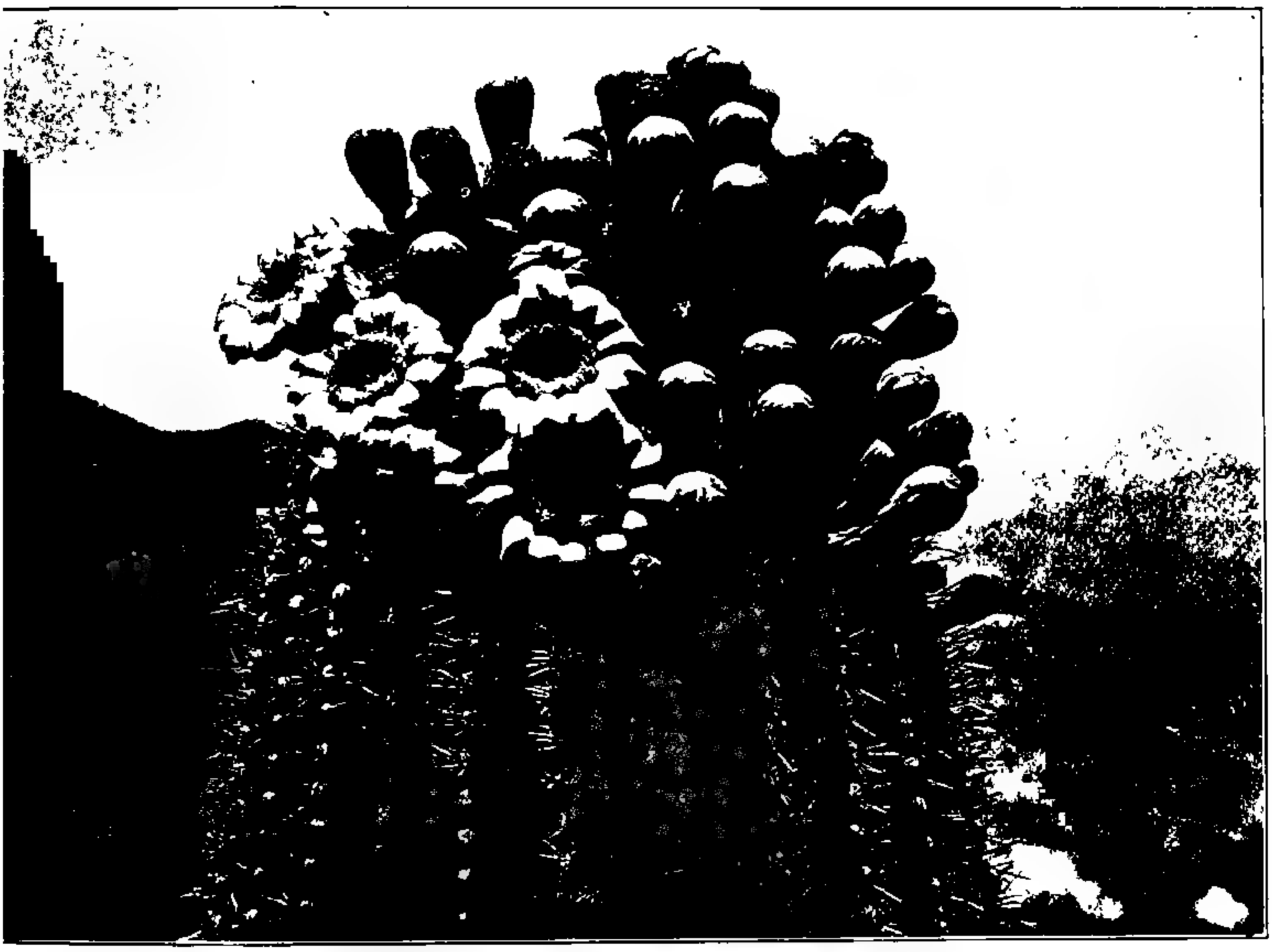

Fig. 27. Flowers, opened and unopened, of the saguara (*Cereus giganteus*).

This plant is certainly one of the most remarkable productions of the vegetable kingdom. Consisting of a single columnar green shaft, or having a few branches extending outward and upward from a point somewhat below the middle of the main axis, its stands with sentinel-like immobility and emphasizes rather than abates the weirdness of the desert landscape. Even when assailed by the storm winds it scarcely nods, while its spines accentuate their hissing. The growth of this plant is evident only in the development of its flowers and fruit, and in the lengthening of the shaft after the first two weeks of the rainy season, which commences about August 1. The flowers are trumpet shaped, green externally, with numerous white petals, and are produced at the tops of the stems (Fig. 27). The tube is always crowded with small insects, chiefly of two kinds, a beetle and a wasp. Although the size of the flower might lead one to expect that it would be pollinated by a larger form, it would appear that these little insects are in part, if not wholly, responsible for the operation. The fruit when ripe is oval, about three inches in length and yellowish green in color and is surmounted by the long withered and hardened corolla tube. When fully mature, the pericarp bursts, exposing the crimson interior tissues. The cavity is filled with a pulp, derived from the long branched seed-stalks, in which are imbedded the numerous black seeds. The opened, highly colored fruits are more striking in appearance than the flowers, and at even a short distance readily deceive one unfamiliar with the plant who mistakes them to be flowers. At the time of flowering and fruiting, the tops of the stems have a curious unkempt appearance. The fruit is much sought after by the Mexicans and Indians as food. The pulp tastes somewhat like that of a fresh fig, but borders on the insipid.

The ocotillo is a leafy shrub which attains a height of about 12 feet and is readily noted by virtue of its peculiar habit. At the base there is a short thick stem from which arise twenty-five or thirty unbranched tapering stems which take an oblique position, giving to the whole plant the form of an inverted cone. During a period of drought, the stems are leafless, but after rain they become densely clothed with rosettes of oval, dark green, slightly glaucous leaves. The stems then look like green cylindrical rods, easily swayed by the wind, and, with the giant cactus, give the most characteristic feature to the flora. I may here add that the ocotillo chiefly engaged my attention during the six weeks spent at the laboratory, my work being directed at the correlation of transpiration and stomatal action.

The palo verde (*Parkinsonia microphylla*) is chiefly characterized by its green smooth bark and numerous but usually leafless twigs. Leaves occur upon young plants, or upon new shoots, but are seldom noticeable. It is evident that the leaf function is transferred to the superficial green tissue of the stems. In form it suggests a well trimmed small orchard tree, although in detail it has its own features, not easily described by the pen, the most striking of which is the great number of slender tapering, usually

FIG. 28. Palo verde (*Parkinsonia microphylla*).

spinose twigs, which render the outline of the tree soft and ill defined (Fig. 28).

In addition to these more dominant elements, there is a varied flora of smaller shrubs of the genera *Lycium*, *Acacia*, *Celtis*, *Covillea* or creosote bush, which after the rains makes a splendid show of bright green foliage and yellow flowers, tree opuntia, prickly pears, barrel cacti, mamillarias, all these and many others, all of which offer material for research.

As I have above pointed out, the summer rains commence about August 1. At this time the vegetation consists only of those perennials which are enabled to resist the drought. Besides the cacti, ocotillo, palo verde, and other low shrubby vegetation above referred to, there are only a few small plants, and almost no herbaceous ones. Of the latter, only a very few scattered individuals of *Euphorbia* and *Astragalus* reward search. A half woody *Cassia* and *Encelia*, a wholly composite, are perhaps the most abundant of smaller plants. At the end of two weeks, however, a rich annual herbage has made its sudden appearance. Most of these have yellow flowers, and thus yellow becomes the dominant flower color. *Tribulus*, with its large poppy-like blossom, *Martynia*, with large fragrant flowers of the snap-dragon type, and *Cassia* are most abundant. The flowers of *Martynia* offer another instance of pollination by means of small insects, while they are usually thought of as adapted especially to large ones, or even small birds. The two-lipped stigma is sensitive, and closes rapidly upon irritation. I have repeatedly noticed that these flowers are infested with aphides which crawl about on the stamens and stigmas, and thus by chance deposit pollen on the sensitive stigmatic lips, which immediately close upon the adherent pollen. Similarly I have noted that the large tubular flowers of a *Datura* (*D. meteloides*) are constantly pollinated by honey bees, though night-flying moths may also be in part responsible.

The season of summer rains is the spring time of the desert. The relative humidity increases materially, so that the heat becomes rather oppressive, and desert conditions are no more present. For the study of the desert vegetation proper therefore, one must be at the laboratory during the prevalence of true desert conditions. August and September, while enriching the flora in point of numbers of plants, change the physiological conditions very materially.

Turning to the laboratory, I found that I was fortunate in having a unique opportunity for work. The abundant northern illumination, with the magnificent range of the Santa Catalina mountains stretching out before the eye, plenty of working space and materials, with the vegetation at the door, with all day and night one's own, together with freedom from the restraints imposed by the closer contact with social conditions found elsewhere, left nothing to be wished for. Here time is punctuated in two points, the rising and the setting of the sun. In the hot though dry and invigorating atmosphere, and under such ideal conditions, one may concentrate and sustain his effort without suffering fatigue. The night's sleep in the open air, enjoyed by everyone in this region, refreshes and restores to abounding energy. I may be permitted to add that, although I had previously reserved judgment as to the wisdom of the Direction in choosing the present site for the laboratory, I am now of the opinion, after seeing all the possibilities of Arizona and New Mexico at least, that the decision to establish the site at Tucson was a happy one. Under the generous and efficient administration of Dr. Cannon, and with its abundant equipment the Desert Botanical Laboratory should draw to it from time to time a goodly number of earnest workers, who will find many directions of study open to them.

During the first two weeks of August, Dr. Cannon and I made an excursion into northern Arizona, visiting the San Francisco Mountain and the Grand Cañon of the Colorado. It was proposed to undertake a physiological reconnaisance, and to this end a number of instruments for the study of transpiration in subalpine plants were taken with us. Unfortunately, however, continuous heavy rains prevented us from carrying out our original purpose in detail. Moreover, the sustained droughts of the then closing dry season had proved markedly inimical to vegetation. The trip was, however, distinctly profitable in enabling us better to estimate the importance of the physiological problems involved in the study of desert vegetation.

In closing I have only to say that I spent two most enjoyable and profitable months at the Desert Botanical Laboratory, and I have pleasure here in acknowledging my obligations to the Advisory Board, to whose courtesy I am indebted for the use of the Laboratory, and to the Botanical Society of America, whose patronage made it possible for me to undertake the work which I carried on.

FRANCIS ERNEST LLOYD.

AN AGAVE IN FLOWER.

Among the collection of desert plants brought back from Arizona and Mexico by Dr. MacDougal in 1902, was an agave from the neighborhood of Nogales, Arizona, a few miles north of the Mexican boundary. Some weeks ago this started to send up its flowering stem, and about the middle of August the first flowers opened. The writer was unable to reach a satisfactory conclusion as to the species to which it belonged, it differing

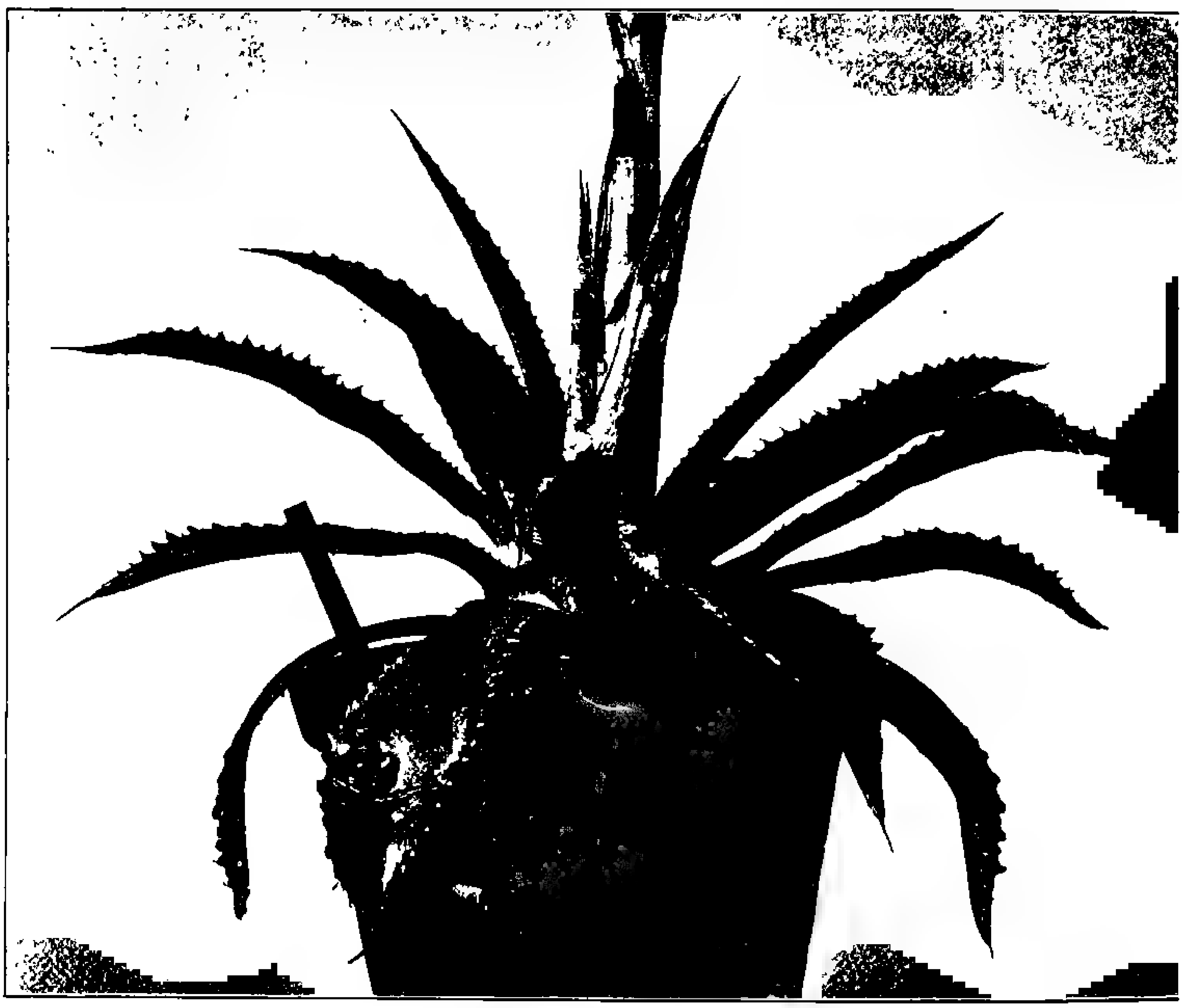

FIG. 29. *Agave Palmeri* Engelm., base of stem and leaves.

considerably from any authentically named material in the collections of the garden. It appears to be almost identical with two specimens in the herbaria at the garden, from the neighborhood of Janos, Chihuahua, Mexico, a small town about 150 miles eastward of Nogales.

A specimen of the flowers and leaves was submitted to Dr. Wm. Trelease, Director of the Missouri Botanic Garden, at St. Louis, who is at present engaged in a study of this interesting group, and the following is the report made by him upon the material furnished:

"This is a very repand form of *Agave Palmeri*, and seems to be what passed for typical *A. Americana* in the 'Botany of the Boundary,' though it, of course, has nothing to do with that species. This Boundary form, which I have myself followed out into the Pajarito Mountains west of Nogales, was at one time called *A. callosa* by Engelmann, in the herbarium, but the species seems to run through so large a range of leaf variation, with identical flower characters, that no one has ever felt the desirability of dividing the species as yet, and in view of my own experience with some of the Mexican species I should hardly feel it wise to do so."

The accompanying illustrations, made from photographs, will illustrate the general form and appearance of the plant, but a few data as to color and size will aid in forming a proper conception of it. The flowering stem is seven or eight feet tall, of a red-purple color with a decided bloom. About fifteen inches of this stem is composed of the panicle, consisting of widely spreading branches about six inches long. The flowers, born in clusters of four or five at the end of the branches, are three to three and a half inches long, including the long-exserted stamens; the perianth, with its erect lobes, is a greenish white color, while the filaments and anthers are of a brownish purple, the anthers being about three quarters of an inch long. The flower exhales a very unpleasant odor.

The rosette at the bottom consists of about twenty oblong-elliptic leaves which are eight to ten inches long and two to two and a half inches wide at the middle; they are abruptly dilated below into a very broad clasping base, and terminate at the apex in a sharp stout spine one half to three quarters of an inch long. The margins are broken up into many teeth with rounded sinuses between, the teeth terminating in spines which are usually reflexed and sometimes one quarter of an inch long.

This is the first one of our agave collection to flower, and for this reason is a matter of considerable interest. As is usual with

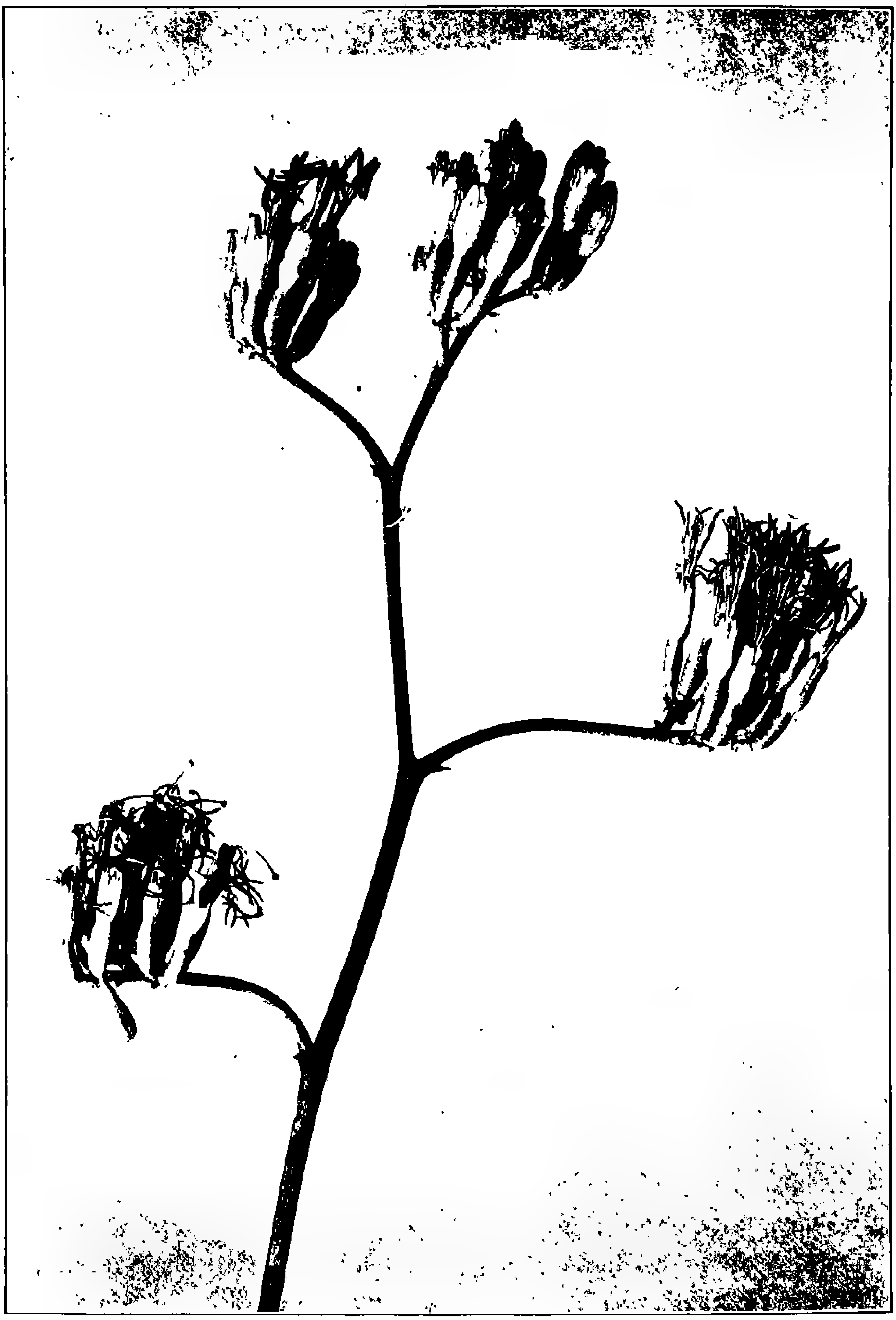

FIG. 30. *Agave Palmeri* Engelm., upper portion of inflorescence.

this group of agaves, the old plant dies soon after it forms flowers and fruits but previous to this they send out suckers from the base, which serve to propagate the species. The plant now in flower is already doing this. We have carefully pollenated the flowers, and trust that the plant may mature some fertile seed.

GEORGE V. NASH.

NOTES, NEWS AND COMMENTS.

An additional appropriation of $75,000, for the continuation of construction work at the Garden, voted by the Board of Estimate and Apportionment on June 24, 1904, became available by the signature of His Honor Mayor McClellan, on August 9, 1904, having been before the Board of Aldermen for the required period of six weeks. It is expected that the expenditure of this money will complete all the driveway bridges and their approaches, and all, or very nearly all, of the driveways laid down in the general plan of the Garden, approved by the Board of Managers and by the Department of Parks, June 21, 1897; also the practical completion of all the heavy grading work, and it will also effect the continuation of the path system east and north of the Museum Building. The largest single piece of work contemplated is the construction of the bridge to carry the main driveway across the valley of the lakes north of the Museum Building, for which a contract may be awarded by the Park Department in the autumn.

Dr. and Mrs. N. L. Britton sailed for Nassau, New Providence, on August 19, for the purpose of continuing the exploration of the Bahamas.

Dr. W. A. Murrill has been appointed Assistant Curator, to take the place of Prof. F. S. Earle, who resigned earlier in the year to become Director of the Experiment Station of Cuba.

Dr. C. S. Gager, of Albany, has been appointed Laboratory Assistant and entered upon his new duties September 1.

Misses W. J. Robinson and M. E. Brackett, who had gone to the Tropical Laboratory of the Garden, at Cinchona, Jamaica, in July, to carry on some morphological investigations, have returned to New York.

The total precipitation in the Garden for August, 1904, amounted to 6.52 inches. Maximum temperatures of 87° on the 6th, 81° on the 11th, 86° on the 17th, and 82° on the 24th were recorded; also minima of 59° on the 2d, 53.5° on the 9th, 51.5° on the 19th, and 45° on the 27th.

ACCESSIONS.

LIBRARY ACCESSIONS FROM JUNE 15, TO AUGUST 15, 1904.

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RENDLE, A. B. *The classification of flowering plants.* Vol. 1. Cambridge, 1904.

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WETTSTEIN, RICHARD R. VON. *Vegetationsbilder aus Südbrasilien.* Leipzig, 1904.

PLANTS AND SEEDS.

2 plants from near Pittsburgh, Pa. (Given by Mr. J. A. Shafer.)

8 plants for the conservatories, from St. Augustine and Miami, Fla. (Collected by Dr. N. L. Britton.)

1 plant *Echeveria cuspidata.* (By exchange with Dr. J. N. Rose.)

3 plants for the conservatories. (Given by Mr. T. S. Brandegee.)

3 plants of *Phyllocactus latifrons.* (By exchange with the New York Zoölogical Society.)

25 plants for the conservatories. (By exchange with Mr. F. Weinberg.)

47 plants for the conservatories, from Chihuahua and Rio Balsas, Mex. (Given by Mr. Albert de Lautreppe.)

1 plant of *Sauromatum pedatum.* (Given by Mr. R. Hamblet.)

160 plants for the conservatories from Arizonia and Lower California. (Collected by Dr. D. T. MacDougal.)

2 plants of *Mimosa sensitiva arborea.* (By exchange with the Bureau of Plant Industry.)

7 plants of *Echeveria cuspidata*, from Vesa Coahuila, Mex. (By exchange with Dr. J. N. Rose.)

5 plants for the conservatories. (By exchange with the Missouri Botanical Garden.)

1 plant of Cyrtopodium. (Given by Mrs. John Egan.)

8 plants for the conservatories. (By exchange with Dr. J. N. Rose.)

5 plants for the herbaceous grounds, from Palisades, N. J. (Collected by Mr. Norman Taylor.)

1 *Castalia pygmaea.* (By exchange with the New York Zoölogical Society.)

1 plant of *Gonolobus laevis.* (Given by Mr. C. S. Williamson.)

36 plants from Lake Hopatcong, N. J. (Collected by Mr. George V. Nash.)

2 plants of *Cerastium arvense velutinum*, from the serpentine barrens, Lancaster Co., Pa. (Given by Mr. J. J. Carter.)

4 plants for the conservatories, collected by Dr. Palmer in Mexico. (By exchange with Dr. J. N. Rose.)

1 plant of *Cereus flagelliformis cristatus.* (By exchange with Mr. F. Weinberg.)

9 plants for herbaceous grounds and conservatories. (Given by Dr. C. G Waters.)

1 plant of *Lenophyllum pumilum.* (By exchange with Dr. J. N. Rose.)

4 plants of *Cactus*, from Cassells, Col. (By exchange with Dr. J. N. Rose.)

8 plants for the herbaceous grounds. (Collected by Mr. Norman Taylor.)

3 plants for the herbaceous grounds. (Collected by Mr. W. W. Eggleston.)

1 plant of *Lilium Canadense*, from Goshen, N. Y. (Collected by Prof. L. M. Underwood.)

21 plants for the herbaceous grounds, from Pleasant Grove, Pa. (Collected by Mr. George V. Nash.)

21 plants for the herbaceous grounds, from McCall's Ferry, Pa. (Collected by Mr. George V. Nash.)

24 plants for the herbaceous grounds, from McCall's Ferry, Pa. (Collected by Dr. N. L. Britton.)

24 plants from Mexico. (Given by Mr. Albert de Lautreppe.)

10 plants for the conservatories. (By exchange with Dr. J. N. Rose.)

3 plants for the herbaceous grounds. (Collected by Mr. George V. Nash.)

1 plant of *Dudleya Plattiana*, from Mt. St. Helena, Cal. (By exchange with Dr. J. N. Rose.)

3 plants of *Iris sicula.* (Given by Mr. J. S. Merrian.)

1 plant of *Isoetes Traversii*, from Tyler's Pond, Ct. (Collected by Prof. L. M. Underwood.)

2 plants of *Begonia.* (Given by Mr. George A. Skene.)

1 plant of *Laelia Digbyana.* (By exchange with Messrs. H. Siebrecht & Son.)

1 plant of *Dudleya cymosa.* (By exchange with Dr. J. N. Rose.)

7 plants for the conservatories. (By exchange with Mr. F. Weinberg.)

5 plants for the conservatories. (By exchange with Mr. Phelps.)

1 plant of *Chamaelirium luteum.* (Given by Dr. J. K. Small.)

1 plant for the conservatories, from Colima, Mex. (By exchange with the Field Columbian Museum.)

6 echeverias. (By exchange with Dr. J. N. Rose.)

3 cuttings of sedums. (By exchange with Dr. J. N. Rose.)

1 *Opuntia.* (By exchange with Mr. F. Weinberg.)

73 fancy dahlias. (By exchange with Dr. H. H. Rusby.)

1 *Notholaena cretacea.* (Given by Mr. C. L. Mason.)

1 *Antennaria Brainerdi.* (Given by Mr. W. W. Eggleston.)

3 palms. (Given by Miss Mary S. Ames.)

1 *Cereus Peruvianus.* (Given by Mrs. Getty.)

7 plants for the herbaceous grounds and morphological gardens. (Collected by Dr. D. T. MacDougal.)

126 bulbs. (Given by Mrs. H. L. Britton.)

146 hardy shrubs and conifers. (Given by Mr. L. M. Palmer.)

21 cacti. (Given by Miss M. T. Bryce.)

5 orchids from Rio Janeiro. (Given by Mr. Dyke.)

5 begonias. (By exchange with Messrs. Siebrecht & Son.)

1 *Encephalartos horridus.* (Purchased.)

3 plants of *Agave Americana.* (Given by Mrs. Getty.)

1 plant of *Adiantum.* (Given by Mr. J. H. Ley.)

70 plants for the conservatories. (By exchange with the National Botanic Garden.)

4 opuntias, from Florida. (Collected by Dr. J. K. Small.)

5 hawthorns. (Given by Mr. J A. Shafer.)

5 plants of *Aralia Chinensis variegata.* (Given by Mr. T. Smith.)

13 plants from New Jersey and Pennsylvania, for the herbaceous grounds and nurseries. (Collected by Dr. N. L. Britton.)

3 plants of *Echeveria Goldmani.* (By exchange with Dr. J. N. Rose.)

130 hardy shrubs and trees. (Purchased.)

19 hardy shrubs and trees. (Given by Messrs. Hicks & Son.)

1 packet seed of *Viola Rafinesquei.* (Collected by Dr. N. L. Britton.)

4 packets of seed from Italy. (Given by Mrs. H. L. Britton.)

5 packets of seed from Cuba. (Collected by Dr. N. L. Britton.)

46 packets of seed from the Philippine Islands. (Collected by Mr. R. S. Williams.)

6 packets of seed from Arizona and Lower California. (Collected by Dr. D. T. MacDougal.)

22 packets of seed from the Philippine Islands. (Given by Mr. H. Leroy Topping.)

12 packets of seed from Colorado Springs, Colo. (Given by Mr. T. D. A. Cockerell.)

3 packets of seed from Santa Fe, N. Mex. (Given by Miss M. Harrison.)

1 packet of seed. (Given by Mr. A. Wakemann.)

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

15 packets of seed. (By exchange with the Botanic Garden, Melbourne, Australia.)

2 packets of seed from Georgia. (Given by Mr. R. M. Harper.)

20 packets of seed from Jamaica. (Given by Mr. R. K. Tanlinson.)

14 packets of seed from New Zealand. (Given by Mr. Wm. H. S. Wood.)

8 packets of seed. (By exchange with Mr. F. Weinberg.)

1 packet of seed. (Given by Mr. C. G. Copp.)

65 packets of seed. (By exchange with the Botanic Garden, Munich.)

3 packets of seed. (By exchange with the Bureau of Plant Industry.)

253 packets of seed from Mexico. (Given by Mr. Albert de Lautreppe.)

1 packet of seed. (Given by Mr. S. B. Parish.)

121 packets of seed. (By exchange with the Missouri Botanic Garden.)

MUSEUM AND HERBARIUM, JUNE AND JULY.

10 specimens of twigs for the collection of North American Dendrology. (Given by Mr. J. Ferguson.)

175 specimens from the Isle of Pines, Cuba. (Given by Mr. A. H. Curtiss.)

3 specimens of Kohlrabi for the economic collections. (Given by Dr. H. H. Rusby.)

2 specimens of fruit of *Acer rubrum.* (Collected by Mr. R. C. Schneider.)

65 specimens from Yucatan. (By exchange with the Field Columbian Museum.)

200 specimens of *Crataegus* from Pennsylvania. (Given by Mr. J. Semple.)

1 specimen of *Halophila Engelmannii* from the Bahamas. (Collected by Dr. M. A. Howe.)

525 specimens from the Bahamas. (Collected by Professor W. C. Coker.)

14 specimens for the collection of North American Dendrology. (Collected by Dr. J. A. Shafer.)

3 specimens of *Carex* from Pennsylvania. (Given by Mr. J. Crawford.)

680 specimens from Europe and Africa. (By exchange with Dr. M. Gandoger.)

7 specimens from New Jersey. (Given by Mr. Macy Cahart.)

9 photographs of Florida vegetation. (Taken by Dr. M. A. Howe.)

1 specimen of crude rubber from Bolivia. (Given by Mr. A. Matgner.)

240 specimens of arctic plants. (By exchange with Botanical Museum, Copenhagen, Denmark.)

118 specimens from New Mexico. (Collected by Mr. O. B. Metcalfe.)

23 specimens of fossil leaves (cretaceous) from Kansas. (Collected by Mr. Chas. S. Sternberg.)

1 specimen of the fruit of *Asimina pygmaea* from Florida. (Given by Miss Elizabeth Blanchard.)

1 specimen of *Cypripedium* from Mississippi. (Given by Professor S. M. Tracy.)

1 specimen of *Draba micrantha* from Iowa. (By exchange with Mr. O. M. Oleson.)

1 specimen of *Hibiscus Trionum* from Texas. (Given by Mr. J. M. Whyte.)

2,000 specimens from southern Florida. (Collected by Dr. N. L. Britton.)

2 specimens of *Bidens Eatoni* from New England. (Given by Mr. A. A. Eaton.)

6 specimens of orchids from Florida. (By exchange with Mr. O. Ames.)

9 specimens from Long Island. (Given by Miss F. A. Mulford.)

7 specimens of *Dentaria* from Connecticut. (Given by Dr. E. H. Eames.)

12 specimens of violets from Vermont. (Given by President E. Brainerd.)

2 specimens of *Dentaria* from Connecticut. (Given by Mr. C. H. Bissell.)

189 specimens of algae from various localities. (By exchange with Trinity College, Dublin.)

2,400 specimens from southern peninsular Florida. (Collected by Dr. J. K. Small and Mr. P. Wilson.)

1,055 specimens from Java. (By exchange with the Bureau of Public Laboratories, Manila, Philippine Islands.)

268 specimens from the Barbados, West Indies. (By exchange with the Imperial Department of Agriculture for the West Indies.)

1,417 specimens from the Philippine Islands, collected by Mr. E. D. Merrill. (By exchange with the Bureau of Public Laboratories, Manila, Philippine Islands.)

2,500 specimens from the Philippine Islands. (Collected by Mr. R. S. Williams.)

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OF

The New York Botanical Garden

EDITOR

DANIEL TREMBLY MACDOUGAL

Assistant Director

CONTENTS

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JOURNAL

OF

The New York Botanical Garden

Vol. V. October, 1904. No. 58.

A VISIT TO THE BOTANICAL LABORATORY AT CINCHONA, JAMAICA.

The Tropical Laboratory of the New York Botanical Garden at Cinchona, Jamaica, like the Biological Station at Naples, gives the American student the advantage of life in a foreign country in addition to what he gains botanically, and the trip from New York at sea level in latitude 42° N. to Cinchona, at 5,000 ft. elevation and only 18° N. from the equator affords many novel and interesting experiences. The five or six days at sea are most restful and make good preparation for mountain climbing later. There is no bother about steamer rugs nor wraps on deck, yet sufficient breeze to make the cabins very tolerable, and rough weather is the exception, so that nearly every one on board is a "good sailor." The passenger list includes patriotic Colombians always ready to talk about the misfortunes of their country, Germans, Italians, Jews, and Bohemians of one sort or another on their way to the islands or to the various South American ports, willing to risk fever in the hope of gain, interesting people to observe and in some cases to know, in the space between the last glimpse of Barnegat Light and the first shadowy outline of Cuba.

The approach to Kingston in the early morning is a brilliant picture. Along the shore at the east are tall cocoanut palms with their crowns of dark green, dun colored quarries, the red brick buildings of Port Royal Dock yards, and at the southwest the ruins of the old fort and the black salt marshes, with a fore-

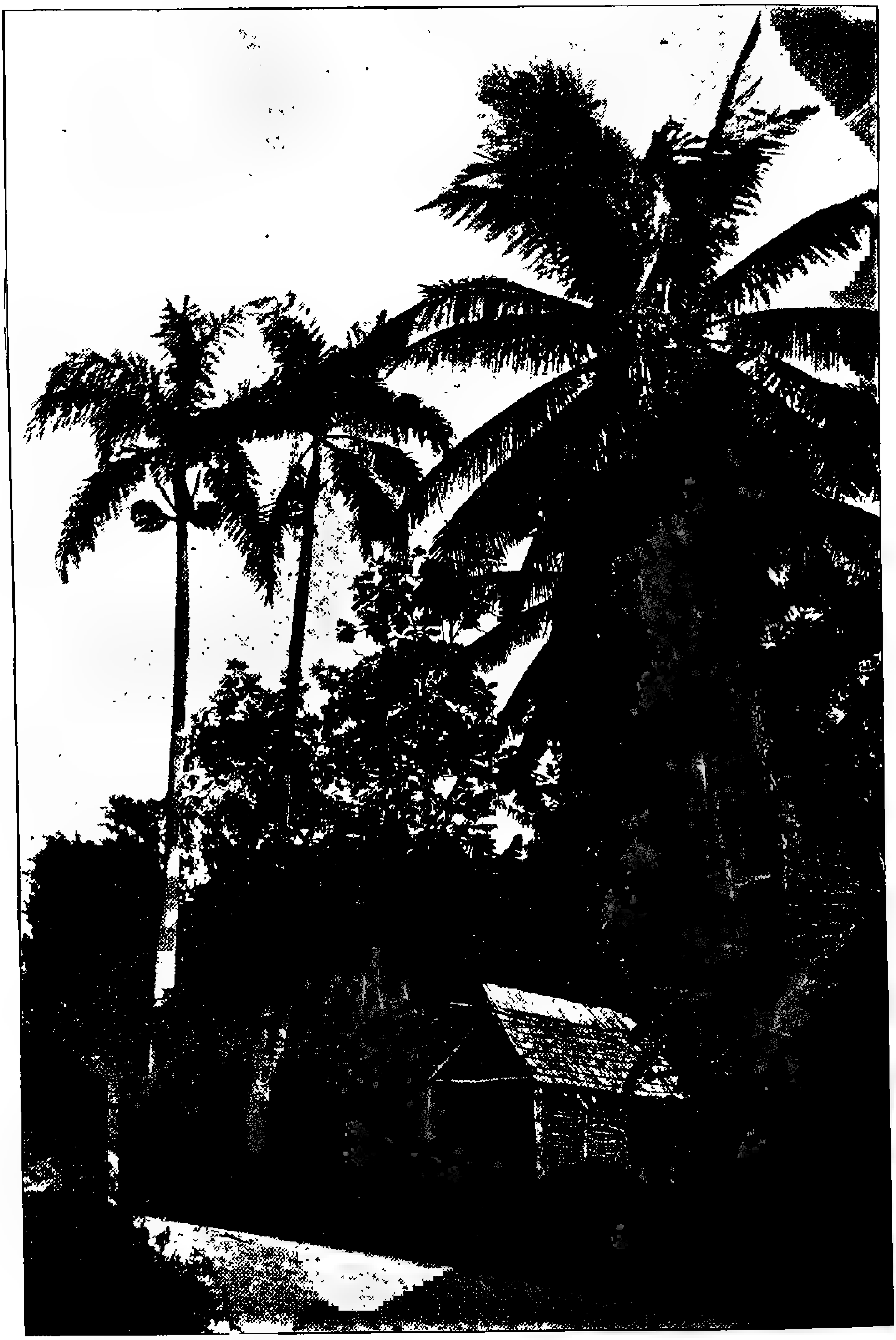

FIG. 31. Wayside scene in Jamaica. Cocoanut, breadfruit, bananas, etc.

ground of the bluest water, a dazzling mirror in the splendid tropical sunlight.

Landed in Kingston, one is impressed with the large number of negroes and the small number of white men. The former include all sorts and conditions, the planter, riding in state in his own carriage, the hotel clerk, tall and dignified, the policeman, the bare-footed market woman, with a huge round basket of fruit or fowls surmounting the gay bandana on her head, trudging along easily and stopping to chat with her acquaintances, never deigning to touch her burden with her hands. The streets are paved and the two-seated carriages or "busses" each drawn by a small pony which is continually lashed to its utmost speed by the black driver, together with the street car service, afford comfortable means of getting about the city. There is little attempt at side-walk, and carriage-drivers, donkeys and men take whatever part of the thoroughfare they choose. The low buildings with their latticed porches have the merit of being adapted to life in the tropics, and though many of them are directly upon the street there is usually an open space in the rear where a palm or mango gives shade. In the more pretentious places in the suburbs the houses are of much the same character as in the business streets but they are surrounded by beautiful grounds and everywhere the *Poinciana*, a magnificent tree, with foliage like an acacia and crowned with a mass of scarlet blossoms rises above the rest.

The trip from Kingston to Cinchona is best made in the morning. The drive of nine miles to Gordon Town is through most picturesque streets where vines run riot over fences and cactus takes the place of barbed wire around many inclosures. The shops are scarcely more than sheds and one may see the baker taking brown loaves from his stone oven, the tailor comfortably stitching under his awning of thatch, the blacksmith pounding his anvil under the shade of a tree. At Gordon Town the carriage road ends and the remaining thirteen miles of the distance must be made by riding a pony or mule. The path follows the course of Hope River, from which Kingston takes its water supply, for several miles, and the steep sides of the valley are lovely with palms, bamboos, the brilliant magenta of the mountain flag, the red of the young leaves of the mango. At 4,000 ft. the summit of Port Royal Range is reached and Kingston is in sight. Then a descent to 2,000 ft. must be made to ford the Yallahs River, a small stream in summer, though the round white boulders along its bed tell a tale of its work at high water. From the Yallahs the climb to Cinchona may be made by several different paths, anyone of which leads past coffee plantations where

FIG. 32. Director's residence at Cinchona.

the white trunks and dark glossy leaves, the fragrant white blossoms or cherry-like fruit are very pleasing on the mountain side.

Cinchona covers about 1,500 acres of mountain land, which was formerly used by the British Government as a station for cultivating the cinchona tree for its bark. Part of this property with its buildings and such furniture as tables, chairs, and beds, is leased by the New York Botanical Garden, for the use of students who wish to observe tropical vegetation, collect specimens, or work upon some problem which involves residence in the tropics. The buildings are a cluster of quaint bungalows, surrounded by terraced gardens (see JOURNAL for January, 1904). Roses blossom nearly the whole year round and the ferns and yuccas are always beautiful.

The laboratory and herbarium are buildings about 12 x 30 feet in size, and well lighted. A shelf which extends along the

FIG. 33. One of the laboratories at Cinchona.

wall serves as a table, and pigeon holes for driers, and a few shelves for reagents constitute the equipment. It is necessary for each student to take with him a microscope; glassware and reagents are furnished by the New York Botanical Garden. It is the intention of the director to equip the laboratory gradually as the needs of students require. Mr. Fawcett, Director of the Public Gardens of Jamaica, is most kind in loaning literature from the library of the Public Gardens to students at Cinchona.

The New York Botanical Garden makes provision for having some one in charge of the living arrangements who understands local conditions. The food is brought from Kingston with the exception of such fruits and vegetables as are obtained from the St. Helen's Gap Market, a crossroads near Cinchona, where the negroes from the surrounding country meet every Thursday to barter their yams, scallions (onions), and mangoes. This market, is more a social than a business affair and donkeys and their mistresses alike refresh themselves upon mangoes while the

FIG. 34. Interior of one of the laboratories.

latter exchange "plenty-how-do-do," so that the place is fairly paved with mango stones. Excellent drinking water is brought from the upper course of Clyde River, a clear, cold, mountain stream, and rain water is stored in large tanks.

The daily temperature in summer varies from about 56° F. in the early morning to about 70° F. in the early afternoon and at evening the grate fire is a comfort. In winter the thermometer may run down to 40° F. in the early morning. The day is about thirteen hours from sunrise to sunset and twilight is very short in this latitude, so early rising and early retiring are the rule. Light rains are of frequent occurrence but the sun dries out everything so quickly that they cause little inconvenience to the collector. Often at midday the mist fills the valley and shuts Cinchona away from the rest of the world but at evening it rolls down to the west and makes a glorious sunset.

There are treasures for the botanist along every path leading from the buildings but the ferns surpass the others in number and variety. Morse's Gap is about four miles away by an easy path and the wealth of tree-ferns and filmies, vines and bromeliads

FIG. 35. Market at St. Helen's Gap near Cinchona.

is a sight worth the whole Jamaica trip to the uninitiated. There are many other localities, equally wonderful, such as the maze of tree-ferns at Monkey Hill, where one makes his way over and under fallen trunks as best he can, quite awed by the silence and the beauty of the place, and calls out to the guide frequently to be sure that he is not lost.

In making excursions into the bush there could not be a keener guide than David Watt, who has collected with different English and American botanists until he has a remarkable verbal knowledge of the mountain flora. The collector finds it necessary to take in addition a "boy" (a negro anywhere from fifteen to fifty years of age) to carry lunch and drinking water, to cut a trail if necessary with the huge cutlass which he always has in a leather sling over his shoulder, and to carry the plants collected.

The necessary expenses of the trip including steamer passage at the summer rate, a month at Cinchona, and guide are about one hundred and sixty dollars and one must count upon another fifty if he wishes to see something of the plains and the western part of the island.

To have personal knowledge of banana plantations, sugar-cane and coffee, of Sapadillos, chochoes, and akee, the experience of tropical living, together with the scientific knowledge which is gained make a trip to the Cinchona Laboratory a delightful part of a botanist's education.

WINIFRED J. ROBINSON.

VASSAR COLLEGE.

THE PALMS OF FLORIDA.

Up to the present time there are definitely known to occur in Florida fourteen species of palms, representing eight genera. Of these fourteen species, eight are endemic to Florida, four confined to the United States, but not restricted to Florida, one is widely distributed in tropical America in addition to its occurrence in Florida, and the remaining palm is the only one not indigenous; this exception is the cocoanut palm, *Cocos nucifera*, which has been introduced, but has taken so kindly to its genial surroundings that it has all the appearance of being native there and to the manner borne, rearing its stately stems into the air upward of eighty or one hundred feet. Surely it is one of the most graceful of palms, giving in great part to the southern part of the peninsula, where it alone thrives, that tropical aspect so appealing to the northerner fresh from the rigors of the northern winter.

All but two of these fourteen palms are at present under cultivation in the collections of the Garden; these exceptions are: *Thrinax Keyensis*, first found on one of the islands of the Marquesas group, some twenty miles west of Key West, and *Serenoa arborescens*, the only other known representative of a genus confined to our southern states, the first and typical species being the common saw palmetto, *S. serrulata*.

Below are the twelve species under cultivation in the Garden, with a few words of description appended to each :

In the genus *Thrinax*, two of the three species are represented ; these are *T. Floridana* and *T. microcarpa*. Of the former, two trees about twenty feet tall were secured in the fall of 1901. The recovery from the shock of removal of palms as large as these must be slow, but these plants are now showing evidences of activity in the pushing out of new leaves. The chief charm of this thrinax is in the abundance of ivory-white fruit which it bears and the elegant contrast of this with the deep green foliage. I shall long remember my first sight of these in the grounds of the large hotel at Miami, where a number of them had attained perfection, and from whence our two specimens were obtained. Some of the clusters of fruit were two or three feet long and a foot through, and they were borne in such profusion that the mass of ivory white completely encircled the tree. *T. microcarpa* has much smaller fruit, and for this reason is not so ornamental, but it is by no means to be despised, and were it not for the presence of its more showy relative, would take a more prominent place. It has more silvery leaves and a thicker trunk, this latter feature giving it a more robust appearance. Both species are unknown outside of Florida.

This is also true of the two species of *Coccothrinax* inhabiting the state, for at present they are known to occur only in the extreme southern part of the peninsula. We are fortunate in possessing living specimens of both of these, which bear respectively the names of *C. jucunda* and *C. Garberi*, although I must confess that our specimens of the latter are still in a doubtful state. This, *C. Garberi*, is known only from the neighborhood of Miami, where it is indeed abundant, and its successful culture has proved a most perplexing problem, not only with us at the Garden, but with others who have attempted to transplant it from its native woods to gardens in the immediate vicinity. It has met with failure everywhere, and failure was predicted when some thirty specimens were carefully dug, packed and shipped to New York in the fall of 1901. These all arrived in good condition, and a number of methods were tried to make them take hold, but all without success, not one of the entire consignment surviving. We are now trying the experiment again with four plants secured by Dr. Britton on a trip to that region the past spring. It is too soon yet to predict results, but the plants are yet alive, and while there is life there is hope. It is a pity too that it does not take more kindly to cultivation, for it is a charming little species and well worth a place in any collection. It seldom attains a height of more than four or five feet, most specimens being only two or three feet. The other species, *C. jucunda*, is much larger in every way, though closely related to it. Of this we have a single specimen which is indicating increased vigor by a more ample display of foliage. The genus *Coccothrinax* is separated from *Thrinax* by its fruit which has black flesh and a channeled seed, while in *Thrinax* the flesh is white and the seed smooth.

Of *Sabal* all three are to be found in our collections. Two of these, *S. glabra* (also known as *S. Adansonii*) and *S. megacarpa*, are dwarf, that is they make no trunk. The former is found all the way from South Carolina to Florida and Louisiana, and is known as the dwarf palmetto or blue stem. The other is confined to the southern part of the peninsula of Florida, and is known as the scrub palmetto. It was described at one time as *S. Etonia*, its specific name referring to a large area of scrub, many square miles in extent, occurring near Altoona, in Lake Co. This scrub formation occurs in isolated areas in the pine lands, and is characterized by a peculiar vegetation, one of the distinctive features being this scrub palmetto. In that part of the state it is not found outside of the scrub. Later the writer saw it in great abundance on the sandy coral ridges around Miami. It has a peculiar twisted rootstock, much resembling the letter S in shape, the apex of this traveling along the surface of the ground but never rising above it. We have of *S. glabra* a number of specimens, and of *S. megacarpa* a lot of nice seedlings, raised from seed secured at Miami in 1901. An attempt was made to transplant mature plants of the latter species, but unsuccessfully. The other species of the genus, *S. Palmetto*, ranges from North Carolina to Florida, and is the palm reaching the most northern extension of the Palmaceae along the Atlantic coast. It is the palmetto of the south, or the cabbage palmetto or cabbage tree, as it is sometimes called. It attains a height of sixty feet or more, and then becomes a conspicuous feature in the landscape for a long distance, its tall slender trunks overtopping all other vegetation. In young trees, and sometimes in individuals fifteen or twenty feet high, the hard bases of the petioles of the leaves remain attached to the trunk, giving to such trees an appearance quite different from that found in the taller trees in which this feature is lacking. The pockets formed by these petiole remnants collect masses of humus which soon become the home of graceful ferns, mainly the golden polypody, *Phlebodium aureum*, and the old man's beard, *Vittaria lineata*. In the collection in the large palm house will be found a specimen illustrating each type of trunk of this species.

The saw palmetto, *Serenoa serrulata*, is the sole representative of this genus in the collections — a single small plant at the propagating houses. Those who have visited Florida and attempted to make a short cut through a growth of this palm probably have reason to remember it, for the petioles of the leaves are viciously armed with thorns which tear the clothing and lacerate the flesh. Then the long creeping rootstocks, almost entirely concealed by the foliage, which ramify over the surface of the ground, furnish an additional impediment to progress, tripping the unwary and plunging them into a mass of thorny leaves. Add to this the danger of the lurking rattlesnake, he of the diamond back, and a trip through a saw-palmetto scrub becomes one of great interest and expectancy.

Rhapidophyllum, a monotypic genus, is found from South Carolina to Florida, and is rather rare. This is also called blue palmetto, but its other common name, needle palm, is much more descriptive, as it is armed with long needle-like thorns. The single species is known as *R. Hystrix*. It might with propriety be called the porcupine palm, the specific name and its armature suggesting this. A single small specimen of this is in the collections.

The royal palm, *Roystonea regia*, will be found in the palm house in two large specimens. These are just beginning to make the trunk which is so characteristic in their native wilds of this stately palm. This species is said to occur throughout the West Indies and in Central America, in addition to its occurrence in Florida. There is at present some doubt as to whether the forms occurring in this wide area are all the same, or whether they are in fact distinct species.

The palm of most interest, and the rarest of all growing in Florida, is *Pseudophoenix Sargentii*, known definitely only from Elliott's and Long Keys. At the former locality it is all but exterminated, the clearing of the land there for pine-apple culture, and the transplanting of specimens to Miami, some thirty miles distant, for decorative purposes, having this result. I believe but a single specimen marks the place where many formerly grew. A gentleman at Miami, who had several of these growing on his place which he had brought from Elliott's Key, kindly presented one to the garden, and this was moved in the fall of 1901. It did not recover from the check it received in transplantal for some time, but is now sending out new leaves and gives promise of really becoming active. It now has five healthy leaves. Our specimen is about twenty feet tall. The genus *Pseudophoenix* was founded by the late Hermann Wendland, that great student of the palms at Herrenhausen, in Hannover, Germany, the name referring probably to the resemblance of the leaves to those of the date palm.

Of the cocoanut palm, *Cocos nucifera*, of which mention has already been made, two specimens are in the collection from Florida. This is a difficult palm to cultivate; it seems to miss the salt air and the washing of its roots by the salt water, for it does best and grows to its greatest perfection along the seashore.

It is greatly desired to secure good living specimens and seed of *Thrinax Keyensis* and *Serenoa arborescens*, to complete our living collection of palms from Florida. We have but single specimens of some of the other palms from that state, and more material, both in living plants and seeds, of such is also greatly desired. The flora of the keys of Florida is very imperfectly known, and there are perhaps other undescribed palms from that region, or the adjacent mainland. An exploration of this region by means of a large sailboat, or better still a reliable motor boat, would certainly yield interesting results.

GEORGE V. NASH.

NOTES, NEWS AND COMMENT.

The remainder of the autumn course of lectures will be given as follows: October 15, "A Summer at the Desert Laboratory," by Professor Francis E. Lloyd; October 29, "Life History of a Fern," by Professor L. M. Underwood; October 22, "Botanizing in the Austrian Tyrol," by Dr. W. A. Murrill; November 5, "Fossil Plants of the Vicinity of New York," Dr. Arthur Hollick; November 12, "The Effect of Wounding on Plants," by Professor H. M. Richards; November 19, "Hybrids; Their Nature and Behavior," by Dr. D. T. MacDougal. According to this revised schedule the lectures given by Professor Underwood and Dr. Murrill will be interchanged.

Dr. and Mrs. Britton returned from the Bahamas late in September. A large amount of herbarium material, specimens of living plants, notes on geographic distribution and other information were secured by this expedition.

Mr. G. V. Nash, accompanied by Mr. Taylor, sailed from New York to Inagua on October 5, for the purpose of continuing the work on the flora of the Bahamas, which it is hoped may be pushed at several points from this time on.

Dr. H. H. Rusby returned from Kew in September, having spent several weeks at work in the herbarium of that institution and in the British Museum, making investigations on the flora of Colombia, South America.

Dr. M. A. Howe returned from an extensive tour among European herbaria on October 1. Visits were made to the herbaria at Kew, British Museum, Lund, Upsala, Copenhagen, Paris and elsewhere for the purpose of studying types of algae. A large number of photographs and notes on critical forms were secured.

Professor Hugo de Vries, Director of the Botanical Garden at Amsterdam, and Professor of Botany in the University of Amsterdam, was a visitor at the Garden during the last week of September, and sailed for Holland on October 5. Professor de Vries arrived in America early in June and during the summer has delivered lectures on the origin of species at the Station for Experimental Evolution at Cold Spring Harbor, L. I., at the University of California, the University of Chicago, at the International Congress of Arts and Sciences, at the Louisiana Purchase Exposition, and at the New York Botanical Garden. Visits were made to a large number of institutions, and personal conferences were held with workers interested in evolution and breeding experiments.

The lectures given by Professor de Vries at the University of California are being edited by Dr. D. T. MacDougal and will appear in a volume to be entitled "Species and Varieties; Their Origin by Mutation," to be published by the Open Court Publishing Co., of Chicago.

The total precipitation in the Garden during September, 1904, amounted to 4.06 inches. Maximum temperatures of 83° on the 4th, 83° on the 8th, 85° on the 18th, and 87° on the 24th were recorded; also minima of 46.5° on the 7th, 44° on the 16th, 31.5° on the 21st, and 34° on the 22d.

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JOURNAL

OF

The New York Botanical Garden

VOL. V. November, 1904. No. 59.

REPORT ON EXPLORATION OF THE BAHAMAS.

(Submitted October 12, 1904, and ordered printed.)

TO THE BOARD OF MANAGERS OF THE NEW YORK BOTANICAL GARDEN.

Gentlemen: With the approval of Mr. D. O. Mills, President of the Garden, I conducted botanical exploration in the Bahama Islands during parts of August and September, 1904, in continuation of the work done in that archipelago last spring, as already reported by Dr. Marshall A. Howe and by me.* I was accompanied and assisted by Mrs. Britton, and by Mr. L. J. K. Brace, a resident botanist of Nassau, New Providence.

In following up the recommendation made by me last spring, that we undertake a detailed botanical survey of the Bahamas, I decided to first examine the flora of New Providence, that being already the best known botanically of all the islands, and thus serving as the most satisfactory basis for subsequent work; while its flora was thus relatively well known, many parts of its area had not been visited by botanists, and my expectation that a considerable number of rare or otherwise interesting species occurred there, though not reported, has been fulfilled by the results of my recent trip.

The island of New Providence is about twenty one miles long and about seven miles in greatest width; its longer axis lies

* JOURNAL N. Y. BOT. GARD. 5: 129–136, 164–166. 1904.

nearly east and west. Its surface is considerably diversified into plain, hill and marsh, and in the interior are several large brackish-water lakes not connected with the sea except by subterranean passages through the porous limestone of which the island is wholly composed, and which is made up of coral sand closely cemented; this limestone has been much eroded, there being numerous caves and locally an enormous number of holes, varying greatly in depth and diameter, known as sink holes, some of them not less than twenty feet deep; the coast line is partly the ordinary rock of the island and partly elegant coral-sand beaches, backed by low sand dunes; most of the swampy lands are brackish, but there are several large fresh water marshy areas; there is no permanent fresh water stream upon the island, but there are several small creeks opening to the sea. The soil is very meagre over nearly all parts of the island, and is derived from the decay of the limestone, which is evidently almost wholly soluble, and the accumulated débris of plants; the observer wonders, at first, at the dense natural thickets which exist, the shrubs and trees growing essentially immediately upon the rock, until closer examination reveals the innumerable cavities in the limestone into which the plants have sent their roots in all directions; surely there can be no flora more firmly attached to its substratum than this is! And what an admirable protection to it from hurricanes!

There are many good driving roads on New Providence, and our explorations were mainly made by wagon; we thus traversed all the mapped roads, driving over 400 miles, stopping frequently to penetrate the country to either side by paths, or forcing our way through the thickets; except upon the roads and well travelled paths, walking is difficult and even dangerous, owing to the jagged rocks which are nearly everywhere just at the surface of the ground or immediately beneath it, but previous South Florida experience on a closely similar formation had trained us to be careful about the footing; naturally under the circumstances progress in the thickets was slow. Otherwise there was little dangerous to be taken heed of; there are no larger animals to be feared, and a careful avoidance of coming in con-

tact with the poison tree (*Metopium*) which is locally very abundant, was all that we found necessary for safety. Mosquitoes and sand flies gave us some annoyance late in the day, and while camping at night, but we successfully avoided all other noxious insects; our old foe the horsefly of the Florida everglades was conspicuously absent.

The plants of the seashore are mostly the same as those of other West Indian and of South Florida coasts, although there is one abundant endemic Bahamian sand dune shrub (*Salmea petrobioides*). The sand dunes are also characterized by the silver-thatch palm (*Coccothrinax*). The marsh flora is likewise mostly Floridian and Cuban, the most interesting species being a small white-flowered water-lily (*Castalia*), very fragrant and elegant, its flowers rising on stalks above the water, in the manner of *Nelumbo*; there are many marsh grasses and sedges, and a number of these were unknown to grow upon the island previous to our visit; the Cat-tail (*Typha*) and the Saw-grass (*Cladium*) are abundant and conspicuous elements of this marsh vegetation.

The land standing just above the marsh levels is often characterized by the palmetto (*Inodes*) which grows commonly just at their borders, frequently quite in the water, and occasionally also on higher land; this tree is identical with the *Inodes Palmetto* of the southeastern states. Associated with it is an endemic species of St. Andrew's cross (*Ascyrum*) a low bushy shrub with pale yellow flowers, and several inconspicuous herbaceous plants, among them in wettish places the beautiful pink-flowered *Eustoma* of the Gentian Family.

At the next higher level, the pine barren is often met with, and this occupies a large portion of the island, so closely resembling in general landscape features and in much of its vegetation the pine-lands of southern Florida, that without close observation the traveller might readily believe them identical. The pine (*Pinus Bahamensis*) is indeed so similar to the *Pinus Elliottii* of south Florida, and to the *Pinus Cubensis* of eastern Cuba, that critical students of trees have pronounced them identical, and I am unable to dispute this conclusion. Likewise, many of the associated

Fig. 38. Pine land, Waterloo, New Providence.

shrubs and other plants are Cuban and Floridian in distribution; the pine grows also upon the slopes of hills, and in places even upon their summits.

It is in the natural woods and thickets, uniformly called coppices, that the greatest number of species occur, some of them Bahamian only, some also Cuban or Floridian, and some common to the three countries. The character of these coppices differs considerably in different parts of the island, and the distribution of the component shrubs and trees, is, as in the Florida hammocks, exceedingly local; in a number of instances a single colony of a plant, composed of but few individuals, was all that we could see of it, even after traversing miles and miles of coppices. The low coppices, both low in stature and usually in altitude above the sea, are of a density equalling or exceeding any thickets that it has ever been my pleasure to penetrate; the trees and shrubs grow straight up and so close together that one has to squeeze between them to get on, and the growth of air-plants (bromeliads and orchids of several species) upon them is something extraordinary; several of the orchids are showy species of *Epidendrum*, and one of them, bearing very long panicles of yellowish-purple flowers, contradicts its generic name by growing upon the ground, instead of on trees; the most remarkable of them is an essentialy leafless vanilla (*V. Eggersiana*) which scrambles through and upon the shrubs in great abundance and is one of the most curious of Bahamian plants; with it climbs a very slender relative of the bamboos (*Arthrostylidium*) its short flowering branches densely tufted at the joints of the stem. It is in the high coppices that the larger trees occur, the mahogany (*Swietenia*) and the wild figs (*Ficus brevifolia* and *F. sapotifolia*) being of the greatest size, and accompanied by numerous other species which attain smaller dimensions. The growth here is less dense than that of the low coppices, and the air plants are less abundant, though two or three species of *Epidendrum*, and the Long Moss (*Tillandsia usneoides*) which hangs so abundantly from the live oaks and other trees in our southeastern states, are occasionally met with.

The accumulated débris of leaves and twigs makes the meager

Fig. 39. Coppice, Waterloo, New Providence.

black soil of the coppices relatively valuable for agricultural purposes and much of the coppice area has been cleared therefor; should this process go on continuously, the natural growths would, of course, disappear, and a most beautiful and interesting natural feature be lost; the reservation of a few areas of it in different parts of the island would make safe a very attractive and in some respects unique feature and would probably be a profitable public policy, as such reservations have proven to be elsewhere.

Practically all of the area of New Providence not occupied by one or another of the features already mentioned and not under cultivation, roadway or habitation, is scrub-land, being areas which have formerly been deforested for cultivation or otherwise, and permitted to grow up again; there is much of this land, and the character of its vegetation is usually indicative of its original condition.

The collections for our museums and herbarium, of living plants for our conservatories and of seeds for germination, aggregate about 4,000 specimens, included under 710 collection numbers; much of this material is new to us, other specimens are of species of which our representation was previously imperfect or incomplete, and some illustrate plants hitherto unknown to science.

I now propose to extend the exploration to other Bahamian islands and to this end have sent Mr. Nash, our head gardener, to the island of Inagua for about a month, and have commissioned Mr. Brace, who assisted me on New Providence, to examine the island of Abaco. Their work will give us desired information and specimens from both the southern and the northern parts of the archipelago.

Respectfully submitted,

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

NOTES, NEWS AND COMMENT.

Two more lectures are yet to be given in the autumn course: that of Prof. H. M. Richards on "The effect of wounding on plants," Nov. 12, and "Hybrids: their nature and behavior," by Dr. D. T. MacDougal on Nov. 19.

Dr. N. L. Britton, Director-in-Chief received the degree of Doctor of Science during the recent sesquicentennial celebration at Columbia University.

The Department of Botany of Columbia University was awarded a gold medal for its botanical exhibit at the Louisiana Purchase Exposition. The exhibit consisted principally of material for demonstration and teaching arranged in swinging frames together with illustrations prepared by C. C. Curtis.

Dr. J. K. Small, Curator of the Museums, started for Florida on October 28. He will spend a month in carrying out some investigations of the flora of that region.

The Library has recently acquired a number of interesting and valuable books from the libraries of Mr. John J. Crooke and Mr. J. B. Ellis. From Mr. Crooke's collection have come among other items the first twenty-eight volumes of the third series of Curtis's Botanical Magazine, long a desiderata of the Library, a very fine copy of Abbot & Smith's Natural History of the Rarer Lepidopterous Insects of Georgia, 1797, with the beautiful colored plates of plants and insects; Nees von Esenbeck's Flora Germanica; and a copy of the original issue of De Candolle & Redouté's "Plantes Grasses." From Mr. Ellis' library have been procured a copy of Saccardo's Fungi Italici, a complete set of Berkeley's "Notices of British Fungi," taken from the Annals of Natural History, and a large and valuable collection of over 1,100 pamphlets on Fungi.

The total precipitation in the Garden during October, 1904, amounted to 2.77 inches. Maximum temperatures of 75° on the 3d, 80° on the 10th, 83° on the 18th, and 67° on the 25th, were observed; also minima of 41½° on the 2d, 32½° on the 7th, 33° on the 23d, and 22½° on the 31st.

A rearrangement of the meterological apparatus was made late in September by which the rain-gauge was fixed to the roof of the physiological laboratory in the Museum, in which position it has been found to register approximately the same amount of precipitation as a second instrument in the nursery. Hereafter the records will be taken from the Museum. All of the thermographic apparatus and thermometers has been installed inside of the experimental ground, with the recording apparatus in a small office.

ACCESSIONS.

LIBRARY ACCESSIONS FROM AUGUST 16 TO NOVEMBER 1.

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HERBARIUM

25 specimens from Connecticut. (Collected by Dr. D. T. MacDougal.)

1 specimen of dragon's blood in the original palm leaf wrapper. (Given by Dr. J. A. Shafer.)

10 specimens of herbs for the drug collection. (Collected by Mr. Q. T. Shafer.)

73 photographs of New Zealand vegetation. (Presented by Mr. L. Cockayne.)

2 specimens from Bronx Park. (Collected by Dr. N. L. Britton.)

17 specimens from New Jersey. (Collected by Miss P. C. Clarke.)

130 photographs of South American vegetation. (Received from Dr. E. Ule.)

1 specimen of the white-fruited strawberry from the Adirondacks, N. Y. (Presented by Mrs. A. M. Smith.)

2 specimens from Illinois. (By exchange with Dr. J. Schneck.)

2 specimens from eastern United States. (By exchange with the U. S. National Museum.)

202 specimens from the Philippine Islands. (By exchange with the Bureau of Public Laboratories.)

1 specimen of crude rubber from Colorado. (Presented by Prof. T. D. A. Cockerell.)

20 specimens of fungi from the Adirondacks, N. Y. (Given by Prof. H. J. Banker.)

1 specimen of mistletoe from Colorado. (Given by Prof. E. Bethel.)

24 specimens of violets from New Jersey. (Given by Mr. H. D. House.)

2 specimens of North American fungi. (By exchange with Cornell University.)

1 specimen of *Coralhoriza* from Maine. (Given by Mr. B. C. Gruenberg.)

68 specimens from the upper Delaware Valley. (Collected by Dr. N. L. Britton.)

20 specimens of mosses from the Philippine Islands. (By exchange with the Bureau of Public Laboratories.)

8 specimens of Texan fungi. (Presented by Mr. P. L. Ricker.)

2 specimens from North Carolina. (Presented by Miss E. A. Lehman.)

1 specimen of *Dodecatheon Hugeri* from North Carolina. (Given by Mr. C. D. Beadle.)

1 herbarium specimen from Texas. (Given by the U. S. Department of Agriculture.)

46 specimens of fungi from the western United States. (Collected by Prof. C. F. Baker.)

124 specimens from North America. (By exchange with the U. S. National Museum.)

1 specimen of *Uniola paniculata* from the Bahamas. (Collected by Dr. M. A. Howe.)

125 specimens from New Zealand. (Presented by Mr. L. Cockayne.)

857 specimens from western North America. (Collected by Prof. M. E. Jones.)

255 specimens from Georgia. (Collected by Mr. R. M. Harper.)

300 herbarium specimens from California. (Collected by Mr. A. A. Heller.)

380 specimens from the Gulf States. (Collected by Prof. S. M. Tracy.)

38 specimens of Jamaica ferns. (By exchange with the U. S. National Museum.)

23 museum specimens of *Crataegus*. (Given by Mr. C K. Dodge.)

20 museum specimens of *Crataegus*. (Given by Mr. J. Semple.)

78 specimens from the Philippines. (By exchange with the U. S. National Museum.)

1 specimen of *Crataegus* from Colorado. (Given by Prof. E. E. Bogue.)

14 specimens of Georgia fungi. (Given by Mr. R. M. Harper.)

1,200 specimens of fungi from Virginia and Tennessee. (Collected by Dr. W. A. Murrill.)

8 specimens of fungi from United States. (Given by Miss V. S. White.)

1 specimen of fungus from Pennsylvania. (Given by Mrs. C. K. Small.)

10 museum specimens of *Crataegus*. (Given by Prof. C. H. Peck.)

2 museum specimens of *Crataegus*. (Given by Mr. E. B. Harger.)

14 specimens of *Crataegus*. (Given by Mr. E. J. Palmer.)

32 specimens of fungi from Long Island. (Collected by Prof. Underwood and Dr. Murrill.)

107 flowering plants and ferns from Jamaica. (By exchange with the U. S. National Museum.)

1 museum specimen of bog oak from Ireland. (Given by Mr. Wm. Gaynor.)

1 specimen of fungus from Mexico. (Given by Mr. P. L. Ricker.)

2 museum specimens of *Crataegus* from Connecticut. (Given by Dr. C. B. Graves.)

5 museum specimens of *Crataegus* from Pennsylvania. (Given by Prof. C. L. Gruber.)

1 museum specimen of *Leptamnium Virginianum*. (Given by Mr. J. Semple.)

2 museum specimens of fruits of *Toxylon pomiferum*. (Given by Mr. Jacob Schafer.)

3 museum specimens, a partially finished Panama hat, a pair of sandals and a bag from Colombia, S. A. (Given by Mr. T. S. Alexander.)

57 specimens of twigs for the collection of North American dendrology. (Collected by Dr. J. A. Shafer.)

9 museum specimens of various plant products from the West Indies. (Given by Messrs. Hugo Brussel & Company.)

4 museum specimens of Georgia fruits. (By exchange with Mr. R. M. Harper.)

5 museum specimens of *Crataegus*. (By exchange with Prof. E. Wilkinson.)

11 museum specimens of *Crataegus*. (Given by Mr. H. C. Skeels.)

8 museum specimens of *Crataegus*. (Given by Mr. W. H. Blanchard.)

18 specimens of North Carolina fungi. (Given by Mr. E. R. Memminger.)

4 museum specimens of algae from Lower California. (By exchange with the Museum of Natural History, Paris.)

2 herbarium specimens of *Crataegus* from Michigan. (Given by Dr. Louis Sherman.)

15 specimens of hepatics from Sweden. (Given by Mr. H. W. Arnell.)

3 herbarium specimens of marine algae from Africa and Sweden. (Given by the Botanical Museum, Hamburg.)

1 specimen of the fruit of *Oxydendrum arboreum* from Pennsylvania. (Given by Mr. J. A. Medsger.)

1 museum specimen of cork elm from Connecticut. (Given by Mr. W. J. Hill.)

186 museum specimens of *Crataegus* from Vermont, Massachusetts, Connecticut, New York, Pennsylvania and Delaware. (Collected by Mr. W. W. Eggleston.)

4 specimens of hepatics from Central America. (Collected by Mr. C. F. Baker.)

4 specimens of lichens from Naples, Italy. (By exchange with Mr. C. Cufino.)

13 specimens of mosses from Alaska. (Given by Mr. W. T. Horne.)

2 specimens of mosses from West Virginia. (Given by Mr. A. LeRoy Andrews.)

1 specimen of fungus from Virginia. (Given by Miss V. W. Murrill.)

542 specimens of mosses from Guadeloupe and Martinique. (Collected by M. Père Duss.)

2 specimens of mosses from Maryland. (Given by Prof. J. B. S. Martin.)

4 specimens of Chinese giant peppers. (Given by Mr. Frank Weinsch.)

1 museum specimen of mango seeds from Florida. (Given by Dr. J. K. Small.)

15 museum specimens of Philippine plants, collected by Mr. V. LeRoy Topping. (By exchange with the U. S. National Museum.)

1 museum specimen of *Thalesia uniflora.* (Collected by Mr. R. C. Schneider.)

8 specimens of mosses from Kansas. (Given by Prof. M. A. Barber.)

1 specimen of fungus from Long Island. (Given by Miss I. F. Hapgood.)

80 specimens of lichens from Guadeloupe and Martinique. (Collected by M. Père Duss.)

2 specimens of mosses from Vermont and Connecticut. (Given by Miss Annie Lorenz.)

7 museum specimens of date palm leaves and products from Egypt. (Given by Miss A. M. Vail.)

18 specimens of drugs. (Given by Mr. Q. T. Shafer.)

1 specimen of tobacco from Guadeloupe, W. I. (Given by Prof. F. E. Lloyd.)

4 crude palmetto brushes and fiber from Florida. (Given by Dr. J. K. Small.)

3 museum specimens, hat braid made of corn husks and crude rope made of Sisal fiber from the Bahamas. (Given by Mrs. N. L. Britton.)

1 museum specimen of lemons from the Bahamas. (Given by Mrs. N. L. Britton.)

17 specimens of mosses from California. (Collected by Mr. A. A. Heller.)

4,116 herbarium specimens of marine algae from California and Europe, being the herbarium of Dr. C. L. Anderson.

10 herbarium specimens of marine algae from the East Indies. (By exchange with Madame A. Weber-van Bosse.)

1 specimen of *Cardamine digitata* from the Arctic Coast. (Given by Mr. J. M. Macoun.)

32 specimens from British America. (By exchange with the Geological Survey of Canada.)

2,100 specimens from southern peninsular Florida. (Collected by Dr. J. K. Small and Mr. P. Wilson.)

26 specimens of Florida fungi. (Collected by Mrs. N. L. Britton.)

16 specimens of mosses from Florida. (By exchange with Mr. S. Rapp.)

15 specimens of mosses from Central America. (Collected by Mr. C. F. Baker.)

1 museum specimen of the fruit of *Quercus palustris* from New Jersey. (Given by O. P. Medsger.)

6 specimens of fungi from Long Island. (Collected by Dr. J. H. Barnhart.)

29 specimens for the Systematic Museum. (Collected by Dr. J. A. Shafer.)

17 specimens of mosses from British Columbia. (By exchange with Mr. L. Cufino.)

50 specimens "Musci Acrocarpi Boreali Americana." (By exchange with Mr. J. M. Holzinger.)

12 specimens of fungi from Jamaica. (Collected by Miss W. J. Robinson.)

12 specimens of ferns from Long Island. (Collected by Prof. Underwood and Miss Mulford.)

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BRONX PARK, NEW YORK CITY

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JOURNAL

OF

The New York Botanical Garden

EDITOR

DANIEL TREMBLY MACDOUGAL

Assistant Director

CONTENTS

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AT 41 NORTH QUEEN STREET, LANCASTER, PA.
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JOURNAL

OF

The New York Botanical Garden

Vol. V. December, 1904. No. 60.

REPORT ON A TRIP TO EUROPE.

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

Acting under instructions from the Board of Managers of the Garden, I was engaged in work in European herbaria during the past summer and I beg to present below a brief report upon the work there carried on. I sailed for Europe on June 4 with the purpose of visiting certain herbaria and museums where the historical "types" of American marine algæ are preserved, and of making a more or less critical study of such types. Specimens, chiefly of my own collecting in the West Indian region, were taken for comparisons with these originals. Provision, also, was made for photographing the types whenever it might appear that a photograph would be of essential service in future studies, and it is a pleasure to record that permission to take such photographs was very courteously granted in every case in which it was asked. In addition to examining American materials from which species were first described, I was enabled also to see the European or other foreign types of various species with which American plants have been associated. With the idea of saving time and of facilitating the recognition of the taxonomic type, I had previously made out in card-index form a list of the types which I hoped to find at each of the places visited. On these cards, in addition to the original name and place of publication of the species was given the manner of citation of the original specimens, this usually by quoting the words used by the author in referring to the material that he had in hand.

The first herbarium visited and one of the most important for the special object in view was that of the Trinity College, Dublin, where are found the algal collections of W. H. Harvey, author of the "Nereis Boreali-Americana" and two or three shorter papers on the American seaweeds. Professor Harvey's Nereis, published 1852–58, was the first and remains the last attempt to describe the marine algae of North America as a whole, if a very few works of world-wide scope are left out of

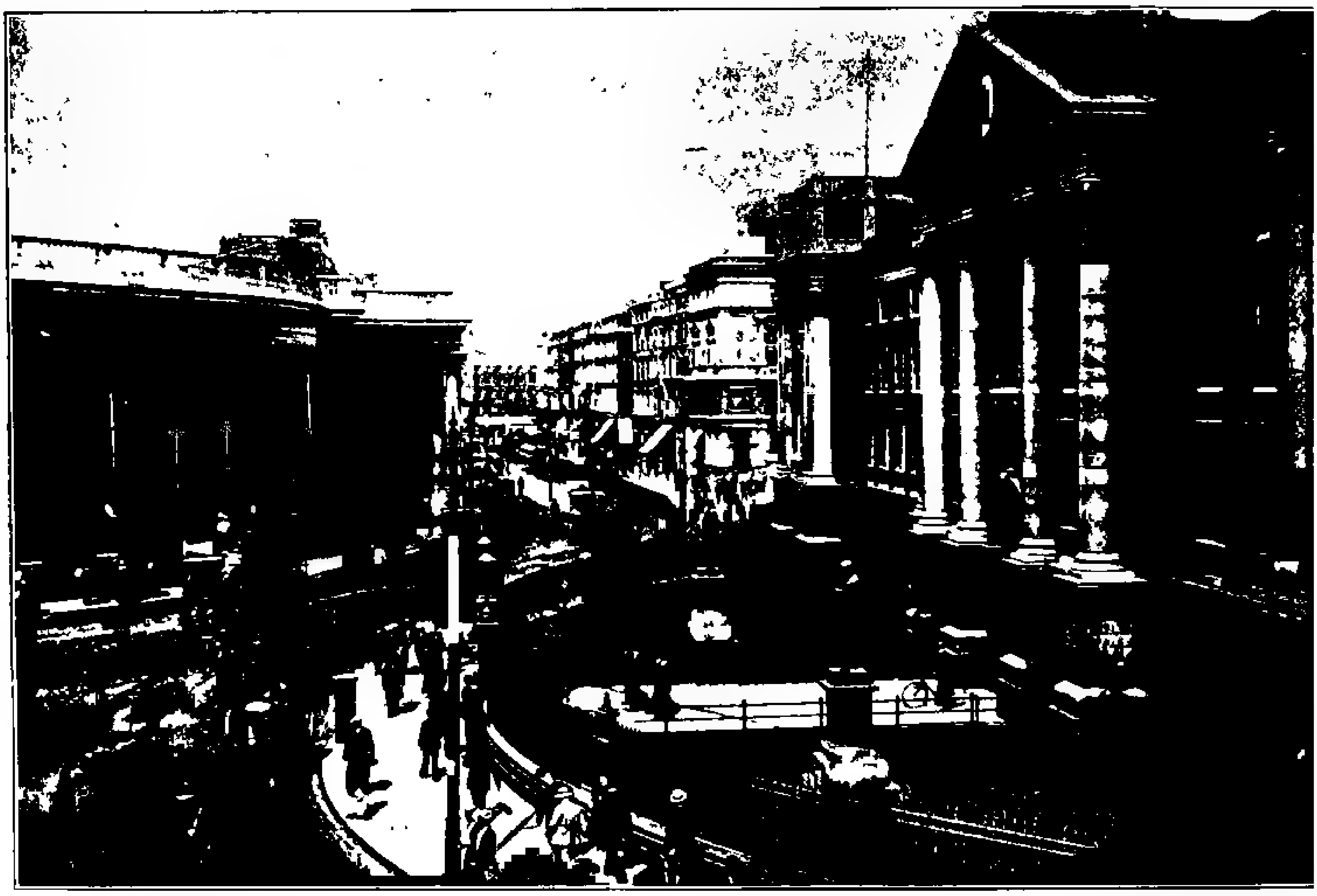

FIG. 40. Trinity College, Dublin. The main entrance and the building in which the algal collections of Professor W. H. Harvey are preserved are shown on the right.

account. He was the first describer of a good number of American species and a hundred or more of his American types are to be seen in the herbarium of Trinity College.

In London and vicinity, more or less time was spent in three herbaria, that of the Natural History Department of the British Museum on Cromwell Road, that of the Royal Botanic Gardens at Kew, and the Linnaean Herbarium at the rooms of the Linnean Society in Burlington House. In the rich collections of the British Museum, certain originals of J. E. Gray and of Dickie, and a set of Guadeloupe algae distributed by Mazé were of special interest. In the collections of the Royal Gardens at Kew are some of the algae from the herbarium of Dawson Turner, author of the classical volumes usually referred to as the "Historia Fucorum." The algae secured by the Challenger Expedition are also to be found at Kew. Advantage was taken of the excellent libraries of the British Museum and of the Royal Gardens to consult several publications which are not yet accessible in New York. The Linnaean herbarium, as is well known, is a rather unsatisfactory one from the standpoint of the type-hunter, nevertheless, it was interesting and edifying to glance over some of the specimens which we have reason to believe once passed under the eye of the "Father of Botany."

After a brief visit to the Dillenian herbarium at Oxford, I went on to France, where the first stop was at Caen. In the herbarium of the Institut Botanique of Caen are found the collections of several well-known students of the marine algae, but those of Lamouroux, who wrote chiefly between 1805 and 1821, were of special interest. The probable types of thirty or more species were examined here, some of them being evidently the specimens from which the figures published by Lamouroux were drawn. At Paris, in the herbarium of the Muséum d'Histoire Naturelle, three weeks were devoted to studying and photographing some of the algae described by Montagne, by De la Pylaie, and by Decaisne. Bachelot de la Pylaie proposed a considerable number of new specific and varietal names for the kelps and rockweeds of St. Pierre, Miquelon, and Newfoundland, which region he visited in 1816 and again in 1819. Montagne was the first describer of numerous American species, particularly from the West Indies. At the Muséum, I saw also a set of the second edition of Mazé and Schramm's Algae of Guadeloupe. The original materials used by the brothers Crouan in making the determinations on which Mazé and Schramm's "Essai de Classification des Algues de la Guadeloupe" * was based

* This work was published in three editions of which the first two are extremely rare. A copy of one of the earlier editions has come into the possession of the Garden during the present year from Père Duss of Guadeloupe.

are now, I believe, in the possession of M. Edouard Bornet, but these I was unable to see at this time owing to the absence of M. Bornet from Paris.

On leaving Paris I went to Eerbeek in eastern Holland, where I was enabled to see certain originals in the collections of Kützing and of Hauck through the courtesy and generous hospitality of Madame Weber-van Bosse, the present owner of these collec-

FIG. 41. Botanical Museum, University of Lund, Sweden. The Agardh herbarium is preserved in this building.

tions. My next stop was a brief one at Oldenburg in the grand duchy of the same name. Here, in excellent condition, was found the herbarium of A. W. Roth, author of the Catalecta Botanica (1797–1806) and of other well-known works. The specimens are usually accompanied by full data and by copies of the specific diagnoses in Roth's own hand.

In Hamburg, a few plants of the Binder herbarium, now in possession of the Botanical Institute, were seen, and in Copenhagen, at the Botanical Museum, a few of Lyngbye and of Vahl.

From Copenhagen, I went to Lund in southern Sweden, where a stay of about a month, the longest of the journey, was made. In the herbarium of the University of Lund is deposited the Agardh collection of algae, consisting of more than 50,000 specimens and doubtless the richest in the world in respect of original materials from which marine species have been described. C. A. Agardh began to publish papers on the classification of the algae as early as 1810. The last work of J. G. Agardh, his son, appeared in 1901. During this active period of more than ninety years, they received much material from America, and the originals from which over two hundred North American (including West Indian) species have been proposed are to be found in the possession of the University of Lund.

In the herbarium of the Royal Academy of Sciences in Stockholm I was permitted to examine types of the few Brazilian species described by Areschoug. This practically finished the summer's study of types, though I had also the pleasure of visiting the universities of Upsala and of Kristiania, and of seeing something of their important collections of algæ. In England, on the homeward journey, I enjoyed the opportunity of visiting the botanical museums and laboratories of the Owens College, Manchester, and of the University College, Liverpool.

The photographs which were obtained of over three hundred of the types examined are expected to prove particularly useful in projected studies, especially in the case of forms which have never been figured and in genera like *Gracilaria* and *Gigartina*, in which attempts to define species have been based chiefly upon external form. Exchanges of specimens were made with several of the institutions visited, and others have been arranged for.

Without attempting to name all who helped to make my visits to foreign herbaria pleasant and instructive, I feel that special acknowledgments of courteously granted privileges and valued assistance are due to Professor E. Perceval Wright, of Trinity College, Dublin ; Mr. George Murray and Mr. and Mrs. Antony Gepp, of the Botanical Department of the British

Museum, London; Sir W. T. Thiselton-Dyer, Dr. Otto Stapf, and Mr. A. D. Cotton, of the Royal Botanic Gardens, Kew; Mr. B. Daydon Jackson, of the Linnean Society, London; Mr. G. C. Druce, Oxford; Professor Octave Lignier and M. Raymond LeBey of the Institut Botanique, Caen; M. Paul Hariot of the Muséum d'Histoire Naturelle, Paris; Madame A. Weber-van Bosse, Eerbeek, Holland; Dr. J. Martin, Grossherzogl. Museum, Oldenburg im Gr., Germany; Dr. A. Voigt and Major Th. Reinbold, Botanisches Museum, Hamburg; Dr. F. Börgesen, Botanisk Museum, Copenhagen; Professors Sv. Murbeck and Otto Nordstedt, Lund; Professor V. B. Wittrock and Dr. G. O. A. Malme, Riksmuseum, Stockholm; Professor F. R. Kjellman and Dr. Nils Svedelius, Upsala; and Professor N. Wille, Kristiania.

Respectfully submitted,

MARSHALL A. HOWE,
Assistant Curator.

NOTES, NEWS AND COMMENT.

One of the most important and valuable contributions of scientific material yet made to the Garden has recently been received from Sir William Dyer, director of the Royal Gardens at Kew, England, consisting of many thousand herbarium and museum specimens of lichens, duplicates from the famous lichen herbarium formed by the Rev. W. A. Leighton, of Luciefelde, Shrewsbury, and presented by him to the Royal Gardens in 1882. Mr. Leighton was an accepted authority on lichens in England, but owing to the crowded condition of the herbarium at Kew for the last twenty years it has hitherto been impossible to arrange his collection properly for consultation. The additional fire-proof building recently erected at Kew for the purposes of the herbarium has now made it possible to install this collection, together with other lichen collections there, and it was found that many of Leighton's specimens duplicated those which Kew had previously received from other sources, including a nearly complete set of published exsiccata, that is dried specimens arranged in series and identified by numbers and suitable labels.

Sir William Dyer remarks, " These duplicate exsiccata, which I believe are very complete, have been withdrawn and I do not think that I can do better than present them to your herbarium to which I have now given instruction that they shall be despatched. You will also receive from us a copy of Rees's Cyclopaedia which we purchased at a very cheap rate and which you will no doubt be glad to add to your library."

Work on roads, paths and grading has been actively continued during the autumn, and much progress has been made. It was hoped at the time the additional appropriation for construction made by the city become available for expenditure in August, that the main driveway from the Bronx Park Station of the New York Central and Hudson River Railroad to the Newell Avenue entrance at the Williamsbridge end of the Garden, could be completed and thrown open for use, but it has proved impossible to finish this work properly, and its final completion will have to be deferred until early spring. The paths around the tanks for aquatic plants in the court of the conservatories, and all the grading and sodding necessary there, have been finished, as well as paths aggregating about half a mile in length east of the Herbaceous Garden and east of the Museum Building, and the telford foundation for an approximately additional length has been laid on the fruticetum plain, and to connect the bridges crossing the railway at Moshulu Parkway and Woodlawn Road, including a large amount of grading and sodding. Grading operations have also been continued at the rear of the museum building, the surplus dirt and rock taken from there being used as filling for roads and paths and for telford foundation.

It having been found desirable and economical to have more horses available for use on the grounds, two additional stalls have recently been built at the stable, by an inexpensive modification of the sheds at that building, and a paddock for the horses which has long been needed, is being obtained by the building of a picket fence around about a quarter-acre of ground at the rear of the stable; this paddock has been made possible by the elimination of the construction railway used for several years by Mr. John B. MacDonald in hauling surplus earth and rock from the excavations for the Jerome Park Reservoir.

The wooden trestle which has carried this construction railway across the fruticetum north of the museum building, and across the valley of the Bronx River, is rapidly being dismantled by its purchaser, Mr. Thomas Ghee, and it is expected that it will completely disappear during the coming winter.

Mr. George V. Nash and Mr. Norman Taylor returned from an exploring tour around the island of Inagua in the Bahamas late in December. The expedition secured a valuable collection of living and preserved plants, including many massive specimens of the few cacti native to the island. A large number of photographs of the vegetation were also made.

The precipitation in the Garden during November, 1904, amounted to 2.17 inches. Maximum temperatures of 63° on the 1st, 60° on the 8th, 58° on the 20th, and 58° on the 22d were recorded: also minima of 31° on the 1st, 25.5° on the 12th, 1.95° ou the 18th, and 18° on the 28th.

ACCESSIONS.

PLANTS AND SEEDS.

19 plants for the conservatories. (By exchange with the Buffalo Botanic Garden.)

58 plants from Vermont and Mt. Washington. (Collected by Mr. W. W. Eggleston.)

24 plants from New Brunswick, N. J. (Collected by Mr. W. W. Eggleston.)

1 plant of *Antennaria*, from Deep Run, Penn. (Collected by Mr. W. W. Eggleston.)

25 plants from Connecticut. (Collected by Mr. W. W. Eggleston.)

5 plants from New Jersey. (Collected by Mr. W. W. Eggleston.)

16 plants for the conservatories. (By exchange with Mr. Frank Weinberg.)

8 plants from Vermont. (Given by Mr. W. H. Blanchard.)

32 plants from Forked River, N. J. (Collected by Mr. George V. Nash.)

97 plants from Inagua, Bahamas. (Collected by Mr. George V. Nash and N. Taylor.)

14 plants from Costa Rica and Mexico. (By exchange with the U. S. Nat. Museum, through Dr. J. N. Rose.)

1 plant of *Sedum* sp. (By exchange with the U. S. Nat. Museum, through Dr. J. N. Rose.)

2 plants of *Opuntia* sp. (By exchange with the U. S. Nat. Museum, through Dr. J. N. Rose.)

19 plants for the conservatories. (By exchange with the U. S. Nat. Museum, through Dr. J. N. Rose.)

6 plants for the conservatories. (By exchange with Mr. O. W. Barrett.)

5 plants of *Sedum* sp. (By exchange with the Department of Parks, Borough of the Bronx.)

1 plant of *Pennisetum macrophyllum atrosanguineum.* (By exchange with the Department of Parks, Borough of the Bronx.)

8 plants for the herbaceous grounds. (Given by Mr. C. S. Williamson.)

31 plants from Jamaica. (Collected by Miss W. J. Robinson.)

112 plants and bulbs from New Providence, Bahamas. (Collected by Dr. N. L. Britton.)

3 plants for the herbaceous grounds, from Prince's Bay, Staten Island. (Collected by Dr. N. L. Britton.)

11 plants for the conservatories. (By exchange with Messrs. Siebrecht & Son.)

53 plants for the conservatories. (By exchange with the Missouri Botanic Garden.)

1 plant of *Schizaea pusilla* from Toms River, N. J. (Given by Rev. L. H. Lighthipe.)

1 orchid for the conservatories. (Given by Mrs. H. Fox.)

33 plants for the conservatories, from Chihuahua and Durango, Mexico. (Given by Mr. A. De Lautreppe.)

4 plants of *Opuntia* sp., from Daytona, Fla. (Collected by Dr. J. K. Small.)

1 plant of *Pellaea atropurpurea cristata.* (By exchange with the Missouri Botanical Garden.)

1 plant of *Zinziber Zinziber.* (Given by Dr. J. A. Shafer.)

3 plants for the conservatories. (Given by Miss M. T. Cockroft.)

1 fern for the conservatories. (Given by Mr. J. Crosby Brown.)

1 plant of *Agave Americana.* (Given by Mr. Hollis.)

1 plant of *Trachycarpus excelsa.* (Given by Mr. Hunter.)

1 plant for the conservatories. (By exchange with the Royal Gardens, Kew, England.)

1 plant for the conservatories. (Given by Mr. J. Bestelmeyer.)

1 plant for the conservatories. (Given by Dr. H. H. Rusby.)

1 plant of *Rosa Banksiana.* (Given by Mrs. H. L. Britton.)

1 plant of *Salvinia Brasiliensis.* (Given by Mr. Cardif.)

21 plants from Jamaica. (Given by Mr. R. K. Tomlinson.)

1 plant of *Nephrolepis Washingtonensis.* (Given by Mr. Chas. Lainier.)

1 plant of *Adiantum Croweanum.* (Given by Mr. Peter Crowe.)

6 plants from Maine. (Given by Mr. David S. George.)

2 plants for the conservatories. (Collected by Dr. W. A. Cannon and Prof. F. E. Lloyd.)

2 plants for the conservatories. (Given by Miss Abbie Small.)

1 plant of *Solidago* sp. from Connecticut. (Given by Dr. P. A. Rydberg.)

11 plants for the conservatories. (Given by Mrs. E. S. Perkins.)

5 plants for the herbaceous grounds. (Given by Prof. Ezra Brainerd.)

3 plants for the herbaceous grounds. (Collected by Mr. N. Taylor.)

1 plant of *Epiphyllum* sp. (Given by Mrs. W. H. Creamer.)

1 plant for the herbaceous grounds. (By exchange with the Department of Parks, Borough of Brooklyn.)

2 plants of *Liparis elata* from Florida. (Given by Mr. Oakes Ames.)

1 plant of *Tigridia* sp. (Given by Mr. G. A. Skene.)

1 plant of *Lygodium palmatum*. (Given by Prof. F. E. Lloyd.)

4 plants for the herbaceous grounds from Nova Scotia. (Collected by Mr. C. B. Robinson.)

1 plant of *Echinocactus* sp. (Given by Mr. W. Lighte.)

2 plants for the conservatories. (Given by Mr. H. G. Runkle.)

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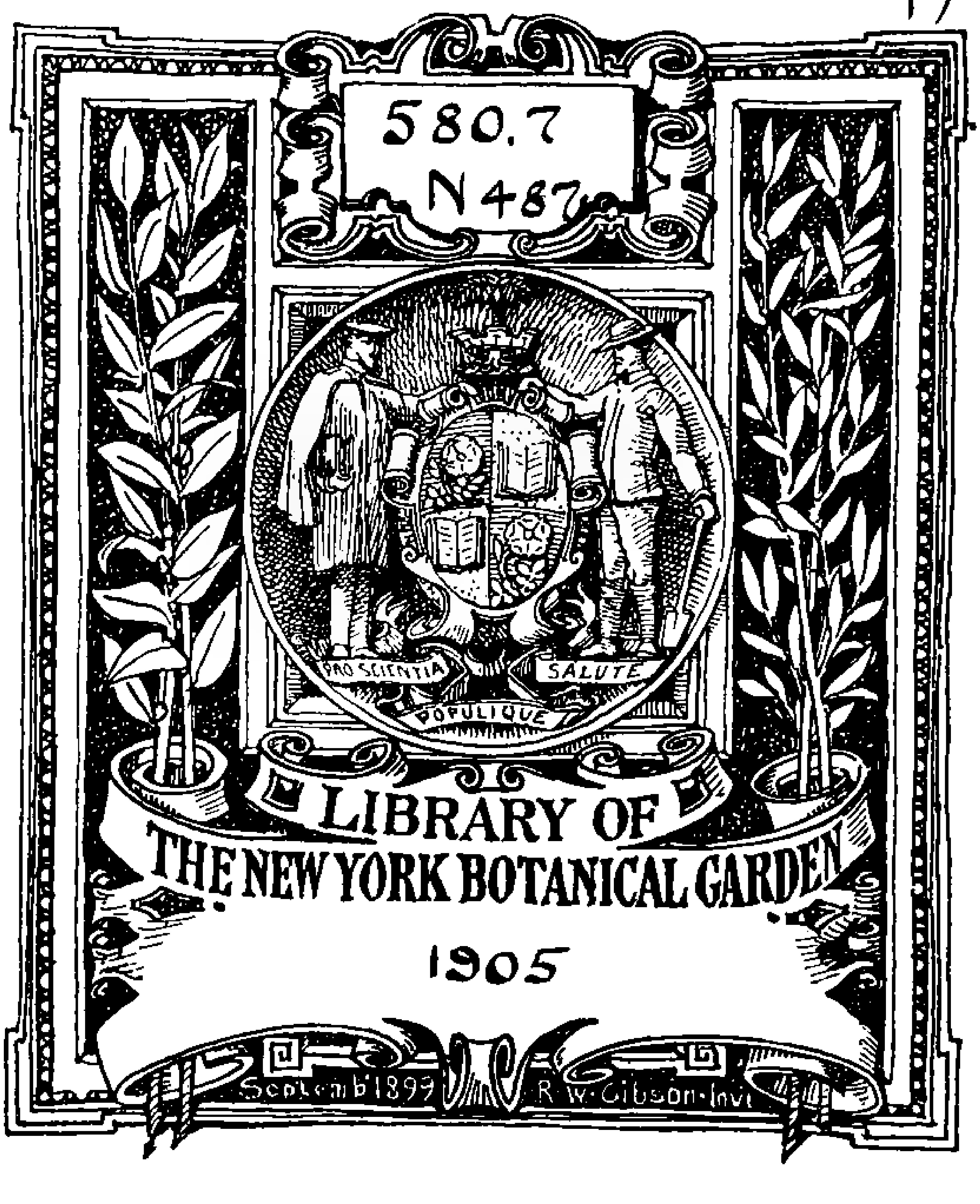
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EDITOR

DANIEL TREMBLY MACDOUGAL

Assistant Director

VOLUME VI

WITH 7 PLATES AND 40 FIGURES

1905

PUBLISHED FOR THE GARDEN

AT 41 NORTH QUEEN STREET, LANCASTER, PA.
BY THE NEW ERA PRINTING COMPANY

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JOURNAL

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The New York Botanical Garden

Vol. VI. January, 1905. No. 61.

BOTANICAL EXPLORATION OF THE INAGUA ISLANDS, BAHAMAS.

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

Dear Sir: I submit herewith my report upon a trip to the Inaguas. I was accompanied by Mr. Norman Taylor, as assistant. We left New York on October 5, 1904, and arrived again in this city on November 11, after an absence of a little over five weeks, four of which were spent on the islands.

On our arrival at Mathew Town on the tenth of October, we were met by Mr. A. B. Barbes, who, by previous arrangement, had kindly selected accommodations for us at the home of Mr. Chas. A. Sargent. This gentleman proved a most genial and pleasant host, and his kindly consideration and thoughtfulness made our stay on the islands a most enjoyable one. His intimate knowledge of the country and its people made his services to us invaluable in planning our trips.

As these islands had not been botanically explored previous to our visit, and as many of the places visited by us are known by local names only, I have thought it advisable to present with this report a map of the islands (Fig. 1), indicating the points at which we touched and their official or local names. As I have failed to find any account in botanical literature of the vegetation of these most interesting islands, I present herewith a rather detailed account of our trips in and around them.

The Inaguas consist of two islands, Little Inagua and Great Inagua; when the word "Inagua" alone is employed it refers

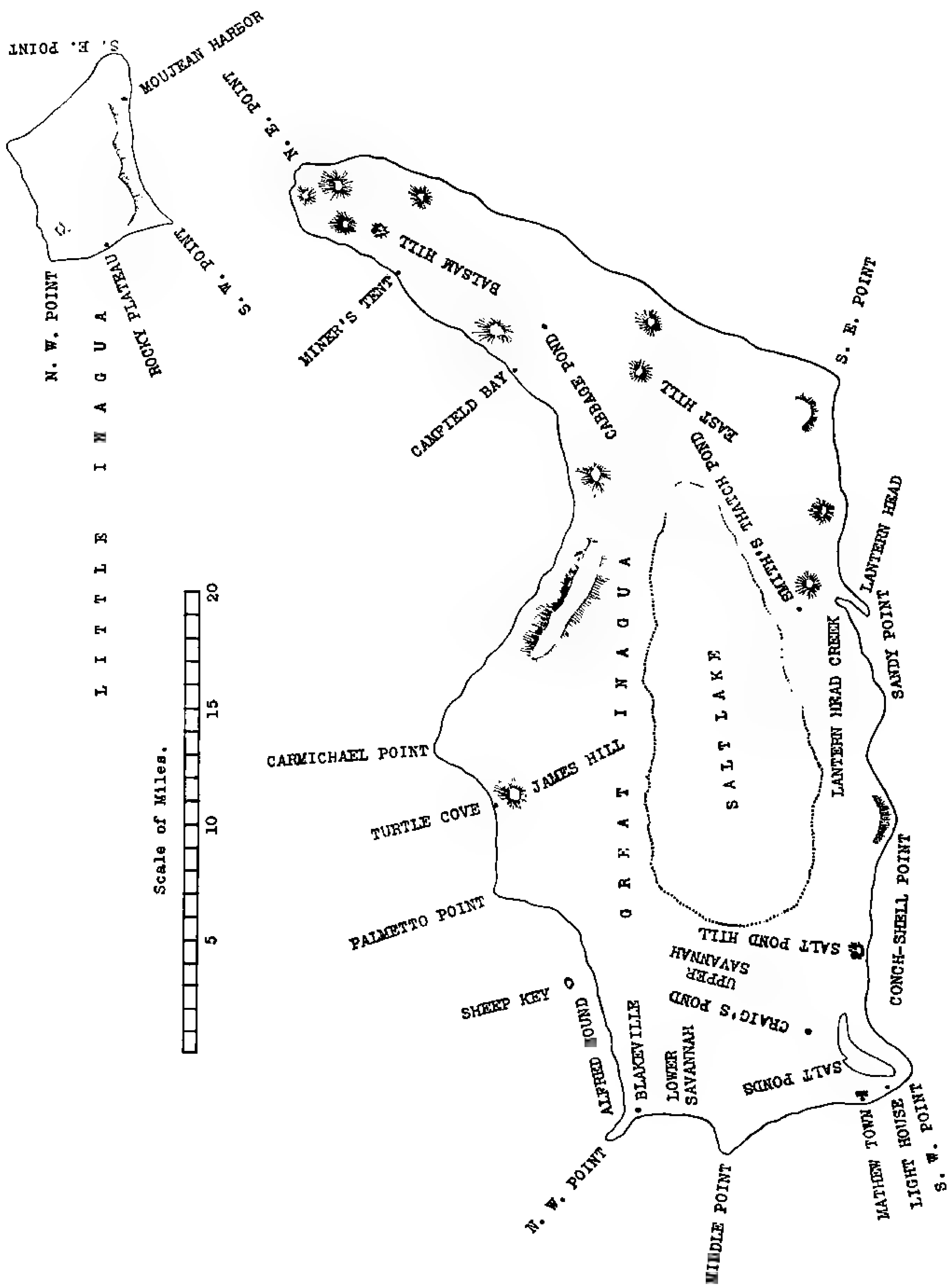

FIG. I. Map of the Inaguas.

always to the larger island. Great Inagua is about 47 miles long and has a maximum width of about 20 miles. The coast is very irregular in outline, especially on the northern side. Sandy beaches are interspersed with rocky shores which are much dreaded by those who have to navigate the waters in that neighborhood. The general surface is flat, only a few feet above sea-level. Skirting the shores, and more rarely in the interior, are rocky ridges, often with slight elevations at irregular intervals. These elevations, while appearing of considerable size as viewed on an approach from the sea, are really of little significance and

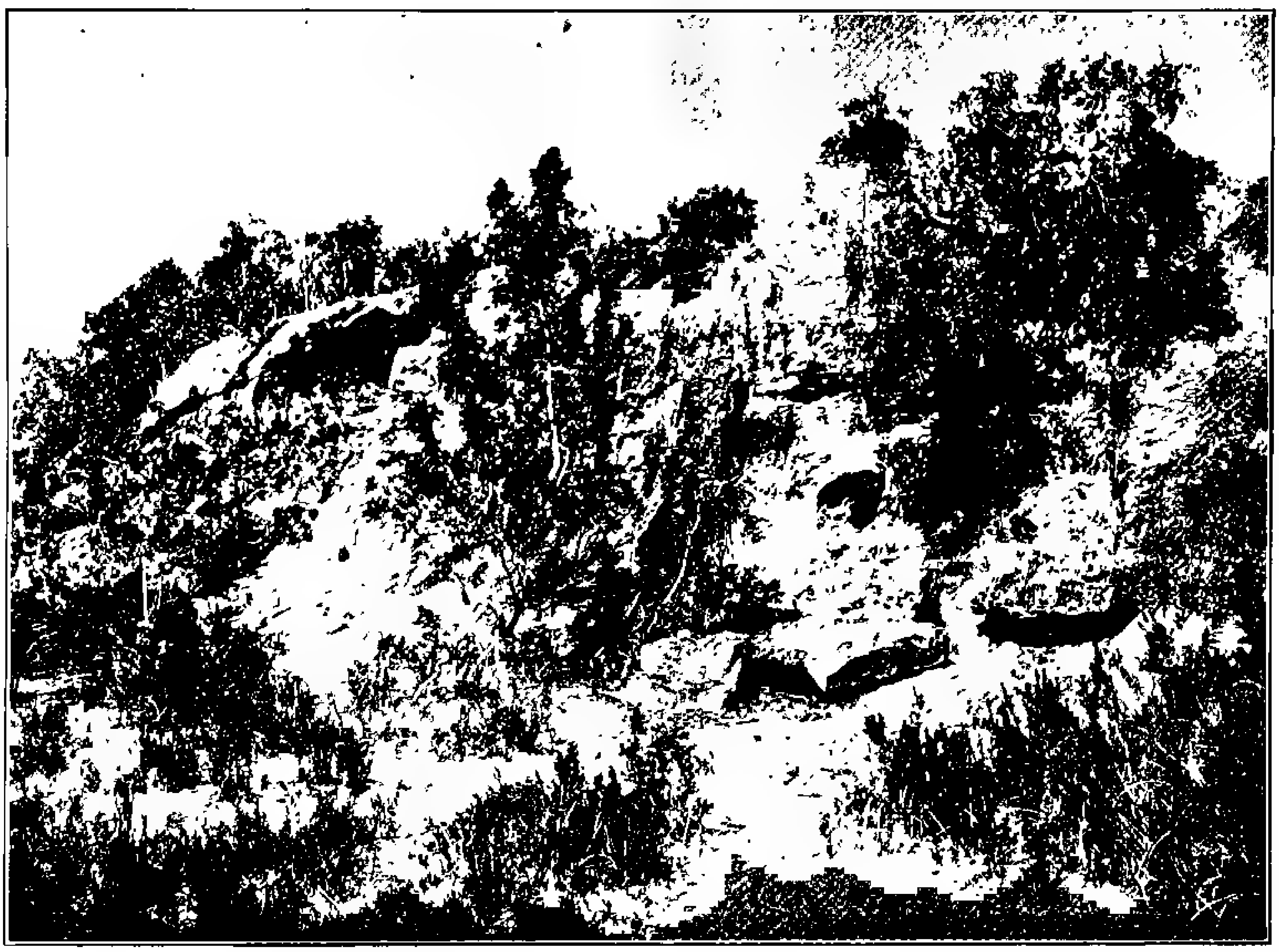

FIG. 2. Base of Salt Pond Hill, where the salina formation impinges upon it, showing honey-combed character of the rock.

do not in any way change the character of the flora. The highest point on the islands, East Hill, has an elevation of 132 feet. James Hill on the north side is 90 feet high, and Salt Pond Hill on the south side is probably of about the same height. The island is a mass of limestone rock, honey-combed throughout with holes and caves some of the latter are of quite extended area. The walls at the mouth of these caves are free of vegetation, unless it be a scattered bush or two. In the low parts of the island this rock is but little disturbed, but on many of the hillsides and at the hill summits it is broken up into large irregular jagged masses which make traveling extremely difficult and tiresome. The accompanying illustration (Fig. 2), made from a photograph, depicts the character of this rock and the holes which are found in it everywhere.

Mathew Town, in about lat. 21° N., really the only town on the islands, is located in the southwestern corner of Great Inagua. It has a population in the neighborhood of 2,000, of which number only about 20 are whites. Formerly great quantities of salt were produced here by the evaporation of sea-water, the dry climate lending itself well to this industry. This has now dwindled to a mere remnant of its former greatness, and the manufacture at present amounts to very little. The furnishing of laborers to the various steamship lines, whose vessels call here, and turtle-fishing are now the principal industries.

Little Inagua is located about six miles north of Northeast Point, Great Inagua. It is a much smaller island than its neighbor, measuring about 8 miles long by 5 miles wide. Like Great Inagua, it is composed entirely of honey-combed limestone rock, and what has been said of the general topographical features of the larger island will also apply here. Its highest portions are located at the easterly end, the elevated ridges decreasing toward the western end, which is flat.

In these islands there are no public conveyances and all communication, excepting with points within a few miles of each other, is by sail-boat. For use in our long trips we chartered a sloop, 22 feet long, from Mr. D. D. Sargent, the American Consul. We were fortunate in securing the services as captain of Mr. Henry Mitchell, who, with two helpers, formed the crew. His knowledge of the islands and their vegetation made his services peculiarly valuable. He conducted us to many rare plants on the islands which otherwise we might have missed.

For trips to near-by points we had the use of the horse and carriage of our host, who possessed the only two-seated vehicle in town. Mr. Dudley Brown, his nephew, kindly offered us his services as guide on such trips.

A number of excursions were made on foot into the scrub within a short distance of the town, but for distances greater than a mile or two it was found better to employ a horse and wagon, and trips were made in this manner to Salt Pond Hill, the Upper Savannah and the Salt Lake, Craig's Pond and the Lower Savannah.

The first of the long trips, occupying six days, was devoted to an exploration of the north side of Great Inagua and to the south and west coasts of Little Inagua. Our first landing was made on Great Inagua, at a point a little to the southward of Blakeville, which is not far from Northwest Point. From our point of landing a road leads into the interior, winding through the scrub, and finally entering the Lower Savannah. We found much of interest along this road. Especially noteworthy was *Tripsacum dactyloides* L., the gama grass, as this was its only occurrence on the islands noted by us, and it later proved to be an addition to the known flora of the Bahamas. It grew in rather low places in the scrub, where there was more water and soil than usual. Our first near view of the savannah formation was obtained when the path suddenly entered the Lower Savannah. The name is indicative of the character of this region, for it is a flat grassy plain, devoid of timber, with the exception of small areas, called coppices, which will be described later.

After continuing for about a mile and a half, pretty thoroughly exploring this part of the savannah, we returned to the sloop. We then rounded Northwest Point and proceeded through Alfred Sound to Sheep Cay, which is about fourteen miles from Mathew Town.

The channel separating Sheep Cay from the mainland is perhaps three quarters of a mile wide. A little over an hour of the day remaining to us before sundown, we determined to explore this cay at once. It is practically the only one of any size near these shores, and a description of it therefore will be of interest. It is a quarter of a mile long or a little more, its width being somewhat less than its length. Like the mainland, it is composed entirely of a porous limestone rock, ruinous to shoes and wearing apparel. The surface is perfectly flat, and lies only a few feet above sea-level. This supports a dense vegetation, for this part of the world, and many trees 15 to 20 feet tall, with trunks 12 to 15 inches in diameter, rise up out of the solid floor of rock. The eastern end of the cay is rather thickly wooded with trees and shrubs; while the western end is more open, quite an extensive area there being entirely devoid of ligneous vegetation, and supporting on the rocks, bare of soil, a luxuriant growth of the sea-beach morning-glory, *Ipomoea Pes-Caprae* (L.) Sweet. I have been familiar with this heretofore as a strand plant, and to find it in such luxuriance in the interior of the cay was a surprise. A species of fig was also quite common. In the open places trees of this attained considerable proportions; one covered a circular area about thirty feet in diameter with a dense mass of green. This tree reached a height of about fifteen feet, thus being fully twice as broad as high. A small pond occurs in the western side of the cay, and on the northern side is quite an extensive cocoanut grove. There is not a sufficient depth of soil to make the trees as stately and fruitful as I have seen the cocoanut in other regions. The fruit here, as in other parts of the Inaguas, is small and the meat thin and small in quantity. But the charm of the tree was there, and this charm of elegance and stateliness was all the more striking here where all its associates are dwarfs. The mangrove, *Rhizophora Mangle* L., also forms part of the vegetation, but an inconspicuous part; in fact, it was but sparingly noted by us in the Inaguas, its presence occurring mainly along the salt-water creeks, and sparsely on the salinas in the interior.

We stopped next at Turtle Cove, a few miles to the west, and proceeded inland about a mile to a slight elevation called James Hill, which is about 90 feet above sea-level. Its flora is similar to that of the surrounding scrub. Among the cactus vegetation here was a species of *Pilocereus* (afterward found in great abundance on Little Inagua); *Opuntia Dillenii* Haw.; another *Opuntia* belonging to the *spinosissima* section (found also generally distributed on both islands, and quite common around Mathew Town, no. 1063); and a species of the genus *Cactus* growing in great profusion, often forming unbroken masses four or five feet across (also found in considerable numbers earlier on Salt Pond Hill). Growing right near these, and subjected to the same dry hot conditions, was the Spanish or Florida moss, *Tillandsia usneoides* L., its only occurrence noted on the islands.

Embarking again we proceeded to Carmichael Point, and from there in a direct line to Moujean Harbor, Little Inagua, a distance of about 31 miles. This place is some two or three miles to the westward of Southeast Point. We proceeded inland

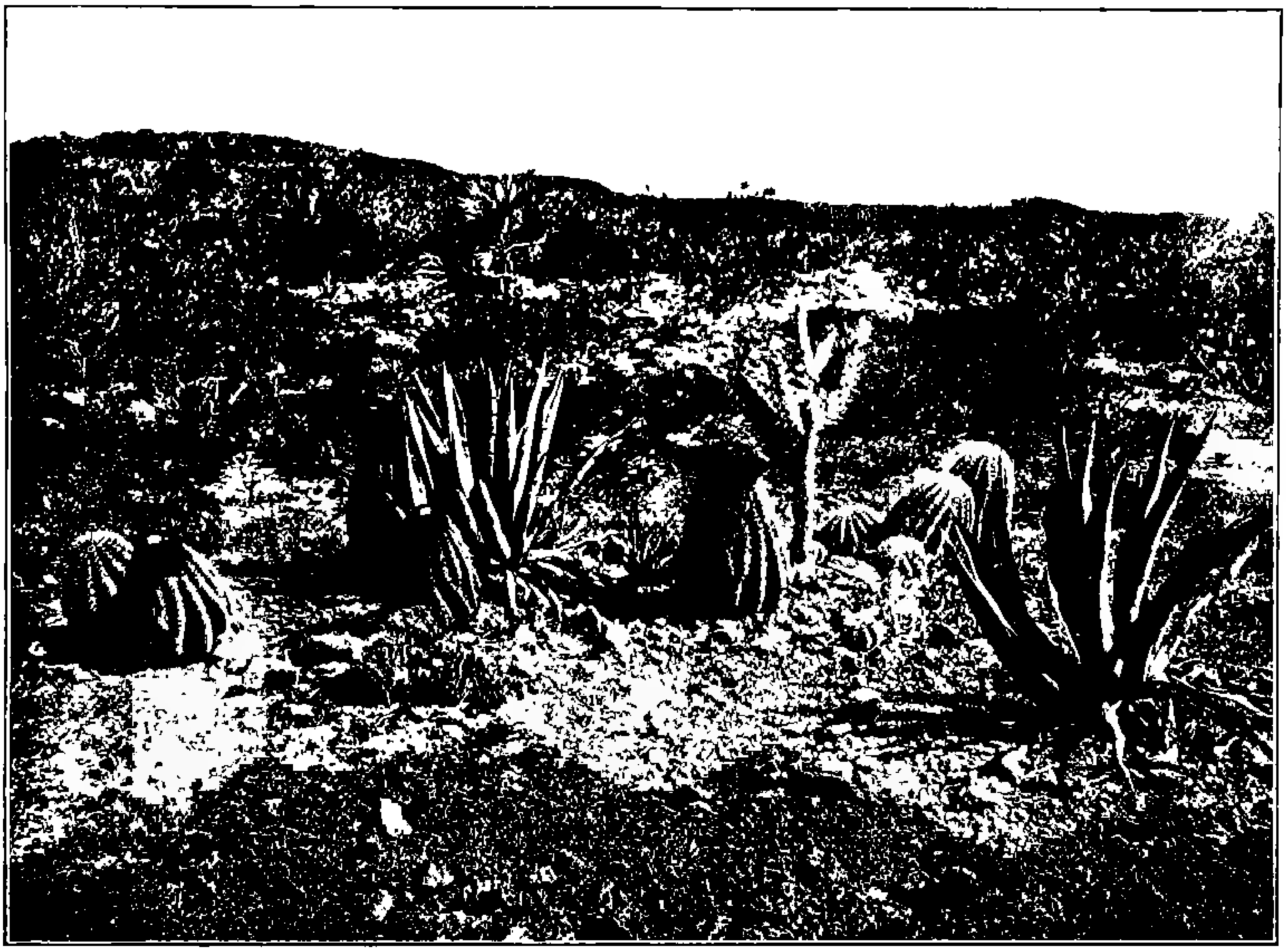

FIG. 3. Cactus formation at Moujean Harbor, Little Inagua. *Melocactus* and *Opuntia* in the foreground, with the *Agave* common there.

for a considerable distance along a ridge. It was here that the *Melocactus* of these islands was first seen. It is quite common at Moujean Harbor; hundreds of them were seen, ranging in size from two or three inches in diameter up to large cone-shaped specimens with a body two feet high and a cap sometimes eighteen inches in height. They grow right on the solid rock, as is indicated in the accompanying illustration (Fig. 3), in company with an

Agave, to which reference will be made later on, and the *Opuntia*, already referred to. Another feature here was a palm, *Thrinax Keyensis* Sargent, first discovered on the Marquesas Keys, lying to the westward of Key West off the coast of Florida. The same *Pilocereus* seen at James Hill occurred here in much greater quantity, forming one of the characteristic plants. Another plant equally characteristic is a species of *Agave*, with upright gray-green leaves, sometimes nearly two feet long, much resembling in color those of *Agave Americana* L. The erect candelabra-like flowering stems, at the time of our visit only dried-up stalks with the disintegrating remains of the old capsules, appeared above the scrub wherever the eye roamed. Standing on one of the little eminences and looking out over the surrounding area, one was struck by the prevalence of these three plants; the palm, with its ever-swaying leaves so unlike the rest of the foliage; the old stems of the *Agave;* and the pipe-like stems of the *Pilocereus*.

From Moujean Harbor we proceeded to Northwest Point of the same island. Here a visit was made to the savannah, quite an extensive one, which passes abruptly into the "white land." This "white land" seems to be a deposit of some depth of white sand mixed with fine humus, very similar to that found in the pineland region of Florida; it supports a dense vegetation twenty feet tall. This is the only place upon the islands where *Canella Winteriana* (L.) Gaertn. is known to occur. It is locally known as "cinnamon." Tillandsias in several species are common, great masses of *T. utriculata* L. occupying indiscriminately both the trunks and branches of the trees and the surface of the ground. This was also true of a species of *Epidendron*, an orchid forming large masses in similar situations. One species of *Tillandsia* in particular attracted my attention on account of its resemblance to *T. fasciculata* Sw., for which commonly distributed species I at first mistook it, and it was not until I found it in fruit that I saw my error. Living plants of this were successfully transported and are now in the propagating houses, where it is hoped they may eventually come into flower. On the savannah, already alluded to, great masses of a *Typha*, not then in flower or fruit, were growing, and also a sedge, *Scirpus robustus* Pursh.

From this point we started on the return journey. At a small point midway between Northwest Point and Southwest Point, Little Inagua, we made a landing to inspect a palm reported to us by Captain Mitchell as growing there, and which he called "silver thatch." This proved to be *Coccothrinax jucunda* Sargent, another species first discovered in Florida. It occurred in considerable abundance. Living plants of this were also brought back. This palm grows in a sandy flat, just at the base of the scrub, which at this place rises abruptly for about 25 feet. and then spreads out into a plateau. Growing about in great profusion were large masses of an *Epidendron* with extremely slender pseudobulbs and leaves. This occurred sometimes on the dry hot rock, at other times on the bases of the shrubs, but always near the ground. In juxtaposition to these were thriving plants of the *Agave* found in such quantities at Moujean Harbor.

From here we proceeded to a point some six miles southwest of Northeast Point, Great Inagua, called Miner's Tent. A start was made from Miner's Tent, by a more or less defined trail through the scrub, for a place called Balsam Hill, the only known locality on the island where the tree grows, called "balsam" by Captain Mitchell. After tramping along this trail for about three miles, Captain Mitchell finally broke into the scrub, and for the next mile or so it was slow progress indeed, every foot of the way requiring the use of the machete. Frequent encounters with *Mimosa Bahamensis* Benth., the "haulback" of the natives, did not improve our tempers. Balsam Hill was finally reached, however, the "balsam" proving to be *Clusia rosea* L., quite common in tropical regions, but certainly a rarity here. Captain Mitchell assured us it grew nowhere else — certainly we saw it in no other place.

Captain Mitchell had been referring to a palm which the natives called "mountain cabbage," and on this trip to Balsam Hill we saw it for the first time. What was my surprise and delight on finding it to be *Pseudophoenix Sargentii* H. Wendl., still another palm originally known from Florida. It grows in considerable abundance scattered throughout the scrub, and fruits here when six or eight feet high. Two living specimens were brought back with us.

Our next stopping place was Camfield Bay, some four or five miles further to the westward. An overland trip of three miles was made here through the scrub to Cabbage Pond, for the purpose of seeing another of the islands' palms, called by the natives "pond thatch," which proved to be *Inodes Palmetto* (Walt.) Cook. A growth of saw-grass, *Cladium Jamaicense* Crantz., formed part of the vegetation here. A single tall plant, about twenty feet in height, of *Pseudophoenix Sargentii* was also observed. The only fern seen occurred in a salt-water hole not far from here. It completely filled the hole, some 25 feet long. It is *Acrostichum aureum* L., known locally as "wild plantain." Cabbage Pond is a slight depression in the scrub where a considerable depth of soil has accumulated. It is in the immediate neighborhood that one of the so-called "fountains" occurs, and the greater luxuriance of the vegetation here is probably due to the abundance of water in this "fountain." These "fountains" are usually circular bodies of fresh water which are said to be affected by the rise and fall of the tide. The one I saw here was 75 to 100 feet in diameter and densely fringed with a growth of saw-grass and shrubs. Looking down into it one saw an inky blackness, not at all inviting as a drinking place. The blackness was not due, as I at first thought, to impurities in the water, but to its great depth. Captain Mitchell assured me that soundings had been made but with no success in reaching the bottom.

Again returning to the sloop we set sail, proceeding direct to Sheep Cay, stopping here mainly for the purpose of photographing some peculiar features of the vegetation which were noted on our first stop.

The next stopping place was a short distance to the eastward of Northwest Point. At about 10 A. M. we rounded the point, and from that time until seven in the evening we tacked and drifted to Mathew Town, a distance of less than ten miles.

The second trip was along the south side of the island of Great Inagua, and occupied three days. The first stop was made at Sandy Point, about sixteen miles from Mathew Town. We then proceeded to Lantern Head, about four miles beyond, the extreme eastern point reached by us on the south shore.

Here the *Melocactus*, or Turk's-head, first seen at Little Inagua, was again found in considerable numbers. Great masses of *Opuntia Dillenii* Haw. were met with here, as elsewhere in the scrub and just back of the strand. Some distance to the north of Lantern Head is the mouth of a salt-water creek, known as Lantern Head Creek. This extends into the interior about a mile. By means of a small boat we reached the end of this creek, and from there proceeded on foot for perhaps a mile and a half to the north to Smith's Thatch Pond, where grew great quantities of the *Inodes* seen at Cabbage Pond on the north side of the island. Herbarium specimens and a series of photographs were made of the palm here. Two living specimens were also secured. One of the surprises at this point was the finding of a *Marsilea* in great quantity. No member of the genus had previously been reported from the Bahamas. Its nearest relative is a species growing in central Texas.

On the return journey several stops were made as we skirted the shore between Lantern Head and Sandy Point. Before starting for Mathew Town a stop was made at Sandy Point that I might make a series of photographs illustrating the character of the vegetation on this part of the shore. The region here is subjected during the summer months to all the force of the trade winds which sweep in from the southeast, often with almost hurricane force, the heavy seas carrying large masses of rock on to the gently sloping hillsides. The condition of the vegetation here clearly indicates how great and constant must be this force, for on the windward side of the ridges the vegetation is all depressed. The shrubs and trees often cover a hundred square feet of surface or more, and do not attain a height of more than a foot or a little over. The accompanying illustration (Fig. 4) pictures this condition of things, and fairly well represents the bleak and barren appearance of these exposed ridges of the southern coast. The *Agave* in this picture is the same as that growing on Little Inagua; here it inhabits the sandier places of the ridges. It is an odd experience to pass from the windward side of these ridges to the protected face and find the vegetation remaining exactly the same as to species, but as soon as the apex of the ridge is reached the vegetation begins to assume an erect position, so that in the descending slope beyond and the continuation of this into the flat plain, the trees and shrubs again regain their normal condition of growth, from six to ten feet high or more. A direct return was now made to Mathew Town.

FIG. 4. South coast of Great Inagua, near Sandy Point, showing the depressing effect of wind on the vegetation.

While it was not possible to make a careful and exact study of the plant distribution of the islands in the short time we were there, enough data were obtainable to warrant some conclusions. Several formations were noted, which are sufficiently marked to be separated. Of course one runs into the other and there is consequently no sharp line of demarcation. The largest of these formations embraces the flora inhabiting the rocky area, called the scrub, which covers the largest part of the island. The general character of this is shown in the accompanying illustration (Fig. 5). The flora here is not a large one, and the same species will be found repeating themselves time and again in different parts of the island, but in almost all the places at which we touched some few plants were found which we had not detected elsewhere, so that it would require a pretty thorough exploration of all parts to secure a complete representation, although the great majority of species would be secured by making a collection in the scrub at

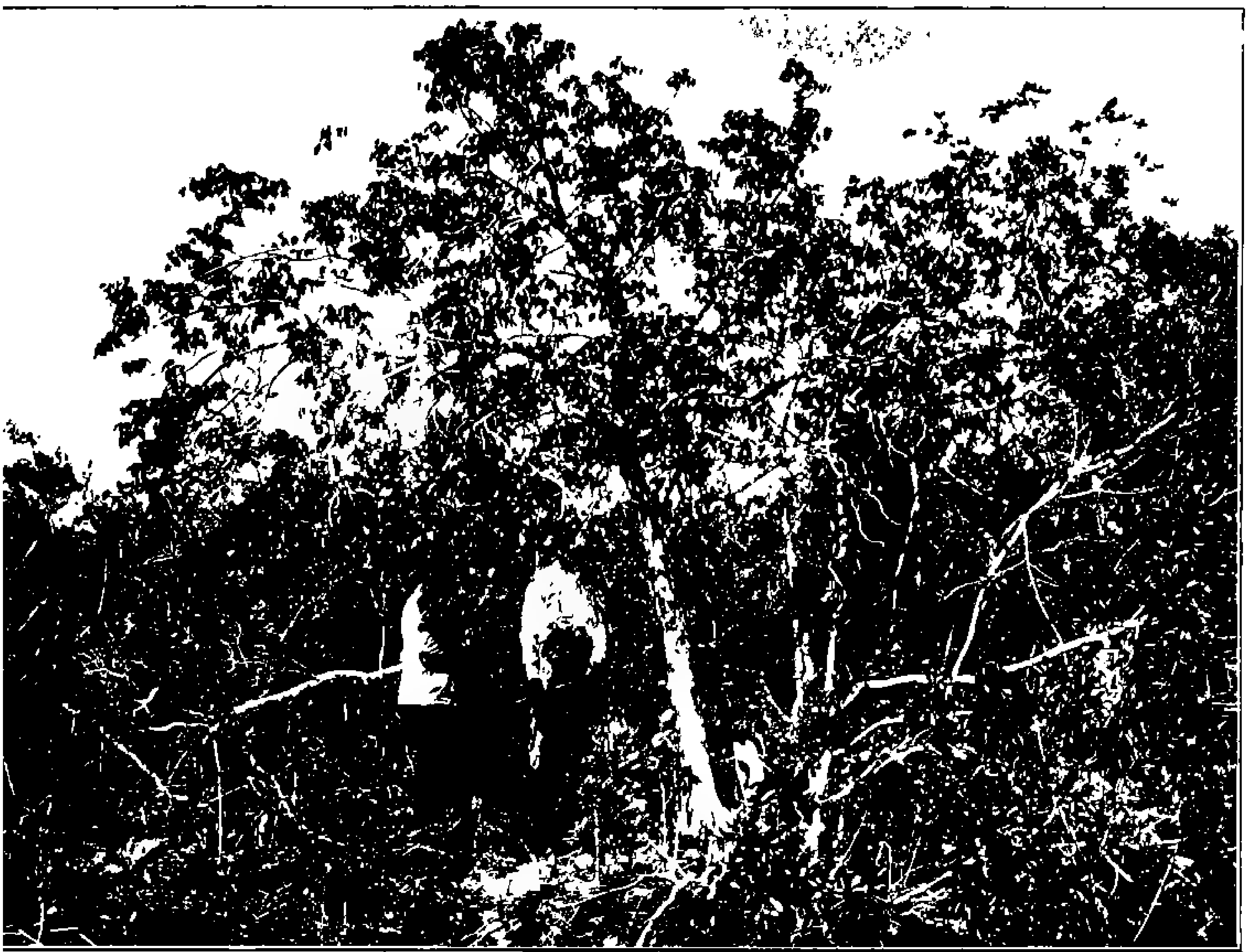

FIG. 5. View in the scrub, showing characteristic formation.

any one point. The whole scrub vegetation, with the exception of that on the south shore, to which allusion was made above, consists almost entirely of shrubs and small trees six to eight feet high. Of course individual trees grow higher, and some portions of the scrub may have a greater general average height. The tree trunks are frequently not over a foot high, and such trees look like the results of dwarfing — everything perfect but on a small scale.

A striking feature of this scrub flora is the group of cacti which forms a conspicuous and characteristic part of it. With the exception of *Opuntia Dillenii*, which is of wide distribution in the Bahamas and elsewhere, none of the cacti is found outside of the scrub — a strong index to the xerophytic character of that region.

While the scrub embraces the greater part of the flora of the islands, there are other but much smaller regions which have a different class of plants, although even here the scrub plants often grow, but they at once take on larger proportions. Perhaps the most characteristic flora next to that of the scrub is that of the

FIG. 6. The "white land" formation at Tenados, just to the eastward of the Salt Ponds, with *Coccothrinax* sp. in the foreground.

"white land" region. These "white land" ridges are areas of white sand, evidently laid down on the rock, and the most conspicuous feature in their flora is a palm, a *Coccothrinax*, related to *C. jucunda* Sargent, called by the natives "common or bastard thatch," and considered by them of little economic value. It attains a height sometimes of 12 or 15 feet, its crown of leaves borne on long slender stems rarely over two inches in diameter. They occur in thousands in this "white-land" region, and, on account of their height, are the most conspicuous objects there. The accompanying illustration (Fig. 6) depicts the manner of their growth. *Jacquinia Keyensis* Mez, known locally as "Joe wood," is confined largely to this region, although it occasionally occurs in stunted plants in the scrub.

FIG. 7. Savannah formation, with a coppice in the background. View in Upper Savannah near west end of Salt Lake.

Then there is the large savannah formation, consisting of large flat plains, covered in great part with *Sporobolus Virginicus* (L.) Kth., the "savannah grass" of the people there. A striking feature in this formation is the coppices (Fig. 7), to which allusion has been made, which dot the savannah at irregular intervals. These are irregular-shaped island-like masses of timber, some of the trees attaining a height of 25 feet; the surface of the ground is flat, as in the surrounding savannah. One of the characteristic trees is what is known locally as "Madeira wood." This is the mahogany tree, *Swietenia Mahagoni* Jacq., and reaches its greatest perfection in these coppices, although it is found scattered throughout in smaller trees.

The regions in the immediate vicinity of Cabbage Pond and Smith's Thatch Pond, already alluded to, are in reality savannahs, but of restricted area. At these two places the all-prominent feature is the *Inodes*, which gives the character to the landscape. One can hardly realize while there, with the truly tropical aspect produced by these palms, that but a few steps beyond the arid rocky scrub again holds sway.

While on the subject of the savannahs I wish to speak of the large body of salt water, called Salt Lake, which I was informed has no visible inlet or outlet. This occupies a large part of the interior of Great Inagua, the Upper Savannah touching upon its western end. We visited this lake while at the Upper Savannah. It reminds one of the savannah itself flooded with water, for the same coppices dot its surface as small islands. We were not able to visit these islands for lack of a boat. This lake is not indicated upon my chart of that region, which is a copy corrected by the Hydrographic Office up to September 30, 1904. I have therefore only report to rely on as to size, and a personal visit as to the location of its western end. I was informed that the lake is eighteen miles long and about six miles wide at its broadest part, with a depth in some places of five or six feet. Certainly it must be of great extent, for it reaches to the eastward as far as the eye can see. On account of this indefinite information I have indicated its position and size on the accompanying map by a dotted line.

The salina is another of the formations. This is a depression in the scrub in which has apparently collected the wash from the surrounding ridges of rock or sand, and the resulting soil is a sticky compound most unpleasant to walk in when wet. The salinas are usually more or less filled with water, although at times some of the smaller ones at least must be perfectly dry. The soil must be decidedly salt, for the characteristic flora is a salt-loving one. The predominant shrub is *Avicennia nitida* Jacq., which sends up its aerial roots in all directions; the mangrove also occurs here to some extent ; and one or two species of *Salicornia* abound. Other than those mentioned the species represented are few.

There is of course the strand flora, but this is the same as exists in such regions throughout that part of America. *Tournefortia gnaphalioides* (Jacq.) R. Br., *Batis maritima* L., *Ipomoea Pes-Caprae* (L.) Sweet., *Sesuvium Portulacastrum* L. and other common strand plants abound.

From the above description it will be seen that the flora is mainly a xerophytic one, the representation of cacti especially indicating this. I think that several of these cacti will prove to be endemic. Among the Euphorbiaceae was one which attracted my attention everywhere in the scrub, whether in the protected inland areas, or as a flat mat on the wind-swept regions of the south coast. I first noticed it in great abundance at Moujean Harbor, Little Inagua, and passed it by, thinking it was dead, for its general brown appearance was that of a shrub which had been killed by fire. I was much surprised on examination to find that it was alive and that the color was the natural one of the plant. This proved to be what was hitherto a rare species, *Euphorbia vaginulata* Griseb., originally described from Turk Islands. It is one of the commonest shrubs of the scrub region. Not a single coniferous plant was seen on the islands.

As a result of this expedition, the Garden has acquired a collection of herbarium material, from a region hitherto all but unknown, of over 1,000 specimens ; a collection of wood-sections numbering about 40 species ; 97 specimens of living plants, including five of the large Turk's-heads already alluded to ; about 30 packets of seeds, from which it is hoped to derive many interesting plants not represented in cultivation ; and a series of 142 photographs, illustrating the features of a vegetation hitherto very imperfectly known. I think it would be well at some time to again visit these islands and explore the regions along the south coast of Great Inagua beyond Lantern Head, and the east and north coasts of Little Inagua, all sections uncovered by the present exploring party.

I have thought it well to add the following list of the more important of the economic and poisonous plants of the islands. The most of this information was derived from Captain Mitchell, who has resided on the island many years, and knows its plants and people well.

Reynosia septentrionalis Urb. Known as the "darling plum." Fruit edible.

Guajacum sanctum L. "Lignum vitae." Used for timber.

Fagara flava (Vahl) Krug & Urb. Called "yellow wood." Also used for timber.

Genipa clusiaefolia (Jacq.) Griseb. The "seven-year apple" of the natives. Fruit edible.

Hypelate trifoliata Sw. Known as "white ironwood." Wood used in ship-building. Berries edible.

Bursera sp. (no. 1393). An undescribed plant, known locally as "gomalimie." Leaves are good for headache; leaves and bark used for tea.

Jacquinia Keyensis Mez. The "Joe wood" of the natives. Bark mixed with lime, placed in a bag and put in the water to stupify fish.

Swietenia Mahagoni L. "Madeira wood." Makes the finest timber.

Inodes Palmetto (Walt.) Cook. Known as the "pond thatch." Leaves used in thatching houses; very durable—said to last for twenty years.

Lysiloma Bahamensis Benth. "Wild tamarind." Wood used in ship-building.

Bucida Buceras L. The "oak" of the islands. Also a timber wood; used for railroad ties.

Batis maritima L. Used as a turtle food.

Calonyction album (L.) House. Used for feeding hogs.

Thrinax Keyensis Sargent. Called "cypress thatch." Considered as next in value to the "pond thatch" for thatching roofs.

Hippomane Mancinella L. "Manchioniel." Much feared as a poison. White crabs are said to eat the fruit, thereby making themselves intensely poisonous to man as a food. No Inaguan will eat white crabs from a "manchioniel" district.

Eugenia punctata Vahl. Known as "naked wood." Leaves used as a condiment.

Rhacoma Crossopetalum L. "Wild cherry" of the islanders. Fruit edible.

Coccolobis diversifolia Jacq. "Tie tongue." Berries eaten by the children, with a peculiar effect on the tongue, hence the local name.

Plumiera sp. (no. 1430). "Milkwood." An undescribed member of the genus. Bark used as a purge in the form of a tea.

Exostemma Caribaeum (Jacq.) R. & S. "Princewood." Bark used in making bitters.

Bourreria Havanensis (Willd.) Miers. "Strong bark." Bark used in making a tea. Berries edible.

Verbenaceous shrub (no. 1454). "Moujean tea." Leaves used as a tea.

Caesalpinia sp. (no. 1455). Undescribed. "Brasiletto." Used in making a dye similar in color to that produced from logwood but lighter.

Fagara coriacea (A. Rich.) Krug & Urb. "Hercules' club." Used for making walking-sticks. Bark of root employed as a bitters.

Panicum maximum Jacq. Grown and used as food for horses and cattle.

GEORGE V. NASH.

NOTES, NEWS AND COMMENT.

Dr. N. L. Britton, accompanied by Mrs. Britton and by Dr. Marshall A. Howe, left the Garden on January 21st to continue the botanical exploration of the Bahamas, expecting to be absent about five weeks. They were joined by Dr. C. F. Millspaugh, Curator of Botany in the Field-Columbian Museum, Chicago, the Field Columbian Museum coöperating in this work. The objective point of the present trip is the Great Bahama Island and contiguous cays, from which no botanical collections have as yet been made; this island will be reached from Nassau, New Providence, by sloop.

A contract for the bronze fountain to be erected, on the marble base already provided for it, in front of the Museum Building, was awarded by the Commissioners of Parks on December 29, 1904, to the Roman Bronze Company, of Greenpoint, New York; the contract price, which includes casting the bronze and setting it in place, together with a slight modification of the marble screen already built, and supplying the requisite water-piping and water-heads, is $7,500, and it is expected that the work will be completed by midsummer. This bronze fountain is built from the moulds prepared by Mr. Carl E. Tefft, sculptor, who won the work in a competition of fifteen sculptors in 1903, his model having been deemed the best, and also having been highly praised by the distinguished committee of sculptors, appointed by the National Sculpture Society as a jury, at the request of the committee of the Board of Managers having the matter in charge. The models also have been approved by the Commissioner of Parks, and by the Art Commission of the City of New York.

The contract for completely constructing the cut granite, bridge, designed by Mr. John R. Brinley, Landscape Engineer to carry the main park driveway over the valley of the lakes, northeast of the Museum Building, has been awarded by the Commissioner of Parks to Jos. Gallo, at a cost of about $37,000. This is the last of the large bridges contemplated in the general plan for the development of the Garden, and is of a monumental character, providing a single stone arch and balustrade railings. It is hoped that the work will be completed during the year 1905, which would permit the practical completion of all the driveways provided by the general plan within the same period.

The total precipitation in the Garden during December, 1904, amounted to 3.51 inches. Maximum temperatures of 43° on the 6th, 39.5° on the 16th, and 48° on the 23d, were observed; also minima of 4° on the 11th, 3° on the 15th, 13° on the 22d and 13° on the 29th.

ACCESSIONS.

LIBRARY ACCESSIONS FROM NOVEMBER 1 TO DECEMBER 31, 1904.

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EDITOR

DANIEL TREMBLY MACDOUGAL

Assistant Director

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STUDIES IN ORGANIC EVOLUTION.

Soon after the appearance of the first volume of Professor deVries's book on the " Mutation Theory of Organic Evolution " the author began a series of cultural tests of Lamarck's evening-primrose and some of the " mutants " which had arisen from it in order to ascertain whether these " seed-sports " or mutants were stable, and what relation they bore to their parent. By a series of extensive cultures begun in 1884 Professor deVries had found that pure strains of this plant produced seeds, some of which gave rise to forms which in their structure, habit and their progeny were quite unlike the parental type. These " mutants " constituted one to five per cent. of the entire progeny. A wide range of similar occurrences were also observed in other plants. This discontinuity or break in descent, by which new qualities arise suddenly, or disappear at once constitutes the basis of the mutation, or saltation theory of evolution.

The results of the earlier tests were published in the American Naturalist for November, 1903. The investigations upon the group of plants mentioned above has widened until more than 120 different cases, or experimental cultures, are under observation in addition to experiments on heredity with other species which have been under way in the New York Botanical Garden for a much longer time.

Attention is being devoted to the determination of the actual composition of the various species, to an analysis of the genetic relationships of the various forms by hybridological and other methods, to a comparison of the life-histories of parental and mutant forms, to the recurrence and stability of the various mutants described by deVries, some of which have had an independent existence for 18 years. In addition pedigree-cultures have been carried on for the purpose of detecting the occurrences of mutants in other speces.

An investigation of the above scope entails a great amount of detail and during the past season I have been so fortunate as to have secured the coöperation of Dr. G. H. Schull, Miss A. M. Vail and Dr. J. K. Small.

An outline of the results recently obtained was presented to the Botanical Society of America at Philadelphia, January 31, 1904, and an extensive paper giving full details, and numerous illustrations, is now in press and will be published by the Carnegie Institution.*

A continuance of the effort to trace the nativity of Lamarck's evening-primrose has resulted in the discovery of records and specimens that make it appear fairly conclusive that it is a true, independent species at one time native to a region extending from near the Atlantic coast westward through the Gulf States to central Texas, and that it has remained unchanged since its first introduction into cultivation more than a century ago. Three or four generations of pure pedigree-cultures are usually supposed to be sufficient to test the purity of any strain of plants, with especial regard to hybridizations. Lamarck's evening-primrose has been carefully guarded against possible hybridizations since 1884, and perhaps no plant is known in which the purity of the parental strain has been so critically examined.

Having come upon a description by Bartram of his discovery of an evening-primrose, which he characterized as "the most pompous and brilliant herbaceous plant yet known to exist" it

* MacDougal, D. T., assisted by Miss A. M. Vail, Dr. G. H. Shull and Dr. J. K. Small. Mutants and Hybrids of the Œnotheras.—Carnegie Institution, Washington, D. C. Papers of Station for Evolution, at Cold Spring Harbor, N. Y., No. 2. Publication 24. Pls. 22 and figs. 13. 1905.

was suggested to Professor S. M. Tracy that he visit the original locality, on the Alabama river, above the old fort at Tensaw. This was done with the result that the plant in question, which proves to be *Onagra grandiflora* (Ait.) Vail was found. Although it has been in cultivation since 1776, its place in the American flora was uncertain.

The common evening primrose (*Onagra biennis*) has been found to consist of a number of clearly separated elementary

FIG. 8. Lamarck's evening-primrose (*Onagra Lamarckiana*) the parental form which has given rise to about 14 mutants, or sports in the last few years. One of these, *O. nanella*, is shown on the right and is always much smaller than the parental form. (By permission of the Carnegie Institution.)

species which apparently do not intercross. The failure to discriminate among these forms has resulted in the currently accepted conclusion that this species is subject to unusually wide fluctuations. As a matter of fact none of the forms included in the species exhibit anything but the ordinary amplitude of varia-

FIG. 9. *Onagra gigas*, one of the new species which has recently arisen from Lamarck's evening-primrose (*Onagra Lamarckiana*). It differs from the parental form in vigor, habit of branching and many structural features. (By permission of the Carnegie Institution.)

bility. The "*O. biennis*" used by deVries in the experiments described in "Die Mutationstheorie" proves to be a form with large flowers which appears to be native to the northern states, and which can hardly be included under this name in its strictest sense.

The search for mutants or seed-sports in other American species has met with gratifying success. One of the common evening-primroses is in a mutative stage, and one seed in about every three hundred gives rise to plantlets which differ markedly from the type. No description of this mutant can be given until a full cycle of development has been completed and the sseedling of the second generation are under observation.

Onagra cruciata has been found to consist of three elementary species which do not intergrade. One of these forms is also in a mutative condition and gives rise to the other two forms by seed-sports.

The hybrid *O. Lamarckiana* x *O. cruciata* consisted of a single type in the first generation, in which the characters of the pollen-parent were largely dominant, although the anatomical limitations prevented their full normal expression. An interesting segregation of the unit characters involved in the arrangement for fertilization was offered by the fact that some of the flowers on a single plant were structurally suitable for self-pollination, while others were more favorable to cross-pollination. The second generation of seedlings appear to be identical with those of the first generation.

The hybrid *O. Lamarckiana* x *O. biennis* was of a pleiotypic character consisting of four distinct types, without intergrading forms, in the first generation, which appear to breed true.

A remarkable predisposition, or weakness to the attack of a fungal parasite was exhibited by one of the types. The habit of inequality of growth of the leaves resulting in crinkling, characteristic of *Lamarckiana*, was transmitted to all individuals of the four types of the hybrid. The symmetrical form of the terminal rosettes of *Lamarckiana* was transmitted unchanged to two of the types. The capacity for self-fertilization was dominant in three of the types, but in the fourth a variability between cross-and self-fertilization was indicated by the varying relative lengths of the stamens and pistils.

Mutants were seen to arise from seeds obtained from purely fertilized seeds of *O. Lamarckiana* grown in the Botanical Garden at Amsterdam in 1901. Also from seeds of the same species gathered in the New York Botanical Garden in 1903 after similar

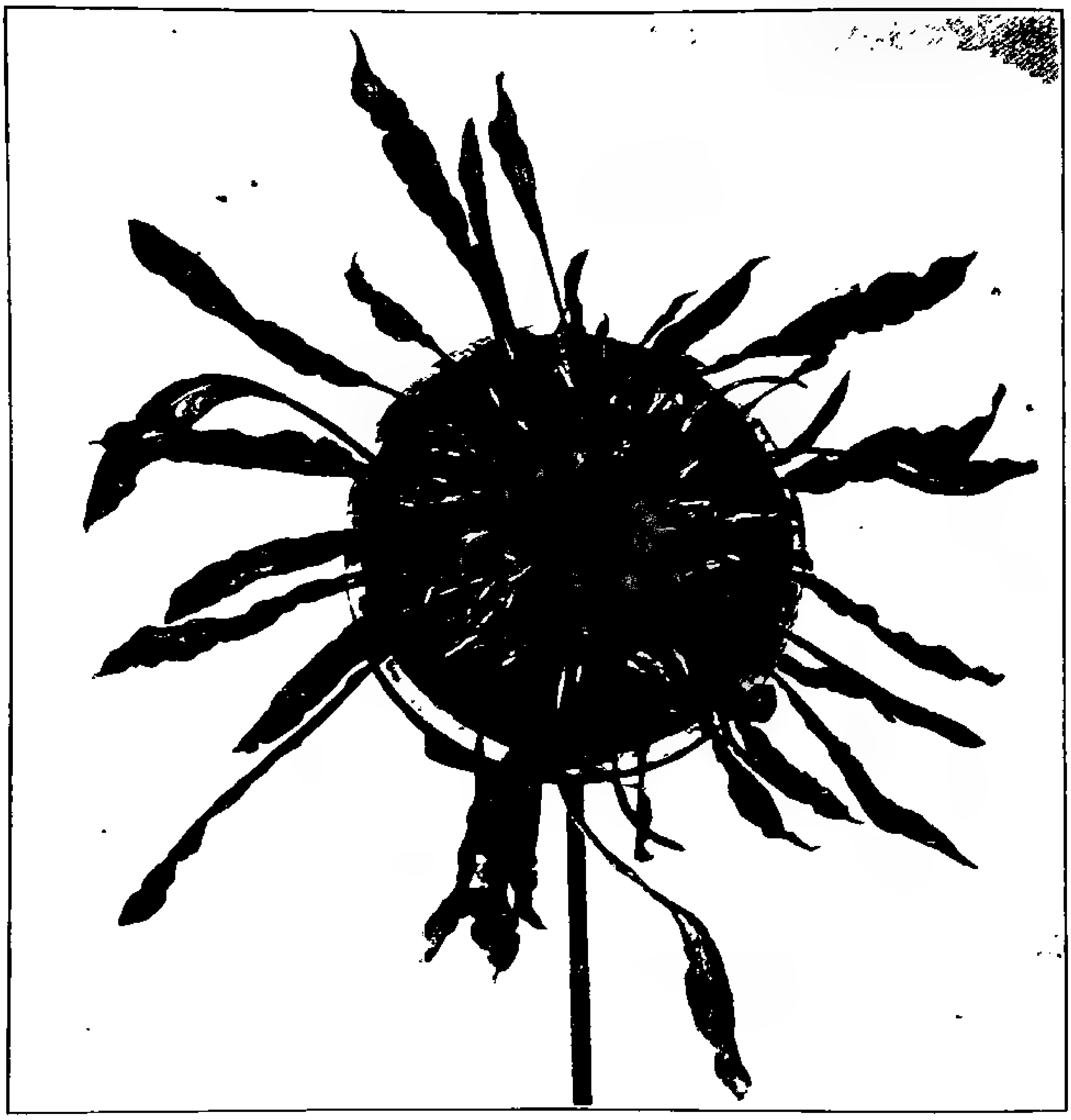

FIG. 10. One of the types (No. 2.1) of the hybrid between Lamarck's evening-primrose and the common evening-primrose. This type has inherited a tendency to disease from its pollen-parent, the common evening-primrose (*Onagra biennis*).

precautions had been observed. *O. albida*, *O. scintillans subovata*, *O. elliptica*, *oblonga*, and *gigas* were found, offering indubitable evidence of the occurrence of the mutants in purely fertilized seeds, and also that *O. Lamarckiana* has not reached the end of its mutative period. Furthermore forms not definitely assignable to any of the known mutants of this parent were found, showing that the range of the mutability of the species had been extended by unknown causes, but which were included in an environment of cultural conditions extremely favorable to rapid and vigorous growth and development. It seems safe to assume therefore that

FIG. 11 One of the types of the hybrid between Lamarck's evening-primrose and the common evening primrose (No. 2.24).

the origination of species is induced, or at least increased by favorable, not adverse conditions, although the duration of the experiments has not been sufficient to permit an analysis of this phase of the subject.

O. gigas, the species most recently tested in the mutation cultures in New York, was seen to agree in stature and habit with the individuals grown in the original locality at Amsterdam. Only about half of the individuals could be brought into bloom during the first season, although it was extended to ten months by special methods of culture; a fact in accord with the behavior of the plant in deVries' cultures. The constancy of the species also extends to its variability as to the forms of the leaves, an attribute also previously recognized.

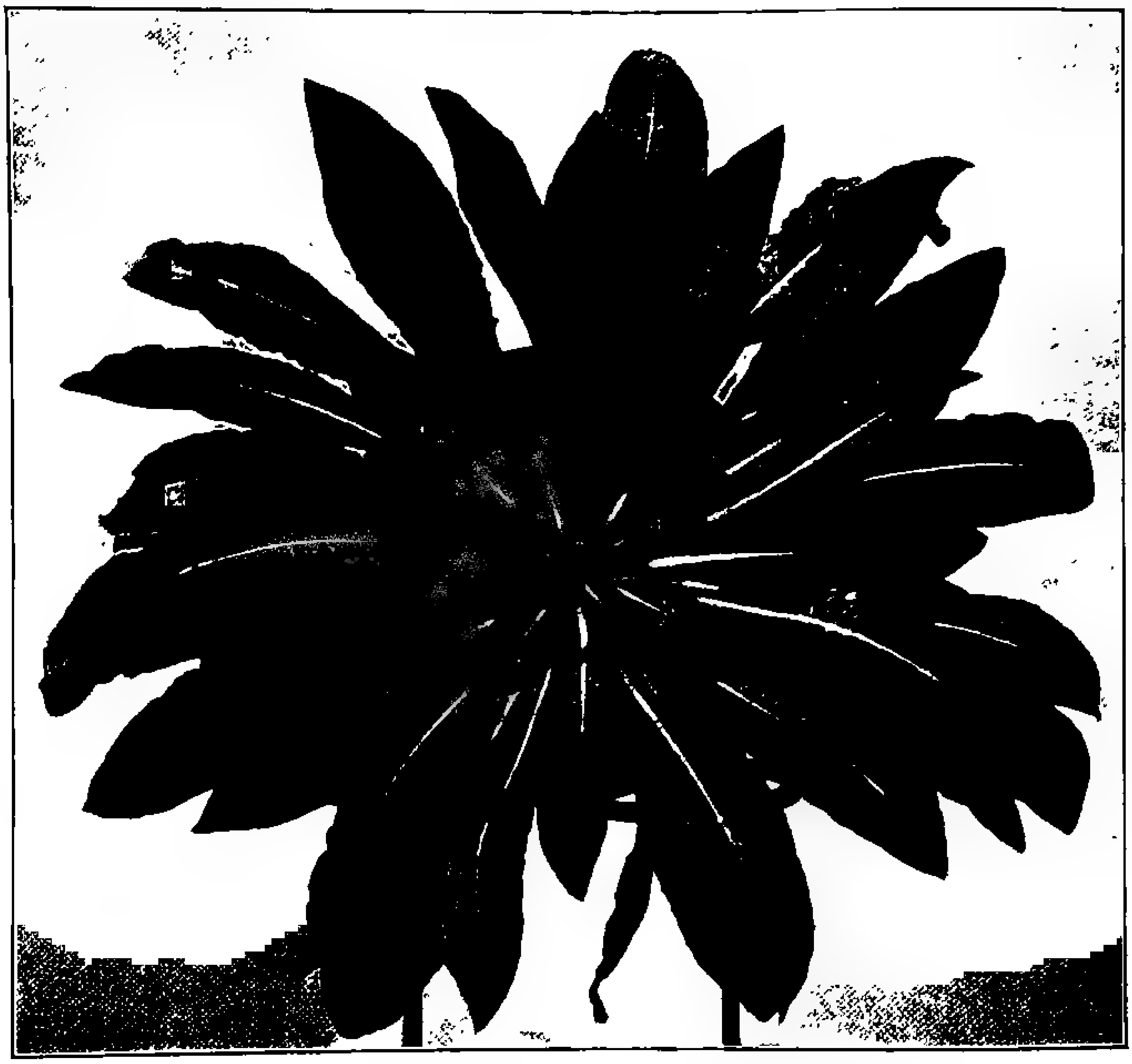

FIG. 12. One of the types (No. 2.32) of the hybrid between Lamarck's evening-primrose and the common evening-primrose.

The results of the statistical studies show that some of the unit-characters of the mutants show a much greater variability than the corresponding features of the parent-form, and the greater amplitude of the fluctuations is coupled with a decreased correlation. Thus the coefficient of variability of the height of the shoot of *nanella* is 31.84 ± 3.16 per cent. while that of *Lamarckiana* is only 5.37 ± .44 per cent. The coefficient of variability for the number of branches of *rubrinervis* is 15.0 ± 1.7 per cent. and for the total length of the branches is 48.7 ± 5.1 per cent. and for the ratio between width and length of the leaves is 10.30 ± .20 per cent., for the number of branches of *Lamarckiana* 15.7 ± 1.7 per cent., for the total length of the branches

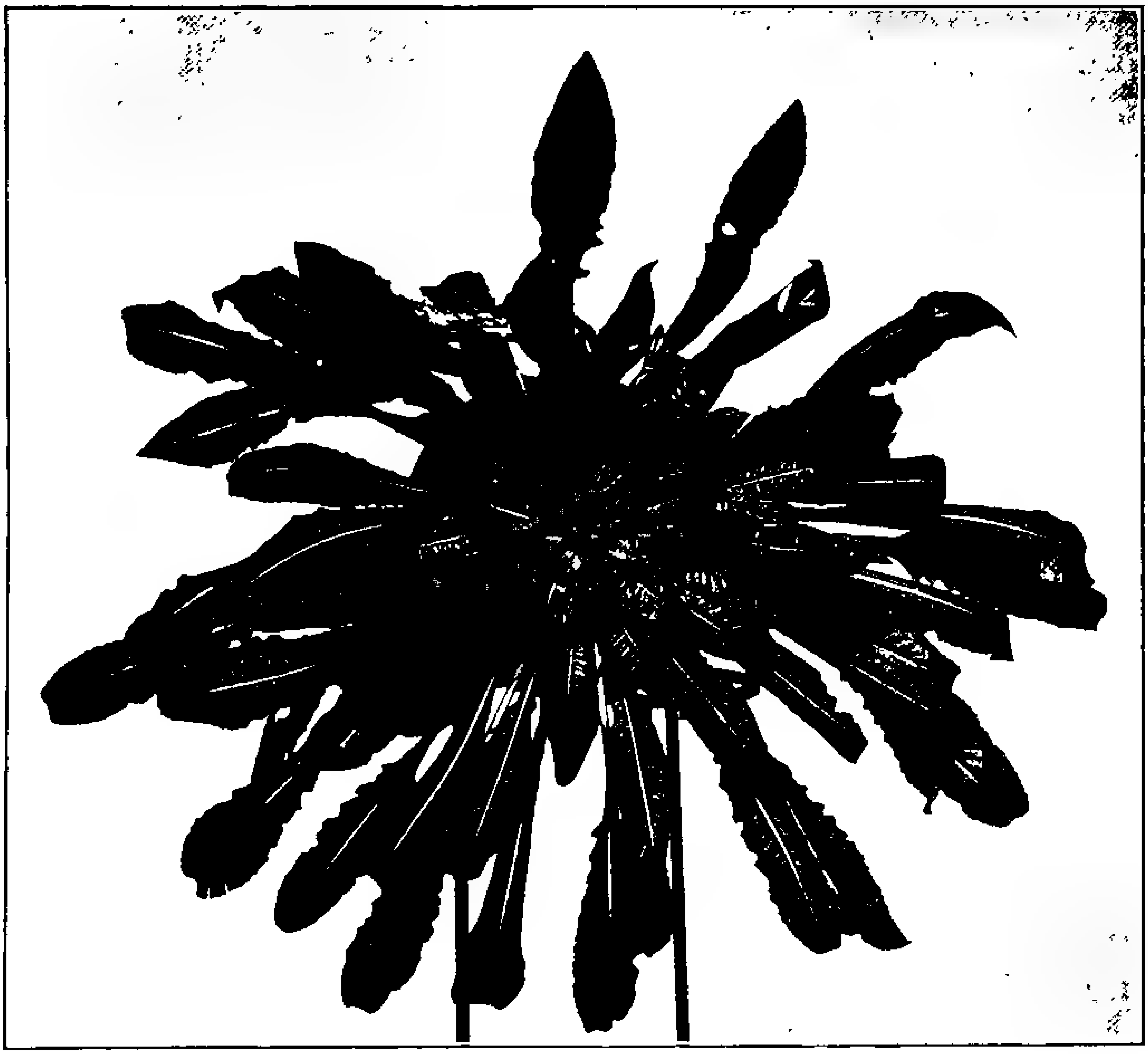

FIG. 13. One of the types (No. 2.27) of the hybrid between Lamarck's evening-primrose and the common evening-primrose.

20.2 ± 2.2 per cent., and for the ratio between the width and length of the leaves 9.53 ± .22 per cent.

The wide variability of the mutants does not, however, seem to result in any diminution of the gap that separates them from the parent-form, and no movement in this direction has been observed in the long period which has elapsed since the new species came into existence. Thus the curves expressing heights of *O. nanella* group themselves about the mean value of 22.81 ± 1.02 cm. with a range from 7 to 35 cm., while those of *O. Lamarckiana* group themselves about the mean of $88.68 \pm .55$ cm. with a range from 77 to 96 cm. The number of branches per individual of *Lamarckiana* ranged from 11 to 25 while that of *rubrinervis* was 34 to 62. The actual discontinuity is somewhat more fully expressed, however, by a comparison of the numerous features which elude measurements. The wide range of variability of the newly arisen forms is in itself one of their distinctive characters. It might be supposed that the variability of the new forms was the result of selection by the experimenters, but it is evident that whatever unconscious selection may have taken place in the cultures would have been directed to a diminution of the range of variability.

The chief interest in these studies lies in the fact that the appearance of new qualities or characters of plants has been brought under actual observation, and that new species have been seen to arise under the eye of the experimenter. Previously to the epoch-making investigations of Professor DeVries upon the subject a few species had been known to arise by the hybridization or crossing of two other species. The cross thus formed contained simply qualities that it had derived directly from its two parents. To prove however that the plants of fields and woods are producing purely fertilized seeds, of which one in every two or three hundred is capable of giving rise to an individual so different from its ancestors as to constitute a new species is quite another matter, and constitutes the most important evolutionary discovery since the time of Darwin. Furthermore this newest aspect of the subject is of additional interest since the method of origin of species, one of the most elusive questions in the whole realm of natural history, has been brought within the range of experimental investigation, and has been so simplified that any one with a small garden at his command may, with patience, hope to make some substantial contribution to the subject.

D. T. MacDougal.

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NOTES, NEWS AND COMMENT.

The lectures upon the mutation theory of organic evolution delivered at the University of California by Professor de Vries during the summer session of 1904 have been edited by Dr. T. MacDougal, assisted by Miss A. M. Vail and brought out in book form by the Open Court Publishing Co., of Chicago. The book is an octavo in clear print xviii + 847 pp. and is furnished with a very complete index.

The total precipitation in the Garden for January, 1905, amounted to 4.98 inches. Maximum temperatures of 54° on the 1st, 52° on the 7th, 41° on the 12th, 48° on the 20th, and 37° on the 28th; also a minimum of 3° on the 5th, 7° on the 15th, and 2° on the 27th.

Professor Clara E. Cummings and Miss Harriet L. Merrow sailed for Jamaica on February 1 for the purpose of making some investigations on the flora of that island. The Laboratory of the New York Botanical Garden at Cinchona will be used in the prosecution of the work in question.

Dr. C. S. Gager, assistant in the Laboratories is acting as instructor in botany at Rutgers College for the last half of the collegiate year.

Dr. W. A. Cannon, who is in charge of the Desert Botanical Laboratory of the Carnegie Institutlon, at Tucson, Arizona, spent a few days at the Garden in January in consultation with Dr. MacDougal of the advisory committee of that institution.

Mr. J. F. Cowell, Director of the Botanic Garden of Buffalo, has undertaken some investigations of the flora of Panama for the New York Botanical Garden. Mr. Cowell sailed for Colon on February 15, and will first make an examination of the canal zone.

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\ RECENT DISCOVERY OF AMBER ON STATEN ISLAND.

During the months of October and November of last year, while he writer was engaged in collecting fossil leaves in the Cretaceous :lays at Kreischerville, Staten Island, there were found, associated vith the leaves, numerous specimens of amber. The discovery vas briefly recorded in the Proceedings of the Natural Science \ssociation of Staten Island for November 12, 1904, and was ncluded in a paper entitled "The Occurrence and Origin of \mber in the Eastern United States," which was read at the ˀhiladelphia meeting of the Botanical Society of America, in)ecember. This paper will appear in full, in a forthcoming .umber of the American Naturalist. The discovery aroused onsiderable interest and the preparation of the following brief ıotice was suggested.

The deposits in which the amber was found consist of Cretaeous sands and clays, representing a part of the eastward extenion of the Amboy clay series of the Raritan formation of New ersey, as evidenced by the fossil plant remains found in them. \t Kreischerville they have been extensively excavated for ecoomic purposes and utilized in the manufacture of fire brick, terra otta, etc.

The amber occurs in a stratum or bed, characterized by layers nd closely packed masses of vegetable débris, consisting of leaves, twigs and fragments of lignite and charred wood. This bed, where exposed in vertical section, appears as if lens-shaped, with an indicated maximum thickness of about three feet and a lateral extent of about eighteen feet, near the base of the pit [Fig. 14].

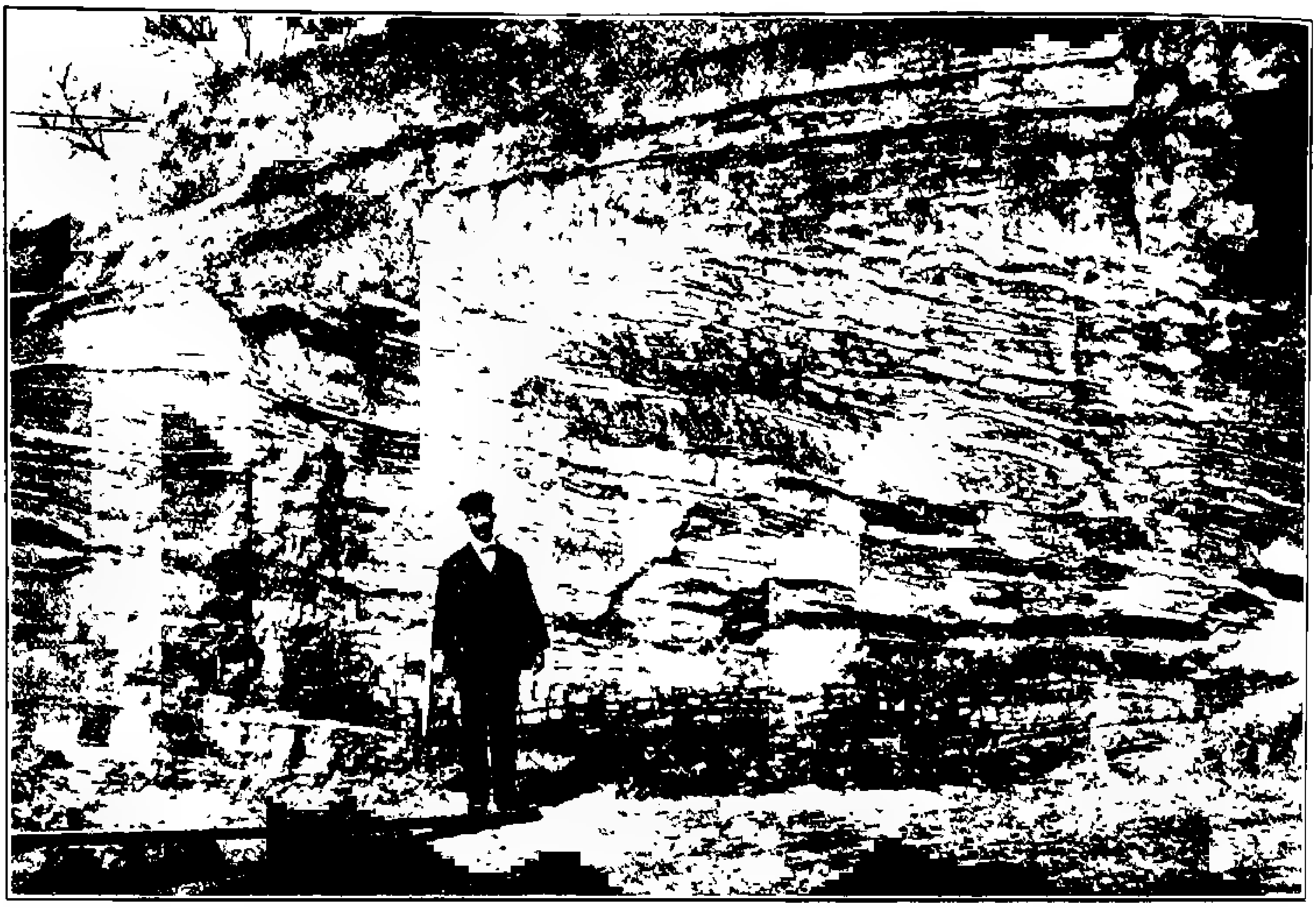

FIG. 14. Exposure of Cretaceous deposits, Androvette pit, Kreischerville, Staten Island. — Layers containing amber are in the stratum indicated by the pick handle.

Most of the amber was found in a relatively thick accumulation of finely comminuted lignite and charred wood, through which it was irregularly distributed. Other specimens were obtained from thinner layers of closely packed leaves and twigs. A piece of the lignitic matrix, with two fragments of amber enclosed, is shown in Fig. 15*a*. A large part of the amber is in the form of drops or "tears," examples of which are shown in Fig. 15*c*, *d*, *e*, but irregular shaped fragments, some as large as a hickory-nut, are the most abundant. They are generally more or less transparent and yellow or reddish in color, but many are opaque and grayish-white, from the presence of impurities. One of the best specimens of the former is shown in Fig. 15*f*, and one of the latter in Fig. 15*b*.

Although it is probable that amber is far more common in the Cretaceous deposits of the eastern United States than is generally supposed, as indicated by the relatively large amount that was found in the limited exposure at Kreischerville, the actual records of its occurrence are few and the localities mentioned are widely separated. It has been found at Cape Sable, in Maryland, Gloucester county, N. J., Martha's Vineyard, and at Northport, Long Island. At the latter locality it was discovered by the writer, but has not been previously recorded.

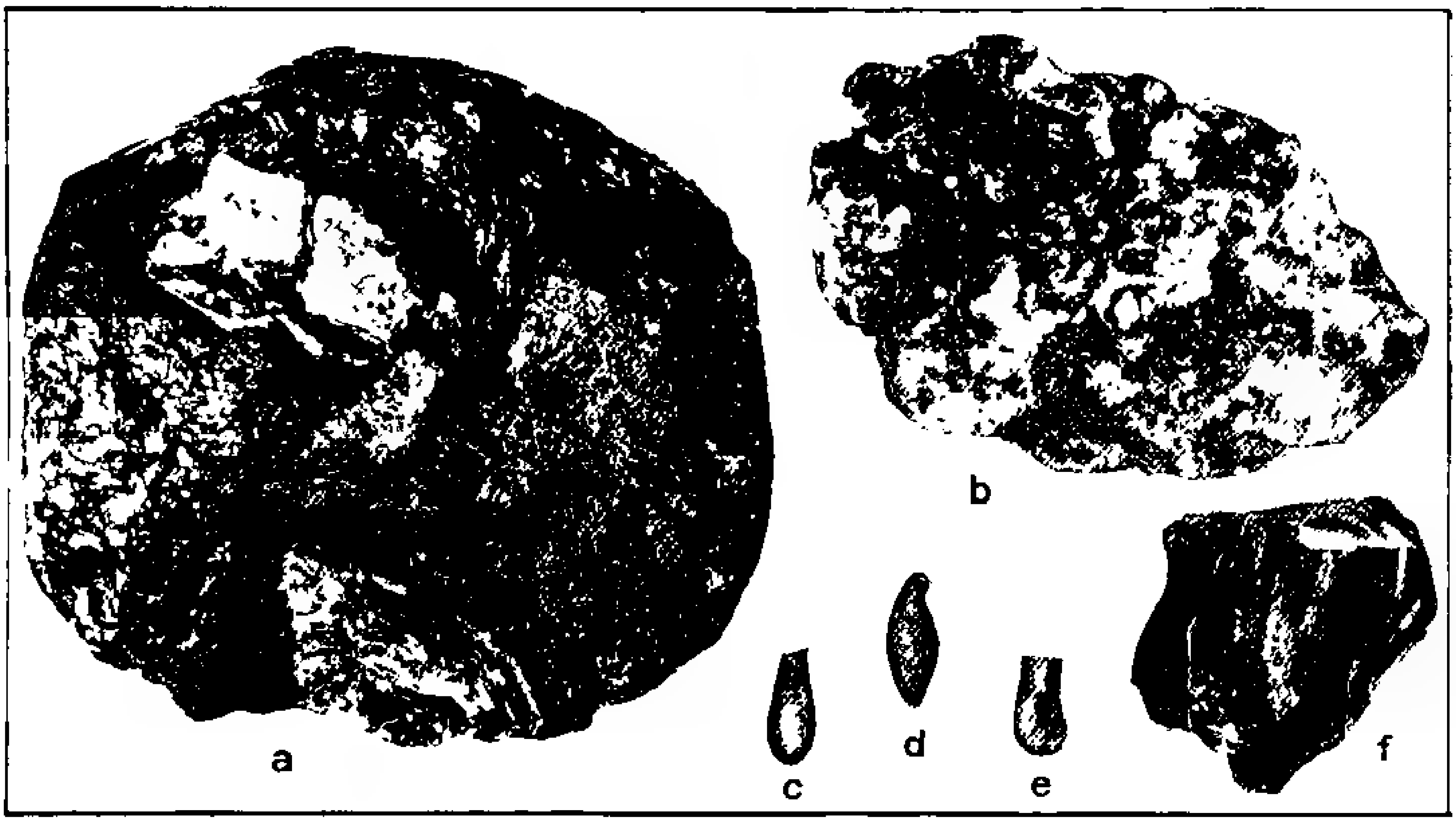

FIG. 15. *a*, Lignitic matrix, containing amber; *b*, impure amber; *c*, *d*, *e*, amber drops or "tears"; *f*, large specimen of clear amber.

The problem of the origin of the amber is of considerable interest from the botanical point of view. At Cape Sable it was found included in the interstices of a log of lignite, which was determined by Dr. F. H. Knowlton, of the U. S. National Museum, to belong to an extinct species of *Sequoia*, the genus to which the giant trees of California belong, and at Kreischerville it occurs in close connection with the leafy twigs of *Sequoia heterophylla* Vel. and *S. Reichenbachii* (Gein.) Heer. The amber of Japan is also said to be associated with the leaves of a *Sequoia*.

Other remains of coniferous trees which occur in the Kreischerville clays are *Widdringtonites Reichii* (Ett.) Heer, *Juniperus* *hypnoides* Heer, *Dammara microlepis* Heer, and a species of *Pinus*. The genus *Dammara* is represented in our living flora by *D. australis* Lamb., the well-known "Kauri" gum tree of Australia.

ARTHUR HOLLICK.

THE FLOWERING OF NOLINA TEXANA.

The plant from which the accompanying illustration was made was secured by Dr. D. T. MacDougal, in 1902, near Austin, Texas, the locality from which this species, *Nolina Texana* S. Wats., was originally described. This plant flowered at the conservatories the middle of the past month, and presented rather an unusual sight among the other plants in house No. 6.

The leaves are long and narrow, of a bright shining green, thick, convex on the back and slightly concave on the upper surface, the margins decidedly roughened; they are about three feet long and a little exceeding one eighth inch in width, rather abruptly broadened at the yellowish base, and very lax, so that their upper portions fall over and lie on the ground, covering in a wild state, so I am informed by the collector, quite an area in the neighborhood of the plant. From the midst of this mass of leaves arises the flower stalk, to the height of a foot or two (in the specimen here under consideration barely reaching the former measurement); this, in our plant, bears a panicle of nearly white flowers, the branches bearing the flowers arising from much longer bracts which are drawn out into long tails. The bracts, axis of the panicle, and the flower buds are white, daintily flushed with rose, these forming a pretty combination with the fully expanded flowers, in which the segments are strongly recurved or almost revolute, and white, with a faint blush of rose on the inner surface; the stamens with their bright yellow anthers greatly heighten the effect. The contrast of the dainty flowers with the bright green graceful leaves is quite unusual.

The genus *Nolina*, belonging to the lily family, inhabits the arid or semi-arid regions of the southwest, ranging, in its ten or

FIG. 16. *Nolina Texana* S. Wats.

twelve species, from central Texas to California and Mexico. It is most readily distinguished from *Dasylirion*, a closely related genus inhabiting the same general territory, by its entire leaves, the leaves in the other genus being usually densely armed on the margins with stout spines. To the botanist other characters, perhaps not so evident to the casual observer, furnish more important differences between the two genera; the included stamens and three-celled ovary of *Nolina* and the exserted stamens and one-celled ovary of *Dasylirion* are characters of this class.

GEORGE V. NASH.

NOTES, NEWS AND COMMENT.

Dr. Alexander P. Anderson who made some investigations at the Garden resulting in the discovery of a valuable method of treating starchy seeds for economic purposes in 1901 and 1902, has recently donated to the Garden a fine model of the automatic weighing apparatus devised and constructed by him. This apparatus was used by Dr. Anderson in his observations on the growth of fleshy fruits, and is a valuable acquisition to the equipment of the laboratories.

Dr. B. E. Livingston, of the Bureau of Soils, U. S. Department of Agriculture, has published a paper in the January number of the Bulletin of the Torrey Botanical Club on the "Chemical Stimulation of a Green Algae." The investigations described in this paper reached some important results which were obtained by Dr. Livingston while resident at the Botanical Garden, September to December, 1903, as a recipient of a research scholarship grant. This paper is published as Contribution No. 63 of the Garden series.

Dr. W. A. Murrill, Assistant Curator, sailed for Cuba on February 25. Dr. Murrill will make a collection of fungi in the island, visiting some localities from which no material of this kind is yet available. He is expected to return late in March.

The Carnegie Institution has recently published a paper on "The Mutations and Hybrids of the Oenotheras" by Dr. D. T.

MacDougal, assisted by Dr. G. H. Shull, Miss A. M. Vail and Dr. J. K. Small. This paper is issued as No. 24 of the series of the Institution, and is the second accredited to the station for Experimental Evolution at Cold Spring Harbor. The results of observations of cultures of the evening-primroses carried on in the New York Botanical Garden are described, and include observations on the origin and characteristics of new species, together with a description of the behavior of these plants in hybridizations.

Dr. J. N. Rose, of the U. S. National Museum, who is coöperating with Dr. N. L. Britton in investigations of the Crassulaceae and of the cacti, has recently been promoted to the position of Associate Curator in charge of the herbarium of that institution.

The Plant World for 1905, which is now under the editorship of Professor F. E. Lloyd, contains an article on "Physiological Drought Relating to Gardening," by Professor Balfour, Regius Keeper of the Royal Botanic Garden, Edinburgh, which is of great interest to horticulturists.

The same number of this periodical contains the first instalment of "A Summer in the Tropics," by Miss M. M. Brackett, describing a season spent at the Cinchona Laboratory of the New York Botanical Garden.

The study of the botanical collections of Mr. Herbert H. Smith in the Santa Marta region of Colombia, made by Dr. H. H. Rusby, continued at Kew during the summer of 1904, shows interesting relations between that and neighboring floras. It is believed that no botanical collection from South America has ever exhibited such wide relationships. Perhaps the most striking similarity is to the St. Vincent flora, many of the species of Mr. Smith's collections on that island being duplicated in his Santa Marta sets. Quite a large number of the species of Dr. Trimble on the Upper Amazon, and a very large number of those of Jamison and others in Ecuador are represented, and Central America and Mexican species are also numerous. Venezuela and Guiana are closely related, as would naturally be expected. Bolivian species are almost without representation.

In spite of the large number of species collected by Purdie at Santa Marta, most of which are represented in Mr. Smith's sets, and of the earlier extensive collections of Karsten, the number of new species will be probably 20 per cent. of the 2,500 species. There are new genera in Rubiaceae, Compositæ, Violaceae and Olacaceae.

Dr. Rusby studied, at the same time, such of the Bolivian collections of Mr. R. S. Williams, on the Conway expedition, as were not determinable at New York, and found most of them undescribed.

The total precipitation in the Garden during February, 1905, amounted to 2.76 inches. Maximum temperatures of 31° on the 1st, 41° on the 13th, 37° on the 19th and 51° on the 21st were observed; also minima of — 1.5° on the 4th, 6° on the 8th, — 3° on the 14th, 5° on the 15th, 2° on the 16th, 8° on the 19th and 17° on the 26th.

Dr. D. T. MacDougal started upon an expedition to the southwestern deserts on the 10th. It is planned to descend the Colorado river from Mellen to Yuma, a distance of over three hundred miles, in a small boat equipped for collecting cacti. At Yuma a small party will be organized and the trip will be continued to the Gulf of California. The series of observations on desert conditions and desert vegetation begun some time since will be continued, and living material of the cacti and other living forms will be obtained for the Garden. Mr. G. C. Copp of New York will accompany the expedition. Permission has also been given to Mr. E. A. Goldman of the Biological Survey of the U. S. Department of Agriculture to accompany the expedition. Mr. Goldman will carry out some work in extension of the field surveys made by the Department and will collect material for a study of the region.

Dr. Britton accompanied by Mrs. Britton and by Dr. Marshall A. Howe, have returned from their expedition to the Bahama Islands, with a collection of about ten thousand specimens for the herbarium, museum and the conservatories, being much the largest amount of material representing the flora of these Islands ever yet brought out at one time. Dr. C. F. Millspaugh of the

Field Columbian Museum was with them, and the institution which he represents will be supplied with a part of the collection, and other duplicates will be used in exchange elsewhere. The exploration included an examination of the Berry Islands, a group of cays lying north of New Providence; a study of a portion of the south shore of the Great Bahama Island, the most northern of the larger islands of the Archipelago; and of the Exuma chain of cays and islands lying southeast of New Providence. Transportation was affected by means of a schooner and the trip was accomplished without serious difficulty; the entire collection has been received at the Garden in good order.

Excavations for the foundations of the one-arched granite bridge, to carry the main driveway across the valley of the lakes just northeast of the Museum Building, were begun late in February by Joseph Gallo, who holds the contract for the building of this bridge by the Department of Parks. This is the last of the large bridges required in carrying out the general plan for the development of the Garden, and it should be completed during the present year.

During the winter, work has been going forward at the rear of the Museum Building in excavating rock, to accomplish the necessary grading of the grounds at this point; the broken stone has been hauled to points east of the Bronx river along the lines of driveways still remaining to be built, taking advantage of the frozen ground to effect easy haulage. Much of the grading for these driveways was accomplished last year and the year previous, and the paving of the roads may be taken up as soon as frost is out of the ground.

Mr. J. F. Cowell, Director of the Botanical Garden at Buffalo, who is making a collection of plants in the Republic of Panama on behalf of our Garden, has commenced shipping specimens, and a large box of orchids, aroids, and representatives of other tropical groups of plants has already been received in good order. It is evident that his collections will add greatly to our representation of species. He expects to remain in Panama until early in April. Aided by his collections, the scientific study of the flora of Panama has been taken up, Mr. Percy Wilson, Administrative

Assistant, giving as much time as possible to this work, which includes the arrangement and determination of a large collection of herbarium specimens made on the Isthmus by Dr. Sutton Hayes, in 1859 and 1860, and the compiling of all references in literature to plants of Panama. The collections at present being made by Mr. Cowell will be divided between the New York garden and the Buffalo garden.

The tanks for aquatic plants built last year in the court of the public conservatories, will be put in operation this spring, and a large collection of water lilies has been brought together for exhibition there; two glass roofed aquatic hot beds are now being built in the western of the two tanks, for the germination and early cultivation of the South American Victorias, this tank having been equipped with a hot water service. The eastern tank is designed for half hardy water lilies and its bottom has been divided into compartments by low brick walls for the purpose of keeping their rootstocks from intermingling.

ACCESSIONS.

MUSEUMS AND HERBARIUM, JANUARY, 1905.

3 specimens of *Zamia* from Florida. (Given by Professor P. H. Rolfs.)

8 herbarium specimens of *Viburnum prunifolium globosum* from New Jersey. (Given by Mr. Geo. V. Nash.)

37 miscellaneous specimens from Pennsylvania. (Given by Mr. J. J. Carter.)

25 specimens "Fungi Utahenses." (Distributed by Mr. A. O. Garrett.)

1 specimen of a fungus from Pennsylvania. (Given by Professor D. R. Sumstine.)

20 herbarium specimens from New York and New Jersey. (Given by Professor Philip Dowell.)

6 miscellaneous specimens of fungi. (Given by Professor L. M. Underwood.)

40 specimens of lichens from Scandinavia. (Collected by Messrs. P. J. and E. V. M. Hellböm.)

1 specimen of *Razoumofskia* from California. (Given by Mr. E. Braunton.)

59 specimens of mosses from Brazil. (Distributed by Professor E. Ule.)

10 specimens of mosses from various localities. (Given by Dr. A. J. Grout, for the Columbia University Herbarium.)

43 specimens "Plantæ Faroensis (lichens).

1 museum specimen of a fungus. (Given by Mrs. Livingston and Miss Crane.)

1 museum specimen of a fungus. (Given by Professor L. M. Underwood.)

16 specimens of hepatics from Greenland. (Collected by Mr. M. Hartz.)

453 specimens of hepatics from Guadeloupe and Martinique. (Collected by Pere Duss.)

40 specimens of fungi from the United States, Cuba and Jamaica. (Collected by Messrs. Maxon, Palmer, Riley and Ricker.)

25 specimens of fungi from Mexico. (Collected by Mr. E. W. D. Holway.)

31 specimens of fungi from Southern California. (Collected by Mr. LeRoy Abrams.

1 herbarium specimen of *Epipactis viridiflora*. Given by Mr. G. B. Ashcroft for the Columbia University Herbarium.)

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CZAPEK, FRIEDRICH. *Biochemie der Pflanzen.* Vol. 1. Jena, 1905.

DRAGENDORFF, GEORG. *Die gerichlich-chemische Ermittelung von Giften.* Ed. 4. Göttingen, 1895.

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FLINT, MARTHA BOCKÉE. *A garden of simples.* New York, 1900.

GRISEBACH, A. *Die geographische Verbreitung der pflanzen Westindiens.* Göttingen, 1865.

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HERVEY, A. B. *Wayside flowers and ferns.* From original water-color drawings by Isaac Sprague. Troy, 1887.

HOLLÓS, LÁSZLÓ. *Gasteromycetes Hungaricae.* Leipzig, 1904.

HOLTON, ISAAC F. *New Grenada: twenty months in the Andes.* New York, 1857.

JAEGER, AUGUST. *Ein Blick in die Mossflora der Kantone St. Gallen und Appenzell.* St. Gallen, 1868.

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MEDICUS, FRIEDRICH KASIMIR. *Pflanzen-gattungen.* Mannheim, 1792.

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MIALL, L. C. *House, garden and field.* London, 1904. (Given by Dr. D. T. MacDougal.)

MICHIE, CHRISTOPHER YOUNG. *The larch.* New edition. Edinburgh, 1885.

Mittheilungen aus dem Gesammtgebiete der Botanik. Herausgegeben von Prof. Dr. A. Schenk und Dr. Chr. Luerssen. Vols. 1 and 2, pt. 1. Leipzig, 1874–1875.

PERSOON, C. H. *Icones pictae rariorum fungorum.* Paris, 1803–1806.

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SCHUBE, THEODOR. *Flora von Schlesien.* Breslau, 1904.

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OF

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Journal of the New York Botanical Garden, monthly, illustrated, containing notes, news and non-technical articles of general interest. Free to all members of the Garden. To others, 10 cents a copy; $1.00 a year. [Not offered in exchange.] Vol. I, 1900, viii + 213 pp. Vol. II, 1901, viii + 204 pp. Vol. III, 1902, viii + 244 pp. Vol. IV, 1903, viii + 238 pp. Vol. V, 1904, viii+242 pp.

Bulletin of the New York Botanical Garden, containing the annual reports of the Director-in-Chief and other official documents, and technical articles embodying the results of investigations carried out in the Garden. Free to all members of the Garden; to others, $3.00 per volume. Vol. I, Nos. 1–5, 449 pp., 3 maps, and 12 plates, 1896–1900. Vol. II, Nos. 6–8, 518 pp., 30 plates, 1901–1903. Vol. III, No. 9, 174 pp., 15 plates, 1903; No. 10, 114 pp., 1903.

Memoirs of the New York Botanical Garden. Price to members of the Garden, $1.00 per volume. To others, $2.00. [Not offered in exchange.]

Vol. I. An Annotated Catalogue of the Flora of Montana and the Yellowstone Park, by Dr. Per Axel Rydberg, assistant curator of the museums. An arrangement and critical discussion of the Pteridophytes and Phanerogams of the region with notes from the author's field book and including descriptions of 163 new species. ix + 492 pp. Roy. 8vo, with detailed map.

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EDITOR

DANIEL TREMBLY MACDOUGAL

Assistant Director

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JOURNAL

OF

The New York Botanical Garden

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THE NEED OF ADDITIONAL ENDOWMENT.

The New York Botanical Garden needs endowment to the extent of at least $1,000,000. Through the generosity of a few persons it now has invested $335,000, on which the yearly income is from $13,000 to $14,000. It needs an income of $50,000, applicable to strictly scientific work, in order that such work may be prosecuted thoroughly and continuously, viz.:

1. *For Botanical Exploration*: Our home territory is wide, and in parts imperfectly explored; our foreign possessions, as well as the West Indies, Panama and Central America, are botanically but partially known.

2. *For the purchase* of desirable plants and specimens not otherwise obtainable, for the greenhouses and museums. We receive much by gift and exchange; but more or less purchasing is necessary.

3. *To complete the Botanical Library*, by purchasing the most important works of the past, as well as current publications; and most important of all,

4. *For the Maintenance of Original Research* on all botanical questions; specially on the problems of plant life, its progress and modifications, and its relations to horticulture, agriculture and forestry, and to human life, disease and its cure; also, as tributary and essential to the foregoing,

5. *For the Maintenance of Competent Scientists*, for laboratory investigations, and as teachers of special research students and

professors, preparing for similar work in colleges, universities and agricultural stations.

6. *For the Publication of valuable original work*, and the establishment of lectures, scholarships, and prizes in order to stimulate widely such original investigations.

In preparing a habitation for the Botanical Garden, the city has expended over $1,000,000 upon its buildings, grounds and roads; and it contributes also to their maintenance as a part of the park system, for the health, instruction and enjoyment of the people; but for support of the life and soul of the Garden, as a valuable and progressive Scientific Institution, we must look mainly to the public-spirited citizens of New York. Much has been already done, as a look at its work will show. The Directors have expended about $240,000; have invested the fund of $335,000 as above stated, and in the gifts of plants, books, apparatus and the deposit of collections, have received about $200,000 more, a total of $775,000 of private contributions.

The Garden has won an honored and a world-wide name, but it must have means for progress and usefulness. Through scientific research, the marvels of the nineteenth century surpass all others in their transforming and beneficent results. Yet the marvels of to-day are opening new vistas, and point with prophetic finger to other discoveries equally important and beneficial to man.

Remittances may be made to

N. L. BRITTON, *Director-in-Chief*, Bronx Park, or to

C. F. COX, *Treasurer*, Grand Central Station.

In behalf of the Board of Managers of The New York Botanical Garden,

JAMES A. SCRYMSER,
Chairman of the Finance Committee.

RECEPTION DAYS AND LECTURES.

The Director-in-Chief and other members of the staff will be pleased to receive members and their friends at the grounds in Bronx Park on every Saturday for which lectures are announced.

Train leaves Grand Central Station, Harlem Division, N. Y. C. R. R., at 2:35 P. M., for Bronx Park. Returning train leaves Bronx Park at 5:32 P. M. Excursion fare twenty-five cents.

Opportunity will be given for inspection of museums, laboratories, library and herbarium, the public conservatories, the herbaceous collection, the hemlock forest, the fruticetum and parts of the arboretum site. The walk planned will be a little over one mile.

The spring course of lectures will be delivered in the lecture hall of the museum building on Saturday afternoons at 4:30 o'clock.

April 29. "The Indian and his Uses for Plants," by Mr. Frederick V. Coville.

May 6. "The Pines and their Life History," by Professor Francis E. Lloyd.

May 13. "Botanical Aspects of Deserts of Arizona, California, Sonora and Baja California," by Dr. D. T. MacDougal.

May 20. "The Coralline Seaweeds," by Dr. Marshall A. Howe.

May 27. "Cuba," by Dr. W. A. Murrill.

June 3. "Vegetable Poisons and their Strange Uses," by Dr. H. H. Rusby.

The lectures will be illustrated by lantern slides and otherwise. They will close in time for auditors to take the 5:32 train from the Bronx Park Railway Station, arriving at Grand Central Station at 6:02 P. M.

The Museum Building in reached by Harlem Division, New York Central and Hudson River Railroad to Bronx Park Station, by trolley cars to Bedford Park, or by Third Avenue Elevated Railway to Bronx Park.

SOME OF THE CORALLINE SEAWEEDS IN THE MUSEUM.

In the JOURNAL for March, 1904, there was published an illustrated account of the exhibit of seaweeds in the public museum of the Garden and in the course of this a brief allusion was made to the corallines. The seaweeds of this group often bear a more or less striking resemblance to organisms of a very different nature, namely to the corals — a resemblance that is due chiefly to the fact that both have the habit of secreting lime and becoming thereby equally hard and stone-like. The true corals have, for a century and a half, been generally conceded to belong to the animal kingdom; but the "corallines," as the word is ordinarily applied at the present day, are just as truly plants as are any other seaweeds. This latter fact, however, has not been recognized for a century and a half; indeed, it is scarcely more than half a century since the conviction that corallines are plants has become in any way general among the students of marine life. The external resemblances existing between these two groups of entirely different organisms naturally led to confusions in classification, so that the literature relating to corals and corallines is more or less intertangled up to about the middle of the nineteenth century. Just as the naturalists of the sixteenth and seventeenth centuries believed sponges and corals to be plants, so most of their successors for the next hundred and fifty years went to the other extreme and insisted upon considering the coralline seaweeds to be animals or else relegated them to a doubtful half-way pigeon-hole under the delightfully non-committal name of "Zoöphyta." The learned John Ellis in his "Natural History of many curious and uncommon Zoophytes" (arranged by Daniel Solander and published in London in 1786) makes the following remarks on the genus *Corallina*, which, as limited by him, consisted entirely of what we now know to be plants: "Is an animal growing in the form of a plant; whose stem is fixt to other bodies, and is composed of capillary tubes, whose extremities pass through a calcareous crust, and open into pores on the surface. . . . This genus has been thought by some late writers to belong entirely to the vegetable kingdom, and to differ but little from Fucus's and Conferva's; but as Dr. Linnaeus observes, in a note on this genus in his System of Nature, p. 1304: 'Corallinas ad regnum animale pertinere ex substantia earum calcarea constat, cum omnem calcem animalium esse productum verissimum sit.' Or, that all calcareous substances are most truly of animal production; therefore, that Corallines, consisting of that substance, do belong to the animal kingdom."

"What or where the link is that unites the animal and vegetable kingdoms of nature no one has yet been able to point out; some of these Corallines appear to come the nearest to it of anything that has occurred to me in all my researches; but then the calcareous covering, though ever so thin, shews us that they cannot be vegetables. . . . The minuteness of the pores of Corallines, though as small as those of some plants, is no proof of their being vegetables, because there may be suckers that come through these pores which our glasses cannot discover; or perhaps they may be like the pores of the sponges, contrived in such a manner as to suck in and throw out the water." This careful and philosophical, though according to our modern notions inadequate, explanation of the nature of corallines must have been written not later than 1776, the year of Mr. Ellis's death. It is interesting to note that as early as 1755 he had published good figures of the conceptacles and tetraspores of the common officinal coralline, but had apparently looked upon the spores as polyps. Although the species of *Corallina*, as that genus was accepted by Ellis and Solander, embraced only organisms of a vegetal nature, they were otherwise an incoherent group, agreeing only in being calcareous. They included representatives of the green algae and also of what are now considered three families of the red algae, to one of which alone the term "coralline" is at present restricted.

The coralline seaweeds are not so generally confined to the warmer seas as are their animal imitators, the corals. They are locally abundant in arctic and temperate as well as in tropical regions. Professor Kjellman, in his "Algae of the Arctic Sea," remarks that three families of algae, the Laminariaceae (kelps), the Fucaceae (rockweeds), and the Corallinaceae, dominate the vegetation of the Arctic seas. *Lithothamnion glaciale* is reported by Professor Kjellman from within almost ten degrees of the north pole (Lat. 79° 56′). He says of it: "Most often and in greatest number it is met with at a depth of 10–20 fathoms . . . On the coasts of Spitzbergen and Novaya Zemlya it covers the bottom in deep layers for several miles and altogether determines the general aspect of the vegetation wherever it occurs. In the formation of future strata of the earth's crust in these regions it must become of essential importance." * In tropical regions, also, the coralline algae form, in places, a conspicuous part of the marine flora. Our plate, XXIV, illustrates one of several forms of *Goniolithon* which are found in the Bahama Islands. In that region they grow especially where there are strong sea-currents, mostly near the low-water mark or where the water is only two or three feet deep at low tide. The form represented in this photograph is very abundant on the windward side of Stocking Island, Exuma Harbor, Bahamas, growing chiefly a little above the low-water mark on rocks which during most of the days of the year are subjected to a heavy pounding from the surf. Its branches are quite brittle, yet they resist the impact of the waves with a success that is surprising. The mass shown in the photograph (less than half natural size) weighs, with the infiltrated sand and a little adherent rock, about forty pounds. This perhaps represents a single "individual" plant. The Goniolithons, as they occur in Bermuda, Florida, and the Bahamas, are commonly sterile, but *Lithothamnion incertum*, a Bermudian species, is ordinarily copiously fertile. The small rounded excrescences to be seen near the ends of the branches in the photograph of *L. incertum* (plate XXV) indicate the position of the conceptacles in which the reproductive bodies are borne.

In the Malay Archipelago, judging from photographs published by Mme. Weber-van Bosse, the coralline algae of the Lithothamnion group form beds or banks that are more conspicuous and striking than any that the writer has yet seen in the West Indian region. In her account of "The Corallinaceae of the Siboga-Expedition" (pp. 4 and 5, 1904), she writes: "Near the coast of Haingsisi, an island near the S. W. point of Timor, the Siboga anchored twice . . . ; the second time good luck favoured us, it was spring-tide, the water sank very low and we could observe that the whole reef, which stretched from the

* The Algae of the Arctic Sea, 96. 1883.

shore out into the sea, consisted chiefly of *Lithothamnion erubescens f. Haingsisiana.* It was remarkable that the branching knolls remained quite dry during several hours of the day, exposed to the glare of the tropical sun and that this seemed not to injure them. . . . This Lithothamnion-bank struck me because it is such a unique sight to see the ground, as far as the eye can reach, covered by the pretty beautifully pink-coloured knolls, which are heaped up so close together that, while walking, one crushes them continually, making a peculiar noise as of broken china. We encountered, however, other and perhaps more instructive Lithothamnion-banks during our voyage."

It seems evident that the building-up of the so-called coral-reefs and coral-islands, which, in semipopular scientific literature has been ascribed almost exclusively to animal agencies, is, in many cases, at least, due in an important part to these calcareous plants. For reasons that are obvious, the collection of coralline algae has been much neglected by the general botanical explorer, and even those who make a specialty of collecting marine algae are likely to pass some of them by unless prepared for detaching crustaceous species from the rocks and equipped for transporting heavy loads. Consequently, the coralline seaweeds, particularly those of the tropical regions, are still quite imperfectly known.

It may be remarked, in passing, that the living color of the corallines in general is some shade of pink or red, but most of them become decolorate or chalky white very soon after being taken from the water and exposed to the light, or after the natural death of the plant. Some of the crustaceous and fruticulose species, though beginning life attached to shells, rocks, corals, etc., finally become free and lie loose on the sea-bottom. Some of these detached pieces may be turned over by the waves often enough so that they develop in a globose, radially symmetrical form.

The group of corallines which has very properly inherited the ancient generic name *Corallina* is represented on our American North Atlantic coast only by what is probably a single variable species, *Corallina officinalis* L. The corallines in this narrower sense have a regularly jointed plant-body and are very different in habit from those that we have referred to above. *Corallina officinalis* occurs occasionally in Long Island Sound and has been reported from as far south as New Jersey. It was formerly supposed to possess medicinal properties and was to be found in apothecaries' shops, whence the specific name. Less conspicuous members of the coralline family form thin crusts on the leaves of the eel-grass (*Zostera*) and of other marine spermatophytes and on the larger algae.

Duplicates of the non-articulated corallines preserved in the herbarium and museum of the Garden (with the exception of those collected on the last two expeditions to the Bahamas) have been submitted to Dr. Foslie, of Trondhjem, Norway, who is engaged on a general monograph of the group. Dr. Foslie's examination of these specimens discloses several new species and varieties from the West Indian region, and it is expected that a paper on the subject by Dr. Foslie and the writer will soon be published.

MARSHALL A. HOWE.

THE CRESTED ORCHID.

Among all the orchids in cultivation there are few that equal and none that surpass in daintiness and purity the subject of the accompanying illustration, *Coelogyne cristata*. Others there are which are more resplendent in color, or by oddity of form attract attention, but for gracefulness and charm this little visitor from the far off Himalayas cannot be excelled. Its home there is among the mountains, at an altitude of from 5,000 to 7,000 feet — an elevation at which a temperate climate prevails, even in that part of the globe; and it is perhaps on this account that it lends itself so readily to cultivation, for it is one of the easiest of all the orchids to cultivate successfully.

Of course there are certain essential conditions which must be supplied, as is the case in the culture of all plants, but the wants of this orchid are so readily satisfied, that it should adorn all collections, even the smallest. When it is at rest, during the winter months, it may be kept in a house, the temperature of which goes down as low as 45° at night. The growing period is during the summer months, so that the additional warmth then required is supplied by the natural conditions existing at that time of the year; indeed too much heat must be guarded against by shading, and plenty of tempered light and air provided. During the active growing period it must be supplied freely with water at the roots, in addition to a syringing once or twice a day in bright weather.

Its flowers are a pure white, growing in clusters of three or more, and in well-grown plants forming a mantle of snowy whiteness over the green of the leaves and pseudobulbs, the latter resembling much in shape the ordinary olive. The lip bears a crest of about five rows of long hairs—this giving to the plant its specific name. In the typical form these hairs are a rich orange, and the effect of this combination is quite pleasing. In the variety *hololeuca* (also known under the name of *alba*) this crest is also white. This white variety is by no means common. In the variety *Lemoniana* (also known under the name of *citrina*) the crest is a lemon-yellow instead of orange. This is interesting as a variation, but is not as effective as the typical plant. The so-called variety *maxima*, from which the illustration was made (Plate XXVI), differs from the typical form mainly in the larger flowers and pseudobulbs. While these differences are of little value botanically, they are of more importance from the standpoint of artistic and decorative effects.

The genus *Coelogyne* is confined to the Old World, being especially rich in species in the East Indies and the Malay Archipelago. Something over fifty species are known, many of these being in cultivation, but none with which we are acquainted can surpass, and few equal, this native of the temperate Himalayas. I know of no other orchid which will so well repay the care and attention given, or which will yield so rich a harvest of delightful bloom.

George V. Nash.

HUGO DE VRIES ON THE ORIGIN OF SPECIES AND VARIETIES BY MUTATION.*

From the time of Linnaeus (1753) to the time of Darwin (1859) it was the general belief that the various species of animals and plants had been separately created and that they remained forever unchangeable in their essential characters. It seems strange to us now, but for those hundred years this doctrine of the immutability of species was held to be a necessary test of orthodoxy — theological as well as scientific. When Darwin attacked it, he encountered the vehement opposition, not only of churchmen, like the Bishop of Oxford and the Duke of Argyle, but also of men of science, like Richard Owen and Louis Agassiz. But notwithstanding the number and strength of his opponents, Darwin overthrew the dogma once for all, and thereby destroyed, at least in the domain of science, the tyranny of authority.

His principal service to pure science was in the establishment of the principle of derivation, and the results of his work in that direction stand secure, but he also discovered, and placed on a firm foundation of proof, the method by which derivative forms are made permanent — namely, by what he called "natural selection," or as Herbert Spencer afterwards named it "the survival of the fittest." It has been mistakenly supposed that Darwin considered natural selection as an actual producer of new forms and this misapprehension has been to some extent encouraged and fostered by his own phrase "the *origin* of species" and other more or less figurative expressions used by him ; as a matter of fact, however, he correctly conceived that selection could not operate until there were already various forms to select from, and he did not attempt to solve the problem of "the origin of the fittest" — to use Professor Cope's apt designation. Darwin did, however, undertake to explain heredity, in his theory of pangenesis, but he seems to have considered variation as inexplic-

* Species and Varieties, Their Origin by Mutation. Lectures delivered at the University of California by Hugo de Vries, Professor of Botany in the University of Amsterdam. Edited by Daniel Trembly MacDougal, Assistant Director of the New York Botanical Garden. Chicago and London, 1905.

able. So, indeed, it was in his time; but later knowledge has thrown some light on the subject by showing that there are two kinds of variability to be reckoned with — namely, the deviations of the individuals of a species, or a variety, from the average characters of their groups — correctly termed by Darwin "fortuitous" — and the differences between species and varieties due to the acquisition or loss of characters. The first-named mode of variation is now distinguished as "fluctuation" and it can be shown by mathematical calculation to be subject to the law of chance, as was supposed by Darwin. It was the products of this kind of variability upon which Darwin assumed that natural selection must work in order to build up the characters of a new species. But Professor Hugo de Vries was not satisfied with Darwin's assumption, and therefore took up the matter at this point and subjected it to scientific scrutiny. The results of his many years of research and experimentation have been set forth in his monumental work "Die Mutationstheorie," of which the book before us may be considered in part a summary, and in part a supplement. Although the author claims that his work is "in full accord with the principles laid down by Darwin," he contends that there is no evidence that a species ever originated by the accumulation of "fluctuations" and undertakes to show that the only method by which one species can originate from another is by the sudden acquisition of a character or characters springing into existence fully formed, and completely hereditable — by a process called *mutation*.

As a consequence of the far-reaching importance of Darwin's theories, many of his followers have been carried away by the allurements of deduction, and have been writing essays in support of evolution, when they ought to have been adding knowledge to what Darwin accumulated. Professor de Vries is one of the few men of science who have undertaken to bring the great question which Darwin propounded, as to the derivation of species, back into the realm of observation and experiment. He is, in fact, the first who has advanced the matter much beyond the point at which Darwin left it. This he has accomplished by three methods of procedure: first, by traversing the history of botany, particularly of horticulture, and gathering up the records of the introduction, from time to time, of new species and varieties ; second, by closely scanning wild plants for the discovery of probably mutating forms ; and third, by laborious and long-continued test cultures of plants, for the purpose of detecting mutations and of determining the laws of heredity and variation. In each of these fields, he has been eminently successful. He has shown that in times past, new varieties and species have without doubt sprung into existence unobserved. He has discovered wild plants with their mutants growing beside them. He has raised hundreds of species in his garden and actually beheld new species spring from them, and he has followed seedlings and cuttings through generation after generation, until he has disclosed many of the laws governing the transmission of their characters.

While throwing light upon the question of the relative importance of heredity and environment, he has, in large measure, cleared up the confusion which has long existed with reference to the meanings and connotations of the terms "species" and "varieties." His pedigree cultures and extended observations have quite satisfactorily confirmed the theory that the characters which we regard as varietal, specific and generic, are fundamentally physiological in their nature, and he has furnished evidence in confirmation of Mendel's law, and in consonance with the most important discoveries of modern cytology. He pays Darwin the compliment of saying that he has based his field researches and his testing of native plants on the idea of unit-characters deduced from Darwin's hypothesis of pangenesis. In many directions de Vries has moved forward of Darwin's positions, but, let us admit, on the line of Darwin's own advances over his predecessors. Their work is really continuous, as de Vries himself generously declares.

The most striking of his discoveries are those relating to the evening primroses, by which he has demonstrated for the first time that a new and veritable species may descend by a single step from a parent species. Under his very eye *Onagra Lamarckiana* gave birth to over a dozen novel forms, most of which are entitled to be ranked as species, although a few are considered by de Vries as varieties, in a narrow sense of the word imposed by himself. Of the new forms, at least nine have ever since bred true. In this connection we may note that de Vries has shown that "varieties are as constant as the best species, if kept free from hybrid admixtures." Darwin, on the other hand, believed that species were strongly marked and permanent varieties, that each species first existed as a variety. But de Vries is disposed to limit the use of the term "variety" to retrograde, or negative forms and to apply the name "elementary species" to secondary forms having progressive characters.

Mutations, which de Vries has now placed on a sound scientific foundation, as parts of the order of nature, were formerly included with "sports," and were looked upon as monstrosities, or, at least, accidents. But de Vries has shown that mutation "must be a universal phenomenon, although affecting a small proportion of the inhabitants of any region at one time."

The evening primroses are not the only family in which de Vries has actually witnessed the origination of new species and varieties. He has recorded so many cases of observed mutation and so many facts supporting its probability, that it is undoubtedly true, as has been said by Doctor MacDougal, that if Lamarck's evening primrose and all of its derivatives were destroyed, or had never been heard of, the results of experimental studies which have been made of other species would serve to establish the fact that mutations have occurred in a number of cases representing diverse groups. The observations of de Vries on the evening primroses has exceptional interest for us, because of the fact that many of his experiments have been repeated at the New York Botanical Garden with results entirely confirmatory of those obtained by him, as has been reported in Doctor MacDougal's paper in the February number of this journal, and as is more particularly set forth in a recent publication of the Carnegie Institution.

There are many points at which, while it appears opposed to some of Darwin's ideas, the mutation theory really illuminates and reënforces the theory of derivation by means of natural selection. For example, Darwin was much troubled by the absence of " connecting links " between old species and new ones, and was obliged to invoke " the imperfection of the geological record " and other causes to account for it ; but the mutation theory offers an easier explanation of these *lacunae*. As de Vries says : " The intermediates are lacking simply because they have never existed." Darwin likewise found difficulty in the want of intermediate forms of fossils in consecutive geological strata, but this obstacle is overcome by the theory of de Vries, for of course mutations have probably occurred in past ages as they are now known to occur in the present. Another subject of perplexity to Darwin was the immense length of time required by his theory for the development of the present living world from its primeval ancestors, and it is well known that the geologists and the physicists declined to allow him the enormous periods demanded. But the mutation theory very greatly reduces these demands and so brings the general theory of derivation into harmony with opinions which were formerly supposed to be in a measure antagonistic to it. These are only a few examples of the help de Vries has brought to the doctrine of evolution.

The publication in English of his views and discoveries is a notable event, and is a matter of special satisfaction to members of the New York Botanical Garden, since Doctor MacDougal, our assistant director, has been intrusted with the duty of editing the work in which they appear, and Miss Vail, our librarian, has been able to render him efficient assistance.

C. F. Cox.

ACCESSIONS.

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MUSEUMS AND HERBARIUM.

FEBRUARY, 1905.

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29 specimens "Musci Acrocarpi Boreali-Americani." (By exchange with Professor J. M. Holzinger, for the Columbia University Herbarium.)

100 specimens "Fungi Columbiani," Century XXI. (Distributed by Mr. E. Bartholomew.)

75 specimens of *Crataegus* from Nova Scotia. (Given by Mr. C. B. Robinson.)

41 specimens of *Crataegus* from Illinois. (Given by Mr. E. J. Hill.)

55 specimens of *Crataegus* from New York. (By exchange with Mr. J. Dunbar.)

1 specimen of *Bryum Labradorense.* (By exchange with Professor J. M. Holzinger.)

1 museum specimen of twigs of *Fraxinus quadrangulata* from Indiana. (Given by Professor H. J. Banker.)

2 museum specimens of the fruit of *Malus Ioensis.* (Given by Mr. H. C. Skeels.)

200 specimens "Mycotheca Italica," Centuries XV–XVI. (Distributed by Dr. D. Saccardo.)

13 specimens of *Crataegus* from Missouri. (By exchange with Dr. N. M. Glatfelter.)

2 specimens of *Crataegus* from Michigan. (Given by Miss E. J. Cole.)

3 specimens of twigs for the Collection of North American Dendrology. (Given by Mr. Q. T. Shafer.)

13 museum specimens of fruits and seeds from the Philippines. (Given by Mr. D. LeRoy Topping.)

2 specimens of lichens from New Jersey. (Given by Mrs. N. L. Britton.)

30 specimens of *Crataegus* from Michigan. (By exchange with Mr. O. A. Farwell.)

24 specimens of *Crataegus* from Wisconsin. (Given by Mr. J. H. Schuette.)

MARCH, 1905.

293 specimens of *Rubus* from Vermont and Connecticut. (By exchange with Mr. W. H. Blanchard.)

34 specimens from Montana and Utah. (By exchange with Oberlin College.)

6 specimens from Colorado. (By exchange with Mr. Geo. E. Osterhout.)

106 specimens from Oregon. (Given by Professor J. E. Kirkwood.)

1,218 specimens from Abaco, Bahamas. (Collected by Mr. L. J. K. Brace.)

1 specimen of *Polemonium* from California. (By exchange with Miss Alice Eastwood.)

19 specimens from British Columbia. (Given by Miss Edith M. Farr.)

2 specimens of *Crataegus* from Illinois. (By exchange with Mr. B. F. Gault.)

7 museum specimens of Citrus fruits. (Given by Dr. H. H. Rusby.)

4,350 specimens from the Bahamas. (Collected by Dr. and Mrs. N. L. Britton and Dr. C. F. Millspaugh.)

5 specimens of fungi from the West Indies. (Given by Mr. E. W. D. Holway.)

1 museum specimen of *Pinus Sabiniana* from California. (Collected by Mr. E. Braunton.)

16 specimens of fungi from Pennsylvania. (By exchange with Professor D. R. Sumstine.)

32 specimens "North American Musci Pleurocarpi." (By exchange with Dr. A. J. Grout, for the Columbia University Herbarium.)

4 specimens of *Crataegus* from Ohio. (By exchange with Professor E. L. Mosely.)

111 specimens from British America. (By exchange with the Geological and Natural History Survey of Canada.)

4,650 specimens of algae from the Bahamas. (Collected by Dr. M. A. Howe.)

15 specimens of *Crataegus* from Pennsylvania. (By exchange with Mr. B. H. Smith.)

2 specimen of *Crataegus* from Massachusetts. (By exchange with the Arnold Arboretum.)

300 specimens from New England and the Lower St. Lawrence region. (Collected by Mr. W. W. Eggleston.)

2 specimens of *Salix* from Pennsylvania. (Given by Professor C. L. Gruber.)

PLANTS AND SEEDS.

1 plant of *Freesia refracta alba*. (Given by Mr. J. H. Bailey.)

1 plant of *Mesembryanthemum* sp. (By exchange with Mr. F. Weinberg.)

9 plants for the conservatories, from Abaco, Bahamas. (Collected by Mr. J. L. K. Brace.)

61 plants of cacti. (Collected by Prof. E. O. Wooton.)

1 plant of *Sarracenia* sp. (Given by Prof. J. M. Macfarlane.)

1 plant of *Beaumontia grandiflora*. (By exchange with Vassar College.)

1 plant of *Peperomia* sp., from Flamingo, Fla. (Given by Mr. A. A. Eaton.)

1 plant of *Crassula portulacea*. (Given by Mr. W. H. Becklehaupt.)

1 plant of *Mesembryanthemum crystallinum*. (Given by Mr. Prescott Underwood.)

2 plants of *Stenorhynchus* sp., from the Bahamas. (Collected by Mrs. N. L. Britton.)

54 plants from the Bahamas. (Collected by Dr. N. L. Britton.)

4 plants of *Drosera* sp., from the Everglades, Miami county, Fla. (Collected by Dr. N. L. Britton.)

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

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

96 plants for the conservatories from Costa Rica. (Collected by Mr. C. Werckle.)

2 cuttings from Costa Rica. (Collected by Mr. C. Werckle.)

2 plants of *Dentaria Californica*. (Given by Mr. S. B. Parish.)

1 plant of *Hudsonia montana*, from Table Rock, N. D. (Given by Mr. C. D. Beadle.)

180 plants from Panama. (Collected by Mr. J. F. Cowell.)

13 plants of *Gentiana crinita*. (Given by Mr. J. Ford Sempers.)

6 bulbs. (By exchange with the Botanic Garden, Cambridge, England.)

2 cuttings of *Salix* sp. (Given by Dr. J. A. Shafer.)

137 plants. (Derived from seeds from various sources.)

2 packets of seed of *Crataegus* sp. (Given by Mr. E. G. Harger.)

1 packet of seeds of *Crataegus* sp. (Given by Dr. C. B. Graves.)

1 packet of seeds of *Crataegus* sp. (Given by Mr. B. T. Gault.)

3 packets of seeds of *Crataegus* sp. (Given by Prof. E. Wilkinson.)

19 packets of seeds of *Crataegus* sp. (Given by Mr. C. K. Dodge.)

4 packets of seeds of *Crataegus* sp. (Given by Prof. G. L. Gruber.)

1 packet of seeds of *Crataegus* sp. (Given by Dr. Ezra Brainerd.)

3 packets of California seeds. (Given by Mr. Le Roy Abrams.)

2 packets of birch seeds. (Given by Mr. W. H. Blanchard.)

1 packet of seed of *Victoria Trickerii*. (By exchange with the Buffalo Botanic Garden.)

7 packets of seed. (By exchange with the Botanic Garden, Port Darwin, Australia.)

80 packets of seeds. (By exchange with the Botanic Garden, Dublany, Austria.)

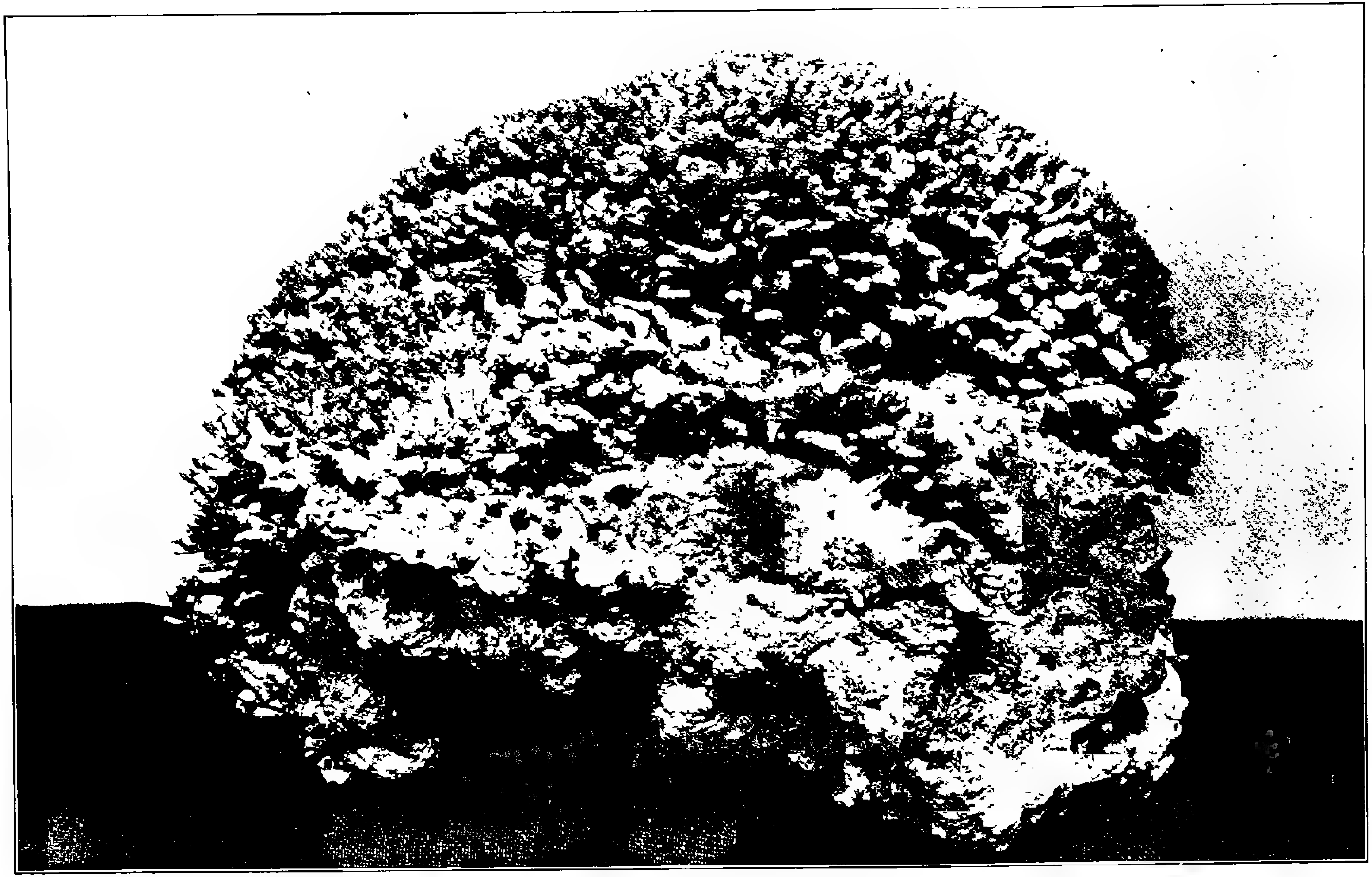
119 packets of *Crataegus* seed. (Collected by Mr. W. W. Eggleston.)

28 packets of seeds. (Collected by Mr. W. W. Eggleston.)

1 packet of seed from Guadalajara, Mexico. (Given by Mr. A. Duges.)

20 packets of seed. (By exchange with the Botanic Garden, Lund, Sweden.)

28 packets of seed. (By exchange with the Botanic Garden, Cologne.)



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A Calcareous Seaweed from Bermuda; natural size.

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OF

The New York Botanical Garden

EDITOR

DANIEL TREMBLY MACDOUGAL

Assistant Director

CONTENTS

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JOURNAL

OF

The New York Botanical Garden

VOL. VI. May, 1905. No. 65.

THE NORTH AMERICAN FLORA.

The first fascicle of this work designed to contain descriptions of all plants growing wild in North America, published by the New York Botanical Garden, was issued on May 22. Its preparation was referred by the Scientific Directors of the Garden on October, 22, 1901, to Professors Underwood and Britton, and its publication was made possible by the bequest of Judge Charles P. Daly, known as the David Lydig Fund.

This first fascicle contains descriptions of the order Rosales, contributed by Dr. John K. Small, Curator of the Museums; of the River-weed Family (Podostomataceae) by Mr. George V. Nash, Head Gardener; of the Orpine Family (Crassulaceae) by Dr. N. L. Britton, Director-in-Chief, and Dr. J. N. Rose of the National Museum, Washington; and of the Virginia Stonecrop Family (Penthoraceae) and the Grass of Parnassus Family (Parnassiaceae) by Dr. P. A. Rydberg, Assistant Curator. The book is large octavo in size, and the first fascicle consists of eighty pages. The next part to be issued will contain the Saxifrage Family (Saxifragaceae) by Dr. Small and Dr. Rydberg, together with several smaller groups, and will be published in the autumn.

As planned, the completed work will consist of thirty volumes; parts of volumes (fascicles) will be published from time to time. The fascicle just issued is Part 1 of volume 22 of the completed work. North America is taken in its broadest sense, including Greenland on the north and the Republic of Panama and the West Indies south to Grenada on the south. The extensive explorations carried on by the Garden during the past few years have brought together plants and specimens the study of which will make it possible to present a somewhat comprehensive treatment of the various groups of plants, including the cryptogams, and the continuation of these explorations will add to the value of the work.

Professors Underwood and Britton have succeeded in enlisting the cordial coöperation of many students in various parts of the country, thus dividing the labor of preparing the necessary manuscript. It is the largest undertaking of the kind that has yet been attempted in any part of the world, and it is believed will be of great value to botanical science.

The subscription price has been fixed at one dollar and fifty cents for each part, but a limited number of separate parts will be sold at two dollars each.

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

EXPLORATIONS IN THE BAHAMAS.

TO THE SCIENTIFIC DIRECTORS OF THE NEW YORK BOTANICAL GARDEN.

Gentlemen: Pursuant to authority granted by the Board of Managers, I continued the botanical exploration of the Bahama Islands during the period from January 21 to March 7, 1905; I was accompanied by Dr. Marshall A. Howe, assistant curator, who made very large collections of seaweeds during the trip; by Mrs. Britton, who aided greatly in the collection, preservation and packing of specimens; and by Dr. C. F. Millspaugh, curator of botany at the Field Columbian Museum of Chicago, who divided with me the work of collecting and preparing specimens and plants, the institution which he represents sharing the expenses of the expedition; the collections will be divided between the Garden and the Field Columbian Museum. Mr. L. J. K. Brace, of Nassau, New Providence, also rendered considerable assistance.

The party assembled at Nassau on January 24; parts of three days were then devoted to obtaining certain specimens of plants growing on the island of New Providence, and to outfitting the schooner "Nellie Leanora," kindly chartered on our behalf in advance, from the owner Mr. W. J. Pinder, by the Hon. H. A. Brook, Registrar of the Bahamian Government; our thanks are due Mr. Brook for this and for many other favors, including let-

FIG. 17. *Pseudophœnix Sargentii* on Whale Cay.

ters of introduction to the Justices of Out Islands and for much valuable advice. The "norther" of January 24 and 25 delayed our sailing until the afternoon of the 26th, at which time the south side of Rose Island, a few miles east of New Providence, was made in a stiff northeastern gale.

The two following days were spent in exploring this long and narrow hilly island covered with scrub vegetation of maximum density No Harbor Cay, an islet just to the south; and the eastern end of Hog Island, off New Providence, a return being made to Nassau on the afternoon of January 28 for some additional outfit that seemed necessary for our trip to the north. Departure was made again from Nassau during the night, and Whale Cay, the southernmost of the Berry Islands, lying about 40 miles northwest of New Providence, was made in the early morning of January 29.

The Berry Islands had not to our knowledge, been previously visited by botanists; they are a chain of cays, concave to the west, located on the eastern edge of the Great Bahama Bank, the group being about 25 miles long, its individual islets separated only by narrow passages, some of them furnishing good harbors

FIG. 18. Cactus (*Pilocereus*) on Frozen Cay.

for vessels of shallow draft. The exploration of Whale Cay occupied us on January 29; it has deeper and more abundant soil than many other Bahamian islets, and contains the largest forests of Sargent's palm (*Pseudophoenix Sargentii*) that we know of, certainly composed of several thousand trees, many of which were in full fruit at the time of our visit; they grow densely intermingled with other trees, forming a most interesting coppice, part of which has already been cleared for a sisal farm, leaving the palms, at least temporarily, to shade the young fiber-plants.

Taking advantage of a favorable wind to sail northward, Little Harbor was reached at sundown, and January 30 was spent in collecting upon Frozen Cay, a very rocky islet, supporting the densest growth of the common West Indian prickly pear (*Opuntia Dillenii*) that we have seen, the greater part of the surface of the cay being impenetrable in ordinary ways on account of this growth; the parts that we could reach, however, yielded speci-

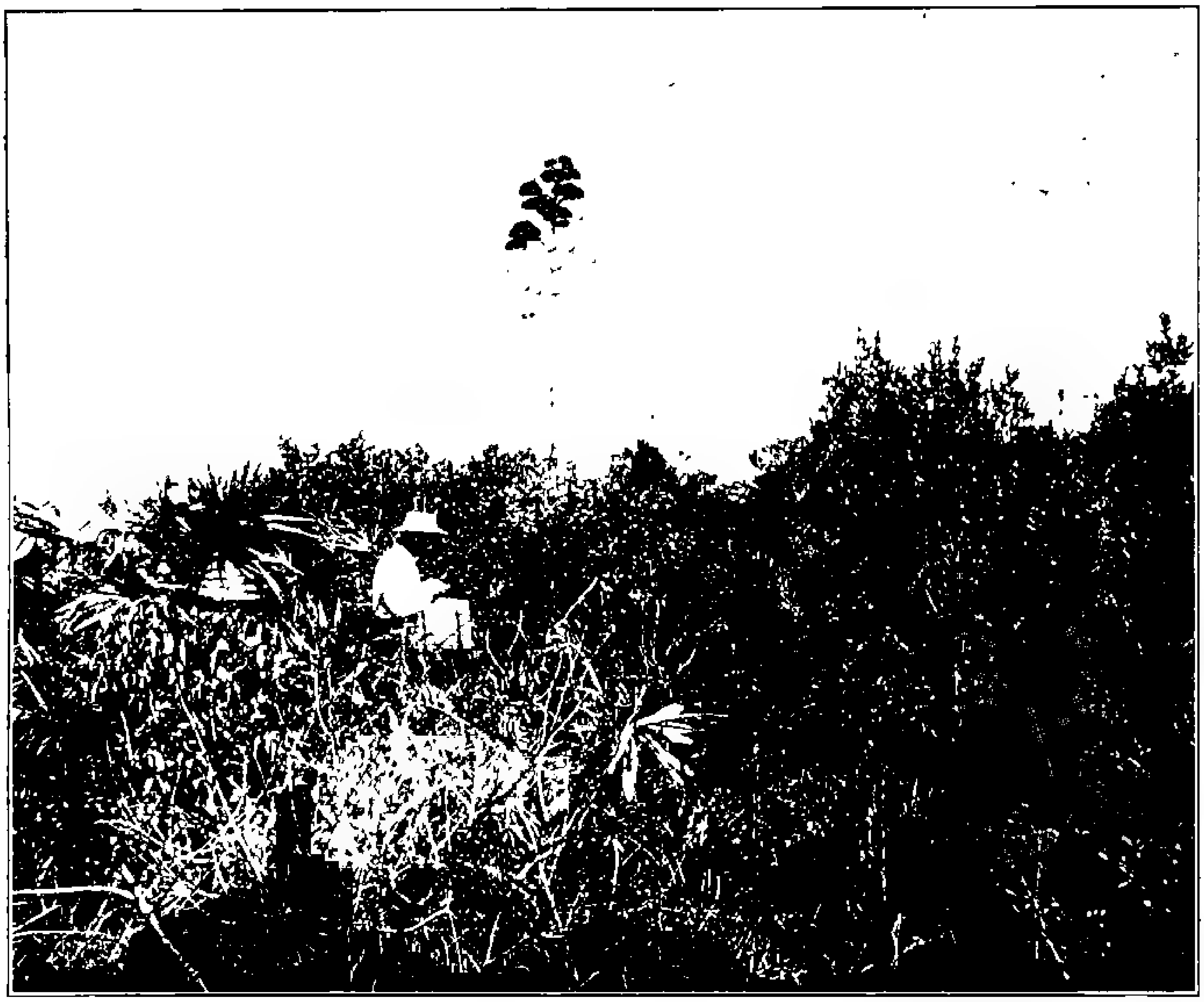

FIG. 19. Bahamian Century Plant (*Agave*) on Great Harbor Cay.

mens of several interesting species, among them a columnar cactus, 10 12 feet high (*Pilocereus*), and several twining vines. Little Harbor Cay, just to the north, was visited on January 31; here considerable arable land was noticed and a fine coppice of large trees, in it the largest specimens of the "Sapin" (*Bumelia loranthifolia*) that we have met with, one individual being 20 feet high with a trunk a foot in diameter.

Again favored by the easterly wind, we made Great Harbor, near the northern end of the Berry Islands in the late afternoon of January 31, and on February 1, 2 and 3, explored Great Sturrup Cay, Goat Cay, Lignum Vitae Cay and Great Harbor Cay; we here noted the apparent northern limits of a number of species which do not seem to extend to the north of the deep and wide Northwest Providence Channel which separates the Berry Islands from Great Bahama. On Great Harbor Cay we found elegant flowering specimens of the Bahamian century plant (*Agave* sp.), uniformly called "Bamboo" by the natives. Its enormous masses of fragrant yellow flowers form without doubt the most striking indigenous floral feature of this island; the plant was subsequently observed on several other islands, as far south as Great Exuma, and our observations indicate that its flowering period is January and early February; it dies, of course, immediately after its fruit is perfected, like the other Agaves. Both Great Harbor Cay and Great Sturrup Cay contain considerable areas of arable land; some of the original high coppice is still preserved on Lignum Vitae Cay, and on this we found a rare terrestrial orchid and a number of other plants of interest. The work about Great Harbor completed our examination of the Berry Islands, and we left for the Great Bahama Island on the afternoon of February 3.

Calm weather delayed our passage across the Northwest Providence Channel, so that we did not reach Eight Mile Rocks, a point on the south shore of the Great Bahama, about twenty-five miles east of its western end, until the morning of February 5. The coast here is continuously rocky for about eight miles, and there is no harbor for boats of any considerable size; fearing that we might be prevented from boarding the schooner by heavy surf, we went into camp at Eight Mile Rocks and spent five days in exploring the vicinity of that settlement. It soon became apparent that the flora of the Great Bahama Island contains many elements not yet discovered further south in the archipelago; the island is over sixty miles long, lying east and west, its western end only about forty miles from Palm Beach, Florida; its average width is perhaps six miles, and its surface is very uniform so far as we observed it, no point more than about twenty feet above the sea being noticed, although the charts indicate that some of it at least, rises to fifty feet. The extensive forest of the Caribbean Pine (*Pine caribaea* Morelet; *Pinus bahamensis* Griseb.), reaches from Eight Mile Rocks apparently nearly or quite to the extreme eastern end of the Island, and in places extends from the north to the south coast, though the southern coast is usually bordered by a belt of scrub land or

FIG. 20. Bahamian Century Plant (*Agave*) on Great Harbor Cay.

coppice, with some swampy palmetto lands locally near the sea. The flora of this pine forest was most interesting, resembling to a considerable extent that of the pinelands of New Providence, and those of southern Florida, but containing a number of species hitherto unknown to grow in the Bahamas, among them two asters, with brilliant and showy purple flowers, two kinds of thistle, a species of golden aster (*Chrysopsis*) and a number of other herbaceous plants; the coppices and scrub lands yielded several shrubs and small trees unfamiliar to us, and in the pine-lands also, we discovered additional species to the Bahamian flora. Continuing the exploration toward the east, we spent February 10, 11 and 12 at Barnett's Point, where the very interesting *Bontia daphnoides*, hitherto unknown to occur north of Porto Rico, was discovered in the palmetto lands. This is an evergreen-leaved shrub, with willow-like leaves, and very irregular 2-lipped small flowers, the only representative in America of the family Myoporaceae, characteristic of Australia and south Africa; several small trees of the red bay (*Persea*), related to or identical with *P. pubescens* of the southeastern states, were here noticed, as well as many other interesting plants; sailing still further east, our last stop on the Great Bahama was made at Golden Grove, where there is a good reef harbor, known as Turtle Reef, and collections were made here on February 13, a few additional species to those hitherto observed being obtained. This point lies a little east of the middle of the island, so its extreme eastern portion still remains to be explored, as well as its northern coast, but wishing to extend our work to other parts of the Bahamas, and to ensure the safety of the extensive collection already made, we left for Nassau at this time, and arrived there on February 15.

The examination of the picturesque chain of islets and islands known as the Exuma Cays was next taken up, leaving New Providence on the afternoon of February 16, and reaching Ship Island Cay, the northernmost of the group, some thirty miles southeast of New Providence, the same night; this chain of cays is about 150 miles long, and lies, like the Berry Islands, on the eastern edge of the Great Bahama Bank; it consists of a very large number of islets and rocks, and at its southeastern end there is the large island of Great Exuma. Our examination included stops at Ship Channel Cay, one or two small cays of uncertain name; Cave Cay, Little Galliot Cay, Great Galliot Cay, Great Guana Cay, and six days' work on Great Exuma. On these islands we detected a considerable number of species not known to occur further north, including some species new to science. Our return to Nassau was delayed by calm weather, and again by head winds, so that we reached that port on the morning of March 4.

The collections made during this expedition are the largest yet brought out at any one time from the Bahama Islands, including in all not fewer than ten thousand specimens, of which about one half are sea-weeds, collected by Dr. Howe, who thoroughly

FIG. 21. Cactus climbing among shrubs, Cave Cay.

explored the waters at every place that we stopped, and these include many rarities and some novelties. During our schooner expeditions Mrs. Britton remained at Nassau and explored portions of that island which we had not reached before, besides visiting parts of it that we had only examined in the summer or spring.

Respectfully submitted,

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

REPORT ON EXPLORATIONS IN PANAMA.

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

Dear Sir: As per your instruction I proceeded to the Isthmus of Panama, on the P. S. S. Co.'s S. S. *Finance*, arriving there on the afternoon of Wednesday, February 22. Thursday was spent in securing a suitable room, unpacking and preparing for work and in making a short exploration about Colon, where my headquarters were established.

Friday my first collecting trip was made and from that day until the middle of March the work went on without serious interruption. The principal features of the canal zone for several miles out of Colon consist of numerous open swamps with small hillocks and ridges emerging irregularly. At this season of the year it is possible by occasional wading and wallowing to penetrate some of these swamps for considerable distances. During the rains, many of these swamps would be impassable except as a "dugout" might be forced through the more open parts. The dense vegetation is made up of comparatively few species. The predominating plants being a species of *Typha*, *Thalia geniculata*, a big *Acrostichum* and several species of strongly growing sedges. In the lagoons and slow flowing drainage streams are *Nymphaea ampla* (?) *Pistia*, two or three species of *Eichornia*, *Lemna*, *Salvinia*, *Limnocharis*, etc. On the firmer portions are some palms, two species of *Carludovica*, mangroves, giant pipers, etc. There are very few of the smaller marsh-loving things that one might expect to find.

As progress is made toward the Pacific side of the Isthmus the land rises and the swamp areas become narrowed, the streams swifter, until at Culebre the highest land in the strip is found at an elevation of about 400 feet.

From this high point the descent to the sea level is quite rapid. While during the winter months the entire zone is comparatively dry, and unresponsive, yet from Culebre to the Pacific the ground is parched and vegetation is at a standstill, and desert conditions are approached. Few distinctively desert plants are to be found however, as during the rainy season the moisture is sufficient to reclothe the ground with an abundant growth.

Going either eastward or westward (north or south) from the zone the elevations increase until respectable mountains are reached in from twenty to fifty miles, and the flora becomes much richer. The canal zone is probably the least interesting part of the Isthmus from a botanical point of view.

The climate of the zone is rather sharply divided by the wet and the dry seasons. During the dry season the climate of the isthmus is delightful or rather that portion of it within reach of the trade winds, which blow with great force and regularity. In the wet season, however, the humidity is doubtless great and consequently uncomfortable. To one accustomed to a tropical climate however, I imagine there is nothing that is unendurable.

Changes in temperature are but slight during the winter, at least, and a mean temperature of about 80° F. in the day time was maintained during my stay. At no time did I observe the midday heat so great as I have frequently noted on the south side of Jamaica.

There are few features to differentiate the canal-zone botanically from other places in the same latitude.

The forests are of mixed growth and the palms are not a conspicuous feature, though the undergrowth contains a large element of low-growing species of that family. The larger trees are the cotton tree, sand-box, *Cedrela*, *Erythrina* and a few others. As one gets further into the forests, *Castilloa* becomes quite common. Aroids and other climbing species are abundant in the more moist woods.

Aside from the Panama Railroad and the Chagres river, there are no roads on the isthmus. Trails from the settlements along the railroad extend back to the scattered provision grounds, but beyond that the "bush" is guiltless of paths, and a way has to be hacked out with the machette.

Wild animals are abundant, though none of them seem to be feared, with the exception of the snakes. Of these, two species only, so far as I could learn, are to be dreaded — the "coral snake," a pretty ringed species, a foot and a half or two feet in length, whose bite is said to be deadly, and the "boa," a large snake reaching a length of twenty feet or more. Fortunately the boa is not abundant, and I saw but two while on the trip. One which I shot measured nineteen feet, six inches in length and had a diameter of five inches or more. I did not learn that the snake ever attacks men; but he would prove an ugly customer to an unarmed man, if he should do so. There are several species of harmless snakes of small size. Birds are plentiful and many of great beauty.

Insects are, of course, everywhere, and as in most tropical countries are the most unpleasant companions one meets. "Ticks," bed-bugs, fleas and mosquitos are to be found without searching and tarantulas of immense size are common. Alligators abound in the slow streams and lizards of all sizes and colors are numerous.

The collections made on the trip with those already in the herbarium and conservatories, will, I think give us a good idea of the vegetation of the Canal Zone; but probably the most important results of the expedition, are the knowledge of existing conditions of the territory, which will enable us to undertake a future, more extensive exploration with an accurate understanding of the problem. The flora south of the zone is evidently a very interesting one, and the study of the economic plants of that region should prove especially valuable.

My thanks are due to Dr. Herman Mohr, for his advice and assistance and to the Superintendent of the Panama Railroad for his prompt help in transportation and other kindly acts.

JOHN F. COWELL.

ADDITIONAL FUNDS FOR CONSTRUCTION.

An appropriation of $50,000.00 voted by the Board of Estimate and Apportionment March 16, confirmed by the Board of Aldermen May 2, and approved by the Mayor May 9, is now available for expenditure. It is planned to complete the driveway approaches to the Mosholu Parkway west of the museum building; and to the Woodlawn Road; to complete the driveway approaches to the long bridge now being built across the valley of the Bronx River north of the hemlock grove and those to the bridge under construction across the valley of the lakes; to finish the driveways under construction in the northern part of the Garden and to continue the building of paths through all parts of the grounds west of the Bronx River except those planned for the Hemlock Grove; to continue the grading work at the rear of the museum building; to extend the water-supply, and to provide some needed cases in the library and other rooms of the museum building. It may also be possible to replace the old wooden bridge at the north end of the Hemlock Grove by a permanent stone structure, a saving of several thousand dollars in the estimates of the cost of the long bridge having been effected.

The grading of the grounds immediately behind the museum building supplies the earth filling required for the Mosholu Parkway approach, for that needed about the lakes, and also the stone for the Telford foundations of driveways and paths. As the work of development proceeds it seems likely that the original calculations that the amount of cutting would supply approximately the amount of filling needed in all parts of the grounds, except in the north meadows will come out quite accurately; some surplus is at present indicated, referable to the dirt embankment built for the temporary construction railroad of the Jerome Park Reservoir contractor, which is being used for road filling at the east end of the long bridge over the river.

NOTES, NEWS AND COMMENT.

Garden Bulletin No. 11, completing volume 3, was issued April 14. It consists wholly of scientific contributions, containing the continuation of Professor Earle's Mycological Studies, in which a large number of new species of fungi are described, principally from California and from the West Indies; Dr. Kirkwood's finely illustrated paper on the Embryology of the Gourd Family (Cucurbitaceae); the continuation of Dr. Hollick's studies on the fossil plants of Long Island; Dr. Small's contribution to our knowledge of the Flora of subtropical Florida, in which many species are first made known; and the first part of Dr. Britton's Contributions to the Flora of the Bahama Islands.

Garden Bulletin No. 12, issued May 8, contains the annual reports of the Director-in-Chief and of other members of the staff, the report of the Treasurer, and that of the committee on membership.

Dr. D. T. MacDougal returned from an expedition to the southwest on April 29. Accompanied by Mr. E. A. Goldman, of the U. S. Biological Survey, Mr. G. G. Copp and Messrs. S. and G. Sykes, a descent of the Colorado river was made from Mellen, Arizona, and an examination made of contiguous deserts and the delta of the river. Especial attention was paid to the Cucopa mountains, hitherto unvisited by botanists. Living specimens of about eighty cacti were secured as well as a large number of herbarium specimens. Some important geographical data were also secured.

The total precipitation in the Garden during March, 1905, amounted to 4.47 inches. Maximum temperatures of 45.5° on the third, 51.5° on the tenth, 68° on the eighteenth, 63.5° on the twenty-sixth and 75° on the thirty-first were observed: also minima of 9.5° on the fifth, 19.5° on the seventh, 19° on the fifteenth, and 29.5° on the twenty-second.

The total precipitation during April, 1905, amounted to 2.88 inches. Maximum temperatures of 63° on the ninth, 70° on the tenth, 76° on the twenty-first and 74.5° on the twenty-fifth were observed. The minimum thermometer was found to be out of order and the records for this month were discarded.

A second edition of Dr. Britton's "Manual of the Flora of the Northern States and Canada," was issued by the publishers, Henry Holt & Company, on May 1. Descriptions of additional species made known as occurring within the geographical area covered by the work have been added, chiefly in the appendix; extensions of ranges brought out by observations since the publication of the first edition in 1902, have been noted; and considerable synonymy has been supplied in the text and errors have been corrected.

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Vol. VI JUNE, 1905 No. 66

JOURNAL

OF

The New York Botanical Garden

EDITOR

DANIEL TREMBLY MACDOUGAL

Assistant Director

CONTENTS

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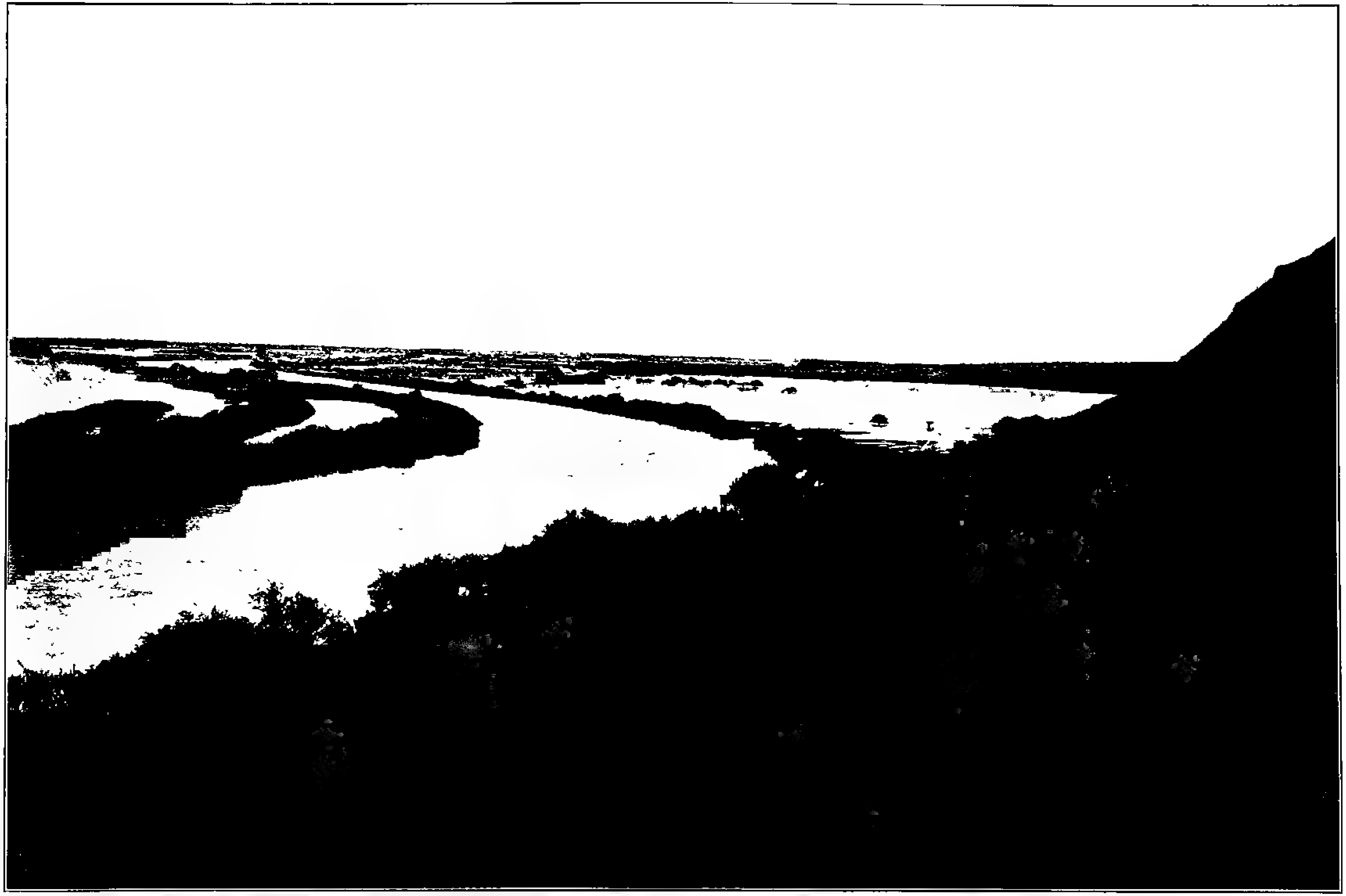

VIEW OF HARDY'S COLORADO IN FLOOD FROM SPUR OF CUCOPA MOUNTAINS.

JOURNAL

OF

The New York Botanical Garden

Vol. VI. June, 1905. No. 66.

BOTANICAL EXPLORATIONS IN ARIZONA, SONORA, CALIFORNIA AND BAJA CALIFORNIA.

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

Sir: The following report of field operations in the valley and delta of the Colorado River and the Cucopa Mountains including a region lying partly within the United States and partly in Mexico is presented. In 1904 a descent of the Colorado to its mouth was made and a landing effected on the western shore of the Gulf of California, by which many new facts were obtained as to the phytogeography and flora of the region and several undescribed species added to the living collections in the garden. (See Journal for May, 1904.)

The recent trip was planned to examine part of the valley of the Colorado River between northern Arizona and the Gulf of California, which has been but little visited by botanists since the earlier railway surveys. In accordance with this scheme, I left New York March 9, 1905, arriving at Mellen, Ariz., March 13 at midnight, having been joined by Mr. G. G. Copp, of New York, enroute. The only building at this place consisted of the telegrapher's quarters, and the camp outfit was put into use at once. On the following morning we were joined by Mr. Stanley Sykes, of Flagstaff, Ariz., who had by arrangement reached the place a few days previously and built a small wooden row-boat with which to pilot the expedition down the river. A canvas boat, twelve feet in length, and of broad beam had been included in our outfit in New York and the forward end was fitted with a large collapsible cage for the reception of cacti and bulky specimens of living plants. This was soon rigged and with all stores aboard we cast loose shortly after noon of the 14th for the journey of 300 miles to Yuma, the first stage of our trip. We arrived at Yuma on March 22, having been delayed a day in camp near the mouth of Bill Williams Fork by a rainstorm and a second day at Ehrenberg by a sandstorm. The extensive mesa east of the river in

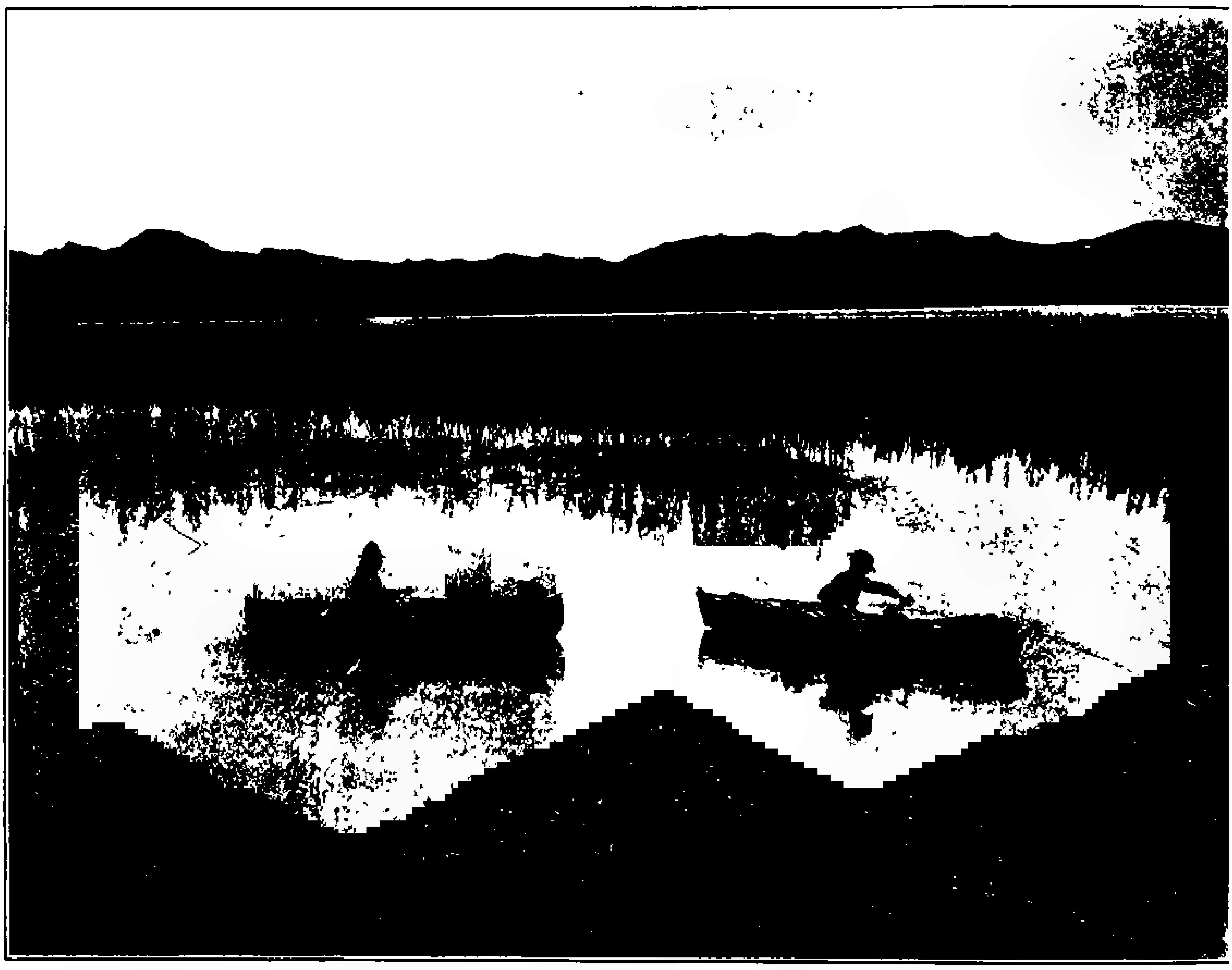

FIG. 22. Expedition on bayou of Colorado River near Cibola, Arizona. Boats loaded with cacti.

this locality is peculiarly subject to such storms, and the effects of the eroding action of the flying sand was noticeable on all of of the larger plants, particularly on the trunks of the giant cactus (*Cereus giganteus*). These stops, as well as others made during the trip, made possible an examination of the lower hills, mesas and plains near the river and resulted in securing about seventy-five species of plants of which one-third were living cacti, *Opuntia*, *Mammillaria*, *Echinocereus*, *Echinocactus* and *Cereus* were the principal genera, and the living specimens secured were shipped from Yuma and are now included in the plants growing in the glasshouses here. Some successful photographic studies were also made, by which the aspect of the adult individuals was recorded and the general appearance of the vegetation of the region preserved.

The upper valley of the river had recently received a maximum

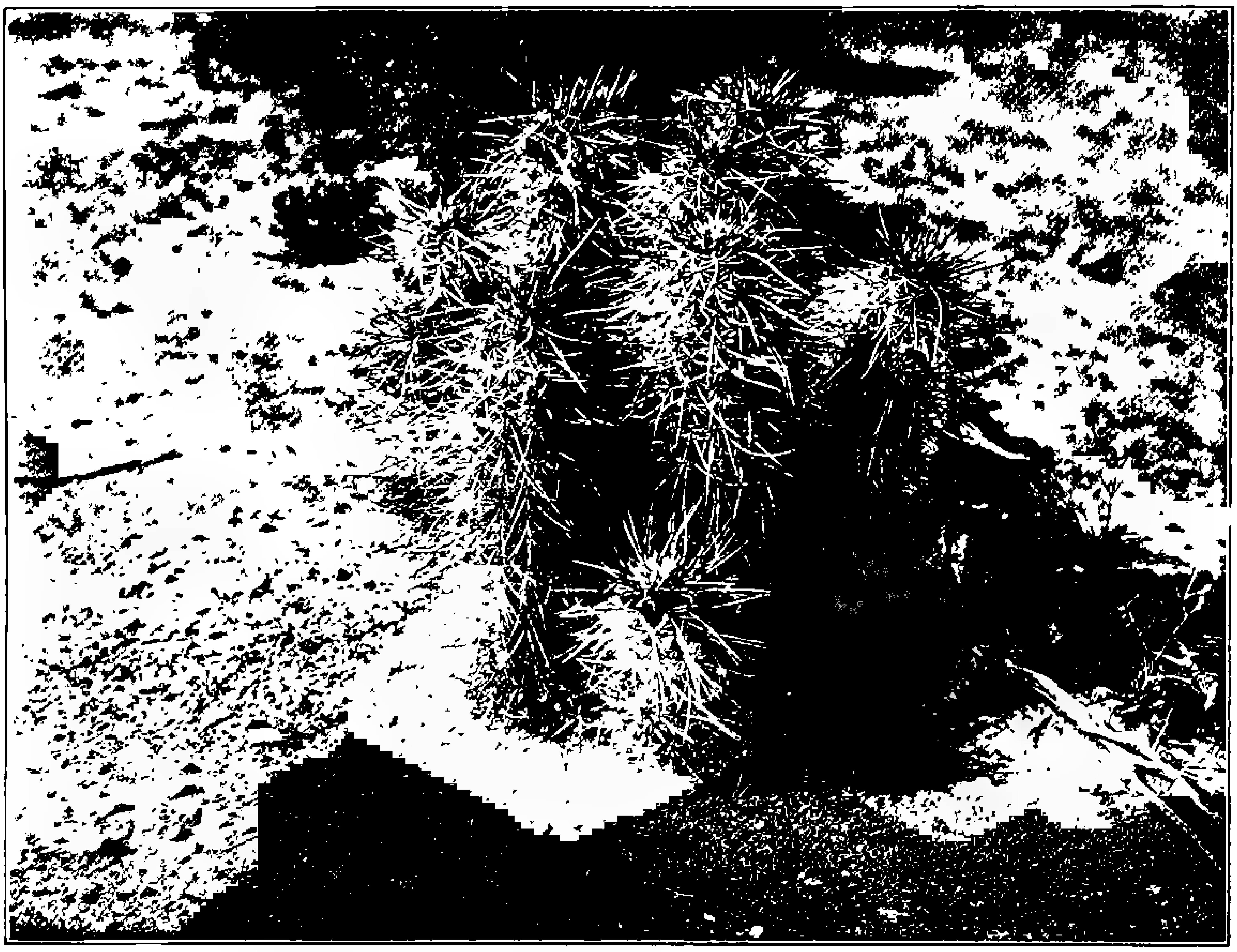

FIG. 23. *Echinocereus* in gravel mesa near Ehrenberg, Arizona.

amount of rainfall, in consequence of which the areas near the river were of an unusually deeply greenish hue due principally to the multiplication of the number of plants of a few small annual species. Among other interesting points in distribution the giant cactus (*Cereus giganteus*) was seen to extend as far north as the mouth of Bill Williams Fork and to cross the river here into the mountains of California. While the botanical recognition of this interesting plant dates only from 1846, yet it was doubtless remarked by the Spanish explorers who visited its habitat as early as 1540, and in all probability notes concerning it are to be found in their records of travel.

While our small boats were found to be quite suitable for the purposes of the expedition, yet some care was necessary to avoid accident. The river was rising by irregular stages, carrying

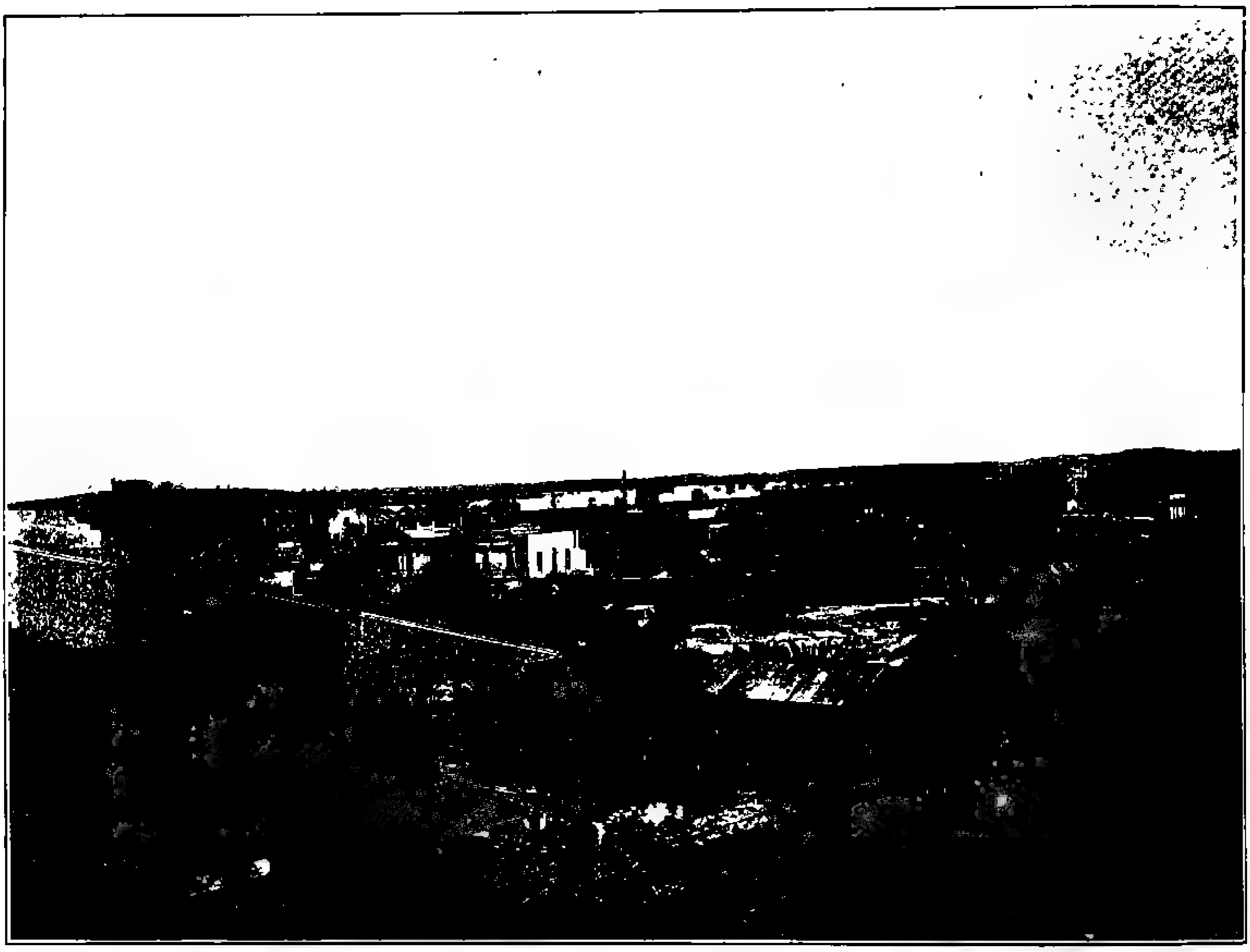

FIG. 24. View of Yuma, Arizona, from reservoir hill, with flood of Gila beyond.

enormous quantities of driftwood including entire trees, and the shifting current was cutting into banks and shoals and making unknown hazards for the navigator of a small boat. During one part of the trip we rode the actual crest of a rise of a few feet during one day, to have it pass us during the night and then to overtake it again on the next day in which we were carried over 80 miles in about seven hours with but little rowing.

When we arrived at a point 10 or 15 miles above Yuma we found the current of the Colorado checked by an inpouring flood of the Gila which raised the level of the Colorado below to a height of about 10 feet.

At Yuma I found a collection of cacti which had been made by Mr. G. Sykes in crossing overland from Flagstaff, Ariz., to San Diego, Cal., and these with the specimens secured in coming down the river were shipped to New York. The expedition reorganized here for the remainder of the work to be done. In accordance with arrangements with the U. S. Biological Survey, Mr. E. A. Goldman, of that institution, joined the party for the purpose of making a collection of mammals, birds and reptiles. Mr. Stanley Sykes left the party here and we were joined by Mr. Godfrey Sykes, master of the sloop, in which the voyage of the previous year had been made. The remainder of the trip was to have been made in the sloop, but it had been taken down to the Gulf of California by a small party in January and news reached us that it had been lost in a storm with all on board, before our arrival. A boat with a capacity of about a ton was built in three days, a small gasolene engine was placed in a small launch, the canvas boat was folded up and carried as freight to be used as needed and we set off down the river with an added equipment of instruments including a sextant, aneroids, compasses, etc., on March 26.

In accordance with representations made to the Mexican government by Mr. Fentor R. McCreery, of the American Embassy, and by the kind offices of Señor M. de Azpiroz, Mexican Ambassador at Washington, and the intervention of the Secretary of Foreign Affairs, the Secretary of Customs for Mexico issued instructions to all stations along the border to pass our equipment and collections across the boundary, and this privilege greatly facilitated our work. In addition we carried a letter from Col. E. Kosterlitzky, of the Army of Sonora, to the Gendarmeria Fiscal. The most considerate treatment was accorded us by all Mexican officials with whom we came in contact, as in all previous expeditions to other parts of Mexico.

Mr. Sullivan in charge of the customs at Yuma and various other gentlemen in the service of the United States likewise aided materially in facilitating the arrangement of the formalities for clearing and entering our material without detriment to the collections.

The entire delta of the river was practically flooded and our descent was so arranged that stops were made only at the three places in which the main channel cuts directly into the Sonora Mesa known locally as "the Upper Mesa," "the Middle Mesa," and "the Colony Mesa." A delay of two days was occasioned at the last stop by a sandstorm, and occasion was taken to trace the channel of the Santa Clara Slough which connects the river directly with the Gulf, to adjust the instruments and calculate the occurrence of the tides in the lower reaches of the river, a matter of great importance to an expedition of this character.

A minute examination was made of the desert here to ascertain the effect of the heavy rainfall of the two months previous, and while some increase in the number of a few annuals such as a small *Astragalus*, an *Oenothera* and a *Krynitzkia*, yet the increase was hardly so marked as in the sloping mesas which had been examined three hundred miles to the northward. The flooding of the sloughs and shallow channels in the delta had given opportunity for the hatching of myriads of mosquitoes and these not only swarmed around our camps but had been carried out across the sandy mesa for many miles and constituted a serious annoyance in the investigation of these desert areas.

Before leaving camp near Colonia Lerdo a Cucopa Indian, Miguel Gonzalez was added to our party. On April 1 we dropped down the river to a point on the western shore a few hundred yards below the mouth of Hardy's Colorado and made camp for a day on a flood-plain bearing salt-grass, Cressa and mesquite, and which is inundated by the bore at spring tides. Here we found that the water had spread from the delta across to the low plains west of the lower part of the river and was pouring off the banks in numerous cascades extending for many miles up and down stream and making a deafening roar in places. We waited here for a day, taking observations to locate the exact position of the mouth of the Hardy which does not appear correctly on any published map, and also to time our movements with the tides. We were now confronted with the problem of taking our loaded boats up the Hardy a distance variously estimated at 125 to 150 miles against a flood current and with the land contiguous to the channel inundated, making camping a perplexing problem. Tracking from the muddy shores, wading in the shallower flats and rowing we made the first stage of a few miles to a point called the "Salada" on the south bank of the

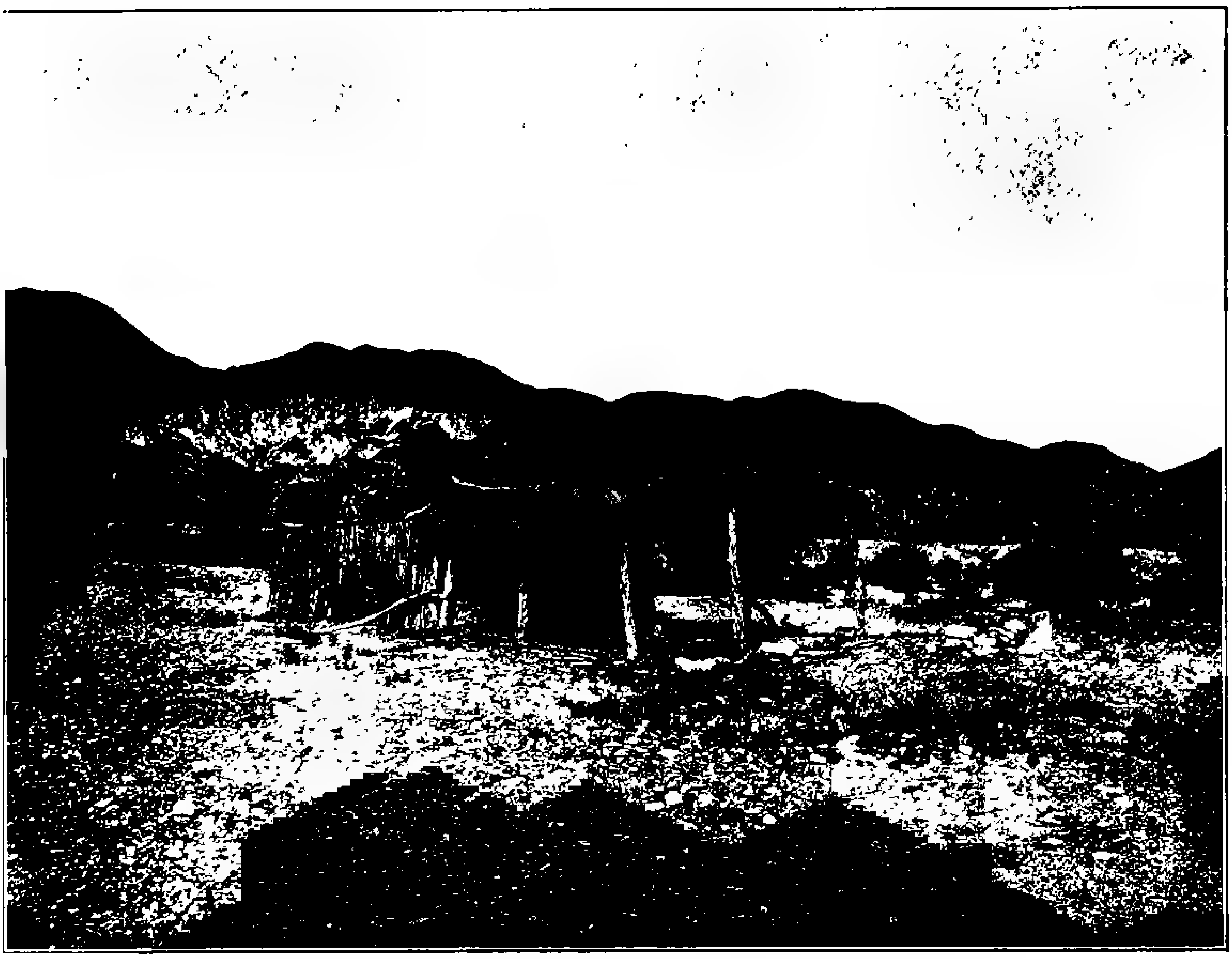

FIG. 25. House of Cucopa Indian made of arrow-weed (*Pluchea sericea*), willow, and canes (*Phragmites*). Cucopa Mountains in background.

Hardy on April 2, and succeeded in finding a small area of saline soil not flooded.

The banks of the Hardy above this point are densely covered with a growth of mesquite, cattails, and willows and further progress had to be made by pulling against the current making one to two miles per hour. In some places we found that the entire country was flooded for many miles on both sides of the channel, yet the fringes of shrubs along the banks made it impossible to go across the country and we were compelled to follow the serpentine course of the river where the distance between two points was more than twice that of a straight line in many places. At sunset of the first day we made a small patch of dried mud a hundred yards back of the shore and to this we carried our camping outfit through three feet of water and mud, impassable

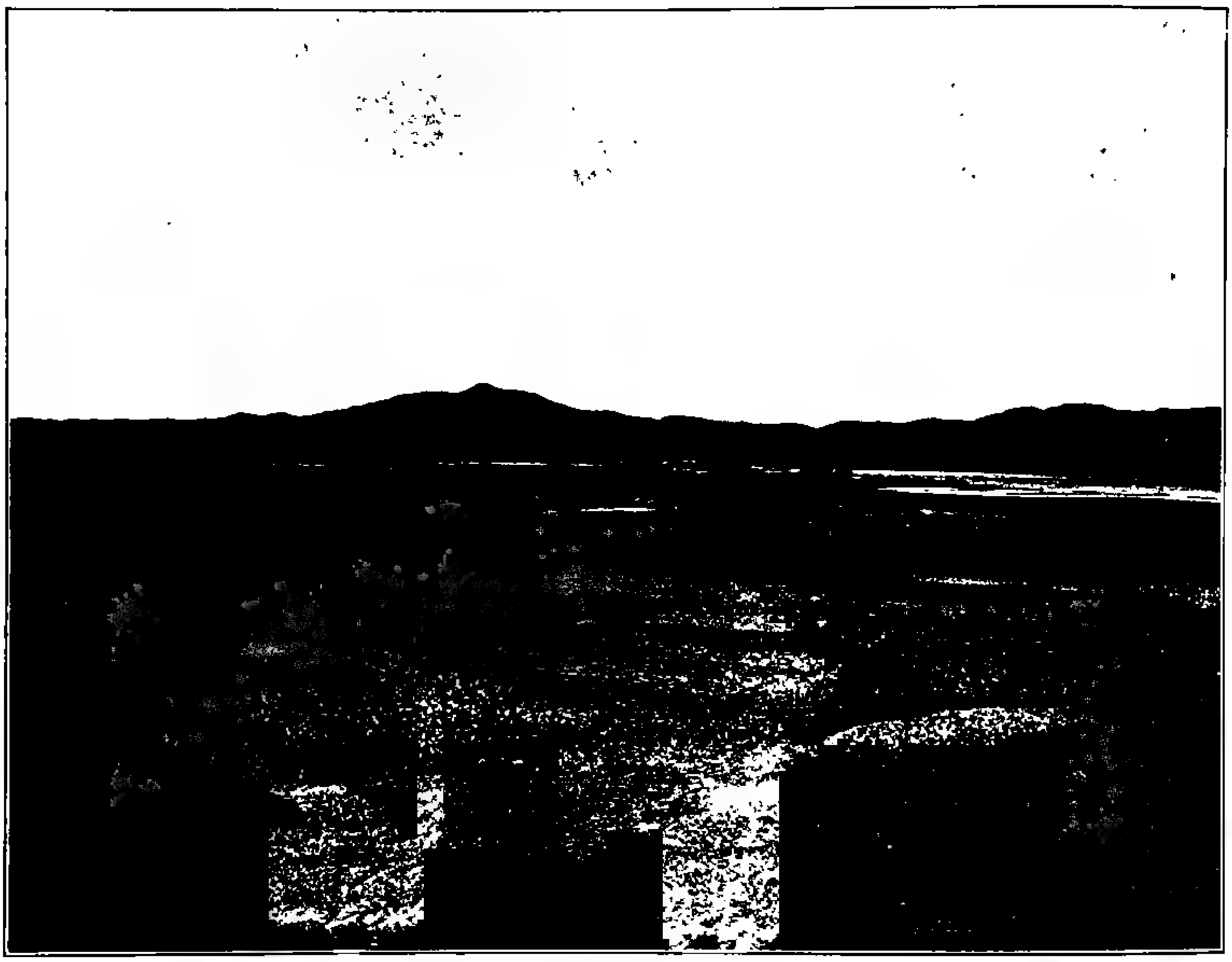

FIG. 26. Alkaline plain near Volcano Lake, Baja California.

for the boats. This place, no larger than the floor of a dwelling house and but few inches above the water level, was the only solid ground to be encountered in two days' travel, and finding it was due entirely to the intimate knowledge of our Indian of the topography of the country. On April 4 we arrived at a point where the main channel of the river runs along the actual base of a spur of the Cucopa Mountains for several hundred yards, and a camp was established here from which observations of all kinds were carried on for ten days. The gravelly slopes leading out from the cañons were found to bear a large *Echinocactus*, several species of *Opuntia*, a *Cereus*, *Olneya* and *Covillea*, while a *Mammillaria* was widely distributed over the slopes. Living specimens of many of these were obtained for the Garden. An ascent was made of the main peak and several minor elevations, and the entire range was traversed through a pass leading to the westward. In addition to the large amount of material representing the plants and animals secured, observations of the topographical features of the country resulted in adding materially to our knowledge of this region and a sketch map is being prepared by Mr. G. Sykes as a contribution to the geography of the country examined.

The Hardy river was followed from this point to its head in Volcano Lake, and we arrived at a camp near this body of water on April 16. Volcano Lake is a sheet of water ten to fifteen miles in length and of half that width, very shallow and exists only in periods of high water. Into it pours the water of the Paredones channel which leaves the Colorado River a few miles below the international boundary. The drainage here is too complicated to be comprised in a brief description, but it may be said however that some of the water of this lake finds its way into the Pescadora River, which is also a flood channel, some into the Hardy by three different outlets and some into New River which pours its waters over the international boundary into the Salton basin lying well below sea-level.

The delta is the home of the Cucopa Indians who build their houses of arrow-weed (*Pluchea sericea*) and carry on their scant agriculture with respect to the periodic overflow. This winter flood, however, which had not occurred since 1891 and which recurs at intervals of about fifteen to twenty years, had seriously disturbed the movements of the entire tribe, the members of which which were now gathered in Poso Vicente and two or three small rancherias on the western margin of the delta, and a few on the eastern bank of the river above Colonia Lerdo. While the arrow-weed is as important and as useful for as many different purposes as the palm to the Pacific islander, yet the native here makes use of a large number of plants, among which is the "quelite" (*Amarantus Palmeri*) which covers immense areas of land subject to overflow. The tender stems less than a yard in height make excellent forage while the adult plants, which often reach a height of eight or ten feet, furnish an abundance of small shiny seeds which are gathered by the women and stored in the basket granaries. These seeds are cooked into an insipid gruel

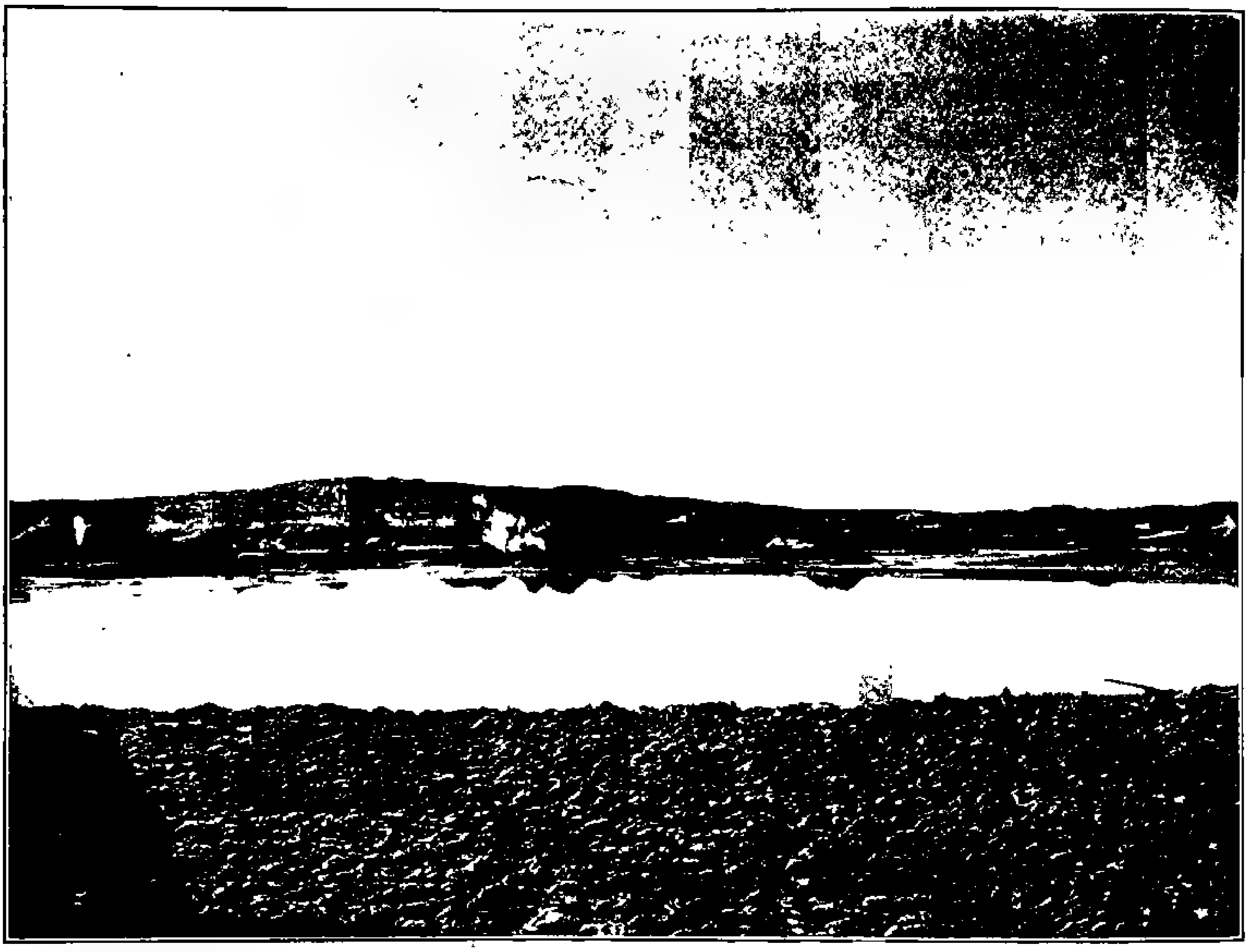

FIG. 27. Boiling lake and mud volcanoes, Baja California.

reminiscent of breakfast foods, and are doubtless of great nutritive value.

The most interesting feature of the region, however, consisted in the great number of mud vulcanoes covering an area of about two square miles on the southern shore of Volcano Lake. These are in a state of activity and the soil near them is extremely highly charged with saline matter and sulphur. *Sesuvium sessile* was abundant in places but extensive areas here were absolutely devoid of vegetation. In a hot spring near one of these volcanoes was found an alga hitherto reported only from Algeria. An ascent was made of an extinct cone to the westward of the lake known as "Cerro Prieto" and several plants including an *Astragalus* were taken from the floor of the old crater.

Volcano Lake lies on the crest of the gentle ridge which separates the main portion of the delta from the Salton basin and we had expected to make our way from this by New River back into the United States into the lake formed by the floods in the bottom of this basin. The direct channel leading from the southwestern corner of the lake into New River was so shoal in places, however, that this route was not practicable and the time at our disposal did not allow us to prospect the circumference of the lake for a navigable channel. Mr. Sykes therefore walked from our camp into Calexico, a town on the international boundary, taking out mails and securing a team at the Enramada cattle camp by the courtesy of the foreman, Mr. Allison. We arrived at Calexico on the evening of April 28 and found New River swollen beyond its banks and were compelled to transfer our outfit across the stream in a small boat. The following day was spent in packing and shipping specimens and in settling up the business details of the expedition. From Calexico I proceeded to Yuma, and found there several plants awaiting shipment including a large *Agave* brought in from southern Arizona at the request of Mr. Herbert Brown, to whom we were indebted for many other favors also.

Briefly stated the expedition travelled about 600 miles on the Colorado River and on Hardy's Colorado by boat, and about 300 miles by land. A critical examination was made of a large portion of the delta and of the contiguous deserts with regard to the effects of a maximum rainfall. Collections of living plants, photographs and herbarium specimens were made in California, Arizona, Sonora and from the Cucopa Mountains in Baja California. Some parts of this region had not been previously visited by a botanist. Not the least important of the results secured by the expedition are the records of observations as to topographical features, which with the botanical features, are being collated for publication.

Respectfully submitted,
D. T. MacDougal,
Assistant Director.

THE OLIVIA AND CAROLINE PHELPS STOKES FUND FOR THE PROTECTION OF NATIVE PLANTS.

Under a resolution of the Scientific Directors of the New York Botanical Garden, adopted in January, 1902, authority was given for the use of the income of the Stokes Fund for the payment of prizes for essays upon the preservation of wild plants, including shrubs, herbs and trees, and the publication and distribution of such essays, which are to be first printed in the Journal of the Garden, and republication of them invited from other journals, magazines and newspapers ; that they also be issued as separates from the Journal and distributed gratuitously to all interested.

The following prizes are offered for this year, payable December 15 :

1. A prize of $25.00 for the best essay on local needs in the vicinity of New York City, not to exceed one thousand words.

2. A prize of $15.00 for the best essay indicating local needs in the parks of New York, not to exceed one thousand words.

3. A prize of $10.00 for the best essay not to exceed five hundred words, indicating needs of any locality.

Essays may be submitted not later than November 1, 1905, to the Director-in-Chief of the New York Botanical Garden.

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

COÖPERATION IN NATURE STUDY WITH THE PUBLIC SCHOOLS.

An interesting experiment in bringing the nature study work of the public schools of the Bronx closer to nature, was carried out at the garden during April and May, by means of illustrated lectures, planned to parallel the course of study in the schools, which were delivered in the large lecture hall of the Museum Building. The subject of "Flowerless Plants" was discussed by Dr. Marshall A. Howe, Assistant Curator; "Cultivation of Plants," was described by Mr. George V. Nash, Head Gardener; and the "Classification of Plants" was discussed by Dr. N. L. Britton. These lectures were followed immediately by demonstrations of the subjects treated, in the museums, in the grounds, and in the conservatories, the children being led in squads of fifty or more to objects described in the lectures, and there met by demonstrators who emphasized the special features brought out in the lectures.

The experiment was tried in pursuance of the recommendation in the "Course of Study in Nature Study, Elementary Science and Geography" adopted by the Board of Education, May 27, 1903, to the effect that "Classroom work should be supplemented by visits to the parks and museums," and "the children should be brought into actual contact with the object of study wherever possible, either in or out of the classroom," and of a recommendation made by Dr. Britton in his last annual report to the Board of Managers of the Botanical Garden, to the effect that it would be desirable to develop a lecture system with special reference to the needs of teachers and students in the schools.

A careful census of the number of children in grade 4 B in the public schools in the Bronx, made by the Principals and District Superintendents, shows that about 2,300 availed themselves of the privilege, each of the three lectures being repeated twice, to audiences averaging over 700, completely filling the lecture hall.

The resolutions empowering the school officials of the Bronx to arrange for this work, adopted by the Board of Education, March 29, 1905, are as follows:

Resolved, That the teachers of the 4 B grade in the schools of the Borough of The Bronx, together with such pupils in their several classes as may be permitted by their parents so to do, be authorized to attend three lectures on the nature study work of the grade, planned strictly in accordance with the requirements of the course of study and the syllabus, to be given in the Bronx Park Botanical Museum by Dr. Britton and his assistants, on one afternoon in each of the months of April, May and June, 1905, and on such days as may be arranged for with the authorities of the Botanical Museum ; provided that attendance on such lectures shall not interfere with the schedule time required to be given to other studies in the grade ; and provided that the Board of Education is not made responsible for any expense in connection therewith.

Resolved, That the thanks of the Board of Education be extended to the authorities of the Botanical Gardens in Bronx Park for their generous offer hereinbefore mentioned.

The result of the experiment is described in the following letter received from Dr. A. T. Schauffler, District Superintendent :

DEPARTMENT OF EDUCATION, CITY OF NEW YORK,
May 12, 1905.

DR. N. L. BRITTON,
New York Botanical Garden,
Bronx Park, Borough of The Bronx, N. Y.

My Dear Dr. Britton : As I understand that you are to leave the city immediately after the close of the series of lectures you are now giving to the 4 B pupils of the schools of this borough, I feel it a privilege, in advance of any action that may be taken by the principals in the borough, to express to you my great gratification at the unqualified success of the experiment so far, and the absolute certainty that the remaining lectures will be as well attended and as enthusiastically enjoyed as those that have already been given. The uniform success of yourself and colleagues, as well as of the younger men who have given demonstrations in the open air, in presenting scientific fact in simple language so as to be perfectly understood by the children of ten and eleven years of age, has been a constant wonder to me, and a delight to pupils and teachers. Ever since the beginning of the lectures, I have made it a point in all my visits to schools, to test the classes that had attended the lectures on their understanding of the lectures themselves, on their recollection of the points presented, and on their interest in the subject generally. I have been more than pleased to find a universal lively interest shown in many ways. For example, in one school I found that the children were already making a collection of such things as can be preserved — bracket and other fungi, ferns for pressing, mosses, etc. — as well as cultivating window boxes to further illustrate the facts learned in the lecture.

At a conference had with the principals of the borough a day or two ago, the unanimous sentiment was that this course of lectures had been a wonderful help and stimulus to teachers and pupils alike, that the next 4 B class should have the opportunity to receive the same instruction in the coming term, that if possible the 5 B class should have the same privilege ; and a committee was appointed to make arrangements for a formal expression of appreciation and gratitude to yourself and those associated with you, who have so earnestly, so wisely, and so successfully labored for the interest and benefit of the pupils in the schools of the borough. Their only regret in this connection is that the pupils in the other boroughs of the city have not been afforded the same opportunity for improvement that has been given to those in the Bronx.

I need not tell you that all these sentiments are mine also, and I wish to add my most sincere thanks to you and your associates for all that you and they have done for us.

Sincerely yours,
(Signed) A. T. SCHAUFFLER,
District Superintendent.

At a meeting of the Board of Managers of the Garden, held May 16, the members viewed one of the lectures and accompanying demonstration, and the Director-in-Chief described the theory and method of this novel educational work, and recommended its continuance and expansion. The action of the Director-in-Chief in organizing the work was commended and approved, and he was authorized to continue and expand it as far as practicable with funds available for the purpose.

THE PALMER COLLECTION OF CONIFERS.

To the large collections of these popular trees and shrubs given by Mr. Lowell M. Palmer in the spring of 1903 and 1904, he has recently made an addition of 467 specimens. Some of these have added to the species and forms in the systematic collection, already made rich by previous donations from Mr. Palmer. It was desired to plant the hill just east of the conservatories with pines. This region had been set aside for this purpose, and a large number of excellent specimens of pines in this recent contribution has permitted of the planting of this area, adding considerably to the appearance of the conservatory surroundings. Others have been used to replace species of uncertain hardiness, the representatives of which succumbed to the cold of the past winter. By repeated trials it is hoped that a strain of unusual hardiness may be found which will stand the severity of our winters. Quite a number, too small for immediate incorporation in either the systematic or decorative plantations, have been placed in the nursery temporarily; while others, not needed in the systematic plantations, have been used for decorative purposes.

GEORGE V. NASH.

NOTES, NEWS AND COMMENT.

Dr. Britton, accompanied by Mrs. Britton, sailed for Europe on May 27, for an absence of about six weeks. They attend the Second International Congress of Botany, held at Vienna, June 11 to 18, Dr. Britton being a delegate from the United States Government, a member of the international nomenclature commission, and also representing the Torrey Botanical Club and other organizations. Advantage of being in Europe will be taken to make a restudy of the botanical gardens at Paris, Geneva, Vienna, Berlin, London and elsewhere, to arrange additional exchanges with gardens and museums, and to make comparisons of a large number of specimens obtained by our several West

Indian exploring expeditions with type specimens in the Old World collections.

Professor L. M. Underwood has gone to Europe and will attend the International Botanical Congress in Vienna early in June, and spend the remainder of the summer studying the collections at Kew and Berlin.

Dr. J. H. Barnhart has gone to Europe and will attend the International Botanical Congress at Vienna as a delegate from the New York Botanical Garden.

The fifth Spring exhibition of the Horticultural Society of New York was held in the Museum of the Garden on June 10 and 11, 1905. Prizes amounting to \$300.00 were offered by the Garden. The exhibition was characterized by a good representation of native wild plants.

The fifth summer exhibition will be held in the Museum, on Wednesday and Thursday, June 14 and 15. The schedule of prizes offered includes roses, flowering shrubs, native flowers and ferns, peonies, iris, strawberries and vegetables. Prizes amounting to about \$150.00 are offered by the Managers of the New York Botanical Garden, and \$130.00 by the council of the Horticultural Society. In addition, premiums and certificates are provided for meritorious exhibits not included in the schedules.

Professor F. E. Lloyd has received a grant of \$500 from the Carnegie Institution as an aid to his investigations of the transpiration of desert plants. He will spend the summer at the Desert Laboratory at Tucson, Arizona.

Miss A. A. Knox formerly assistant in botany in Barnard College has been appointed assistant in the laboratories in the Garden, and took up her new duties on June 1.

The total precipitation in the Garden for May, 1905, amounted to 1.05 inches. Maximum temperatures of 85.5° on the 6th, 78° on the 10th, 76° on the 15th and 80° on the 22d were observed; also minima of 30° on the 2d, 42.5° on the 10th, 39.5° on the 21st and 40° on the 24th.

ACCESSIONS.

PLANTS AND SEEDS.

1 plant *Viola palmata*. (Collected by Mr. Percy Wilson.)

4 plants from the mountains of Honduras. (Given by Mrs. Baxter.)

6 plants of violets. (Given by Miss Pauline Kaufman.)

1 plant of *Unifolium Canadense*. (Given by Miss Pauline Kaufman.)

1 plant *Viola tripartita*. (Given by Mr. C. D. Beadle.)

36 plants of violets. (Given by Mr. C. D. Beadle.)

1 plant *Trillium cernuum*. (Collected by Mr. W. W. Eggleston.)

7 plants of violets. (Collected by Mr. W. W. Eggleston.)

1 plant of dwarf crimson rambler. (Given by Messrs. F. R. Pierson Co.)

12 orchids for the conservatories. (Purchased.)

140 trees and shrubs for outside collections. (Purchased.)

10 plants from Southern Africa. (By exchange with Mr. F. Weinberg.)

5 plants for the conservatories. (Given by Mr. G. A. Skene.)

6 bulbs of *Atamosco* sp. from the Bahamas. (Given by Mrs. C. Brace.)

83 plants from Arizona and Southern California. (Collected by Dr. D. T. MacDougal.)

6 plants of *Scirpus Tabernaemontani zebrinus*. (By exchange with Dreer & Co.)

1 plant from Costa Rica. (Given by Mr. C. Wercklé.)

2 plants of *Trillium*. (Given by Mr. C. W. Harris.)

16 plants of begonias. (Given by Mr. Wm. McDonald.)

1 plant of *Epidendron strobiliferum*, from Everglades, Fla. (Given by Mr. A. A. Eaton.)

1 plant of *Opuntia* from Ventura Co., Cal. (By exchange with Mr. F. Weinberg.)

4 plants. (By exchange with the N. Y. Zoological Society.)

1 plant of *Rhipsalis* sp., from Panama. (Collected by Mr. J. F. Cowell.)

1 cactus from Boulder, Colo. (Given by Mr. T. D. A. Cockerell.)

4 plants of *Crassula*. (Given by Mr. Louis Dupuy.)

1 plant of *Odontoglossum crispum*. (Given by Mr. Julius Roehrs, Jr.)

1 plant *Viola pedata*. (Given by Mrs. F. W. Starmer.)

1 plant of *Viola Leconteana*. (Given by Dr. H. H. Rusby.)

1 plant of *Viola Carolina*. (Given by Mr. A. Cuthbert.)

2 plants of violets. (Given by Mr. F. M. Rolfs.)

1 plant of *Viola nephrophylla*. (Given by Dr. E. Brainerd.)

5 plants. (Given by Dr. E. Brainerd.)

3 plants. (Given by Mr. G. E. Osterhout.)

4 plants from Long Island. (Given by Miss I. M. Mulford.)

2 plants of violets. (Given by Dr. H. H. Rusby.)

2 plants from Long Island. (Given by Mr. E. P. Bicknell.)

1 plant of *Viola lanceolata*. (Collected by Mr. R. C. Schneider.)

1 plant of *Viola Angellae*. (Given by Miss Angell.)

90 succulents. (By exchange with the National Museum, through Dr. J. N. Rose.)

1 plant of *Opuntia stenopetala*, collected by Dr. E. Palmer. (By exchange with the National Museum, through Dr. J. N. Rose.)

3 plants of *Echeveria*. (By exchange with the National Museum, through Dr. J. N. Rose.)

1 plant of *Corynephyllum*. (By exchange with the National Museum, through Dr. J. N. Rose.)

467 coniferous trees and shrubs. (Given by Mr. L. M. Palmer.)

7 beech trees. (Given by Mr. L. M. Palmer.)

3 plants. (Given by Mr. L. M. Palmer.)

3,392 plants derived from seeds, from various sources.

10 packets of seed. (By exchange with Mr. F. Weinberg.)

12 packets of seed. (By exchange with the Botanic Garden at Groningen, Holland.)

1 packet of seed of *Dioon edule*. (Given by Mr. Chas. Chamberlain.)

1 packet of seed of *Tragopogon pratensis*. (Given by Mr. J. Cukor.)

2 packets of seed from Hanbury Garden. (Given by Mrs. H. L. Britton.)

146 packets of seed. (By exchange with Botanical Garden, Zurich.)

1 packet of *Sol num* seed. (Given by Dr. J. A. Shafer.)

1 packet of seed. (Given by Miss E. Billings.)

2 packets of seed from the Philippines. (Collected by Mr. R. S. Williams.)

1 packet of seed. (Given by Mr. L. Abrams.)

MUSEUMS AND HERBARIUM, APRIL, 1905.

76 marine algae from Japan. (Given by Mr. Shigeo Yamanouchi.)

350 specimens "Musci Archipelagi Indici Exsiccata." Distributed by Prof. Max Fleischer.)

1 specimen of seeds of *Abrus precatorius* from St. Thomas, W. I. (Given by Miss Elizabeth Billings.)

11 specimens of twigs for the collection of North American Dendrology. (Given by Dr. J. A. Shafer.)

55 specimens from Grenada, W. I. (Collected by Mr. W. E. Broadway.)

32 specimens from Nova Scotia. (Given by Dr. A. H. Mackay.)

3 specimens from North Carolina. (Given by Mrs. L. E. Livingston.)

937 specimens from Wyoming. (By exchange with Prof. A. Nelson.)

423 specimens from California. (Collected by Mr. H. P. Chandler.)

2,537 specimens of Cuban fungi. (Collected by Dr. W. A. Murrill and Mr. F. S. Earle.)

340 specimens of fungi from southern California. (Collected by Mr. LeRoy Abrams.)

12 specimens of fungi from North America. (Given by Mr. P. L. Ricker.)

18 specimens of fungi from Mexico. (Given by Mr. E. W. D. Holway.)

500 specimens of grasses. By exchange with the Div. of Agrostology, Bureau of Plant Industry.)

300 specimens of marine algae from Florida. (Collected by Mrs. C. E. Burnett.)

15 specimens of Cuban fungi for the Museums. (Collected by Dr. W. A. Murrill.)

50 specimens "Algae Japonicae Exsiccatæ," fasc. 2. (Distributed by Mr. K. O. Kamura.)

208 specimens from British America. (By exchange with the Geological and Natural History Survey of Canada.)

80 specimens from Montana and Utah. (By exchange with Oberlin College.)

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OF

The New York Botanical Garden

EDITOR

DANIEL TREMBLY MACDOUGAL

Assistant Director

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JOURNAL

OF

The New York Botanical Garden

VOL. VI. July, 1905. No. 67.

A TRIP TO CUBA.

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

Dear Sir: The fungi of Cuba have been known chiefly through the collections of Ramon de la Sagra and Charles Wright. Sagra's material was worked over by Montagne and the types are at Paris; Wright's types are at Kew, described by Berkeley.

Many of these types are in poor condition, and many of those better preserved give a very imperfect idea of the original plant on account of scarcity of material and changes in appearance during the lapse of years. It is true, also, that Wright in particular was no special student of fungi, nor were his patrons interested in this group, which may account for the comparatively small number of fungus specimens (something over 1,600 numbers) secured during his ten years of labor in the island.

It was with the intention of increasing our knowledge of the described species, and the hope of adding to the list of those undescribed that I recently undertook a collecting expedition covering several widely separated and topographically different localities in Cuba. The success of this expedition was largely due to Professor F. S. Earle, Director of the Cuban Experiment Station, whose skill and enthusiasm as a collector and intimate knowledge of the country and people left nothing to be desired. We were together during the whole expedition, sharing the expenses and dividing the specimens. At times we were ably assisted by Mrs. Earle and Mrs. Murrill, who not only did their share of collecting but also helped to care for the plants during the tedious operations of drying and packing.

Mrs. Murrill and I left New York on the twenty-fifth of February and reached Havana harbor March 1 at daybreak. At the Custom House we were met by Professor and Mrs. Earle, who took us in their carriage to Santiago de las Vegas, twelve miles south of Havana, where the experiment station is located. Nothing could be more delightful than this quick transition from the clutches of a long and unusually severe northern winter to the fresh and balmy air of a tropical island continually swept by sea breezes.

Add to this the beauty, richness and novelty of the vegetation, the habits of life peculiar to tropical countries and the various phases and customs of a transplanted European civilization so different from our own, yet so attractive because of historic and literary associations and there results a combination of conditions that cannot fail to attract large numbers of Americans of all classes to this magnificent and easily accessible winter resort. Once there, the dullest will appreciate the opportunities for various forms of investment in this vast stretch of virgin land unexcelled in geographical position and productiveness. It is safe, I think, to predict that within five years Americans will own three-fourths of all the land that can be bought in Cuba and that American capital and intellect will control to a large extent the business enterprises of the island.

Agriculture must be the basis of all future progress in this new country. The plantations that have been depleted by years of mismanagement and laid waste by years of war must be restored by careful handling and the vast areas of uncultivated land must be cleared of the dense forests and planted in sugar cane, tobacco, fruits, fiber plants and vegetables before the wonderful development now under way will be in any sense complete. The rôle of the experiment station, established about a year ago, is of the utmost importance in this connection and it will be fortunate for Cuba if President Palma can continue to secure for this new enterprise the necessary funds and freedom of action which its great responsibilities and present broad policy demand.

I was not a little surprised at the progress made by Professor Earle in so short a time, even allowing for the fact that he has no wintry weather with which to contend. The buildings are more commodious and substantial and the organization and actual work of experimentation in progress both in field and laboratory is much more extensive than I had anticipated. I wish here to express my appreciation of the cordial reception tendered me by Professor Earle and his able staff of specialists and of their kindly and valuable assistance during my stay on the island.

Our first collecting was done in Havana province within easy reach of Santiago de las Vegas. Excursions to the dry limestone hills near Managua, about twenty miles to the east, and along the river near San Antonio de los Baños, about the same distance to the west, resulted in several hundred specimens, chiefly woody forms belonging to the Pyrenomycetes and Polyporaceæ. This being the driest season of the Cuban year, fleshy forms were not expected and were found very sparingly during the entire trip.

On March 6 we left Santiago de las Vegas by the Western Railway for Herradura, about seventy miles to the west, in the province of Pinar del Rio. The change from red land and royal palm to gray savanna land and cabbage palmetto was soon very remarked. As the ranges of the Organ mountains came into view, a tract of sandy land was reached resembling the pine regions of Florida, on which pines and barrel palms were conspicuous. The barrel palm is considered by the Cubans a sign of a poor soil and this may be true of the elevations upon which it grows, but this district as a whole, the famous *vuelta abajo*, is the finest fruit land in Cuba and the best tobacco land in the world, the soil being light and porous, easily cultivated and at the same time remarkably retentive of moisture during the dry season.

On March 7 we hired a mule team and pushed on over the rough roads to the edge of the Organ mountains north of San Diego de los Baños, an attractive village celebrated for its sulphur springs, and camped in the foot-hills by the San Diego River. Here we encountered for the first time the dense virgin forest of hardwoods which covers much of the island. The mountains are not high, but very difficult to climb on account of the jagged limestone rock of which they are composed and the wild tangle of vines and thorny shrubs which must be cut away with the machete. The collections made here were exceedingly interesting, several of the species being new. An expedition over these mountain ranges into the moist lowlands of the "upper valley" lying between the mountains and the coast would doubtless bring in still larger returns, but would require more time and a more complete equipment than we had at our disposal.

On March 10 we broke camp and drove back to Herradura by way of Paso Real. The thickets and fields in the vicinity of Herradura were explored on horseback during the next two days and we then returned to the Experiment Station in time to enjoy a visit from President Palma, accompanied by Luis Marx, a wealthy planter, and General Montalvo, the newly appointed Secretary of Public Works and Acting Secretary of Agriculture. The care with which these men inspected every detail of the work showed the great interest taken by each of them in the Station and augurs well for its future.

The evening of March 16 was delightfully spent at the home of Professor Earle with the members of the Station Staff and their families. Incidentally, another use of the royal palm was discovered on this occasion in the highly decorative quality of its immense leaves when used to enclose a large veranda lighted by numerous electric bulbs and colored lanterns. The next morning before daybreak Professor Earle and I left for the eastern part of the island, making stops and excursions of varying length at Santa Clara in Santa Clara province, Ciego de Avila in Puerto Principe and Alto Cedro in the province of Santiago de Cuba. No fungi had been previously collected in Puerto Principe.

The results of these rather brief excursions into five out of the six provinces of Cuba were even better than we had expected and the 2,500 or more specimens obtained give a fair idea of the fungus flora of the Cuban lowlands during the latter part of the dry season. Further explorations should be made in similar localities during the summer and autumn to secure fleshy forms, particularly the Agaricaceae. The flora of the high mountains is comparatively unknown and would undoubtedly yield large returns in undescribed endemic species.

Respectfully submitted,

WILLIAM A. MURRILL,

Assistant Curator.

THE PRESERVATION OF PLANTS BY GEOLOGIC PROCESSES.

In the Journal for April, 1900, may be found an article on "Tussock Formations," illustrated by means of a view of the depression or swamp with numerous tussocks of sedges north

FIG. 28. Tussocks in swamp, now bed of upper lake.

of the Museum building, as it appeared previous to its flooding and conversion into a lake. This view is reproduced in Fig. 28. Some months ago, after several years of submersion, the water was almost entirely drained off, during the construction of the culvert at the eastern end, and a large part of the surface of the swamp was again exposed to view, in which the remains of the old tussocks was a conspicuous feature. Fig. 29 is reproduced from a recent photograph, and it may be seen that these tussocks still retain their original shapes, although they are more or less

FIG. 29. View of upper lake showing tussocks which have been submerged for four years.

worn and are partly buried in the surrounding mud and silt which accumulated during the period of submersion. In the spaces between the tussocks a variety of material has found lodgment, among which, branches, twigs, and leaves from the trees in the vicinity, are abundantly represented, and these, together with the silt, now form a distinct and characteristic layer over the surface of the old swamp.

Since the last photograph was taken the swamp has again been converted into a lake and another layer of silt and débris is slowly being deposited, which in time will completely entomb the tussocks and include them, together with other derelict material, in a constantly thickening layer over the bottom of the lake.

In the Bulletin of the Garden (Vol. 1, No. 2, January, 1897), in an article on "The Glacial or Post-Glacial Diversion of the Bronx River from its Old Channel," Professor Jas. F. Kemp describes the locality as follows: "From the entrance to the gorge a swampy depression extends westward to the railroad and has all the characteristics of an old abandoned channel. The railroad has crossed it by an embankment and culvert. Just east of the culvert there is gneiss but a few feet below the soil and at this point the old stream evidently surmounted a reef."

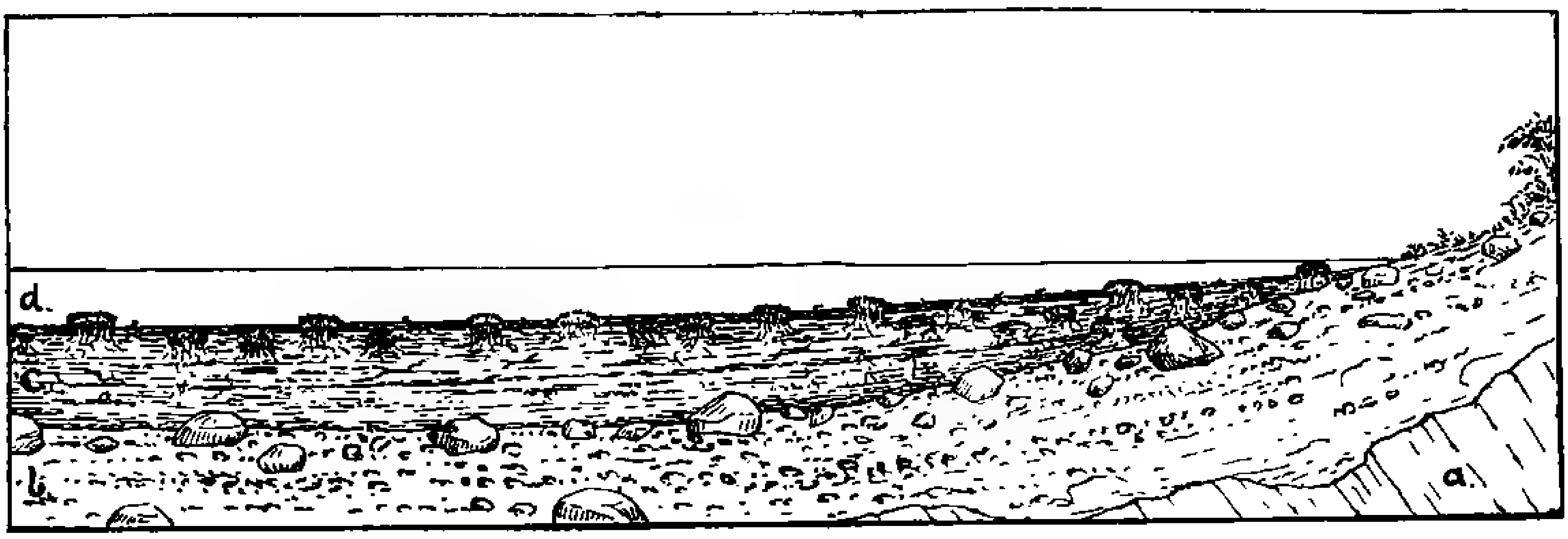

FIG. 30. Theoretical section of bed of lake. *a*, gneiss; *b*, gravel and bowlders; *c*, mud and silt; *d*, water.

If we consider this description, together with the more obvious surface features, we may therefore regard the present lake as having had its origin in a stream flowing through a channel of bare gneissic rock, which subsequently became choked with gravel and boulders and converted into a swamp, in which vegetation lived and died and whose remains accumulated as a black organic mud; and finally came the construction of an artificial dam, flooding it with water and resulting in the deposition of the silt, which is now taking place.

Fig. 30 is designed to indicate these successive stages and the characteristics of their deposits, in a theoretical section through part of the depression, from the present water level of the lake down to the rock bed of the original stream.

Perhaps in the course of time the lake may become filled up, either by the slow operation of natural causes or by reason of the exigencies of civilization, and the tussocks and broken branches and impressions of leaves in the layers of silt will be buried and forgotten or perhaps preserved for some future geologist to unearth and interpret.

ARTHUR HOLLICK,
Assistant Curator.

NOTES, NEWS AND COMMENT.

Dr. Forrest Shreve of Johns Hopkins University, has been appointed Laboratory Assistant in the New York Botanical Garden, detailed for special duty at the tropical laboratory at Cinchona, Jamaica. Dr. Shreve has also been awarded the Bruce Fellowship in biology by the Johns Hopkins University, and plans to spend the winter of 1905–6 in some investigations in Jamaica.

Professor Raymond H. Pond, of Northwestern University, has been granted a research scholarship for three months and is carrying on some investigations upon the enzymes in seeds at the Garden.

Dr. P. A. Rydberg, Assistant Curator, went to Utah early in June, and will spend several weeks in the investigation of the flora of the region west and southwest of Salt Lake City as an extension of his work on the Flora of the Rocky Mountains, which has been in progress for several years.

Mr. Geo. V. Nash, Head Gardener, and Mr. Norman Taylor, Garden Aid, started for Hayti on June 6, to carry on some explorations in the northern part of the Island.

Mr. L. R. Abrams, Fellow in Columbia University, who has been engaged in an investigation of the flora of southern California at the Garden during the last two years has been appointed assistant curator in botany at the National Museum at Washington.

The total precipitation in the Garden during June, 1905, amounted to 4.01 inches. Maximum temperatures of 81½° on the 2d, 90° on the 7th, 89° on the 18th, 89½° on the 20th and 88½° on the 26th were recorded; also minima of 44° on the 2d, 45½° on the 9th, 58½° on the 14th, 54° on the 20th and 51° on the 28th.

ACCESSIONS.

LIBRARY ACCESSIONS FROM APRIL 5 TO JUNE 1.

AMES, OAKES. *Studies in the family Orchidaceae.* Fascicle 1. Boston, 1905.

BANCROFT, EDWARD. *An essay on the natural history of Guiana in South America.* London, 1769.

BANKS, SIR JOSEPH, & SOLANDER, DANIEL. *Illustrations of Australian plants collected in 1770 during Captain Cook's Voyage round the World in H.M.S. Endeavour.* With determinations by James Britten. Pt. 3. London, 1905.

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BEDDOME, R. H. *Icones plantarum Indiaes orientale.* Madras, 1874.

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BRITTON, NATHANIEL LORD. *Manual of the flora of the Northern States and Canada.* Ed. 2. New York, 1905. (Given by the author.)

BRONGNIART, A. F., & GRIS, ARTHUR. *Description de quelques plantes remarkables de la nouvelle Calédonie.* Paris, 1865.

BURBIDGE, F. W. The gardens of the sun. London, 1880. (Given by Mr. C. B. Robinson).

CHALON, JEAN. *Liste des algues marines observées jusqu' a ce jour entre l'embouhure de l'Escaut et la Corogne.* Anvers, 1905.

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DUTAILLY, G. *Sur quelques phénomènes déterminés par l'apparition tardive d'élèments nouveaux dans les tiges et les racines des dicotylèdones.* Paris, 1879.

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GRANT, BARTLE. *The orchids of Burmah (including the Andaman Islands).* Rangoon, 1895.

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LA LLAVE, PABLO & LEXARZA, JUAN. *Novarum vegetabilium descriptiones.* Mexici, 1824–5. (Reprint, Mexico, about 1890.)

LINNAEUS. *Parte practica de botanica del caballero Carlos Linneo . . . por Don Antonio Palau y Verdera.* Madrid, 1784–87. 8 vols.

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NAIRNE, ALEXANDER KYD. *The flowering plants of Western India.* London, 1894.

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EDITOR

DANIEL TREMBLY MACDOUGAL

Assistant Director

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JOURNAL

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VOL. VI. August, 1905. No. 68.

REPORT ON A TRIP TO EUROPE.

TO THE SCIENTIFIC DIRECTORS.

Gentlemen : By authority of the Board of Managers, I was absent from the Garden during the period between May 27 and July 15, for the purposes of visiting certain European botanical gardens and museums, and of attending the international congress of botany held at Vienna, June 11 to 18. I was accompanied by Mrs. Britton.

Reaching Paris, via Cherbourg, on June 4, I reëxamined the collections at the Jardin des Plantes ; their general arrangement has not been changed materially in recent years, but I observed many species of plants for the first time, and studied some type specimens in the herbarium. M. Bureau, the Director, received me with great cordiality and we arranged for some additional exchanges of duplicate specimens.

A feature of the educational work of the Jardin, which I had the opportunity to observe, is their arrangements for Sunday afternoon lectures to the people, on topics of general interest. They have a separate building, containing an amphitheatre, in which these lectures (termed here conferences) are delivered. Admission is by tickets issued for each course. The subject for June 4 was "The Importance of the Cryptogams in Nature," and it was charmingly treated by M. Mangin, fully illustrated by lantern slides, by specimens selected from the museums and by living plants from the greenhouses, very similarly to our lectures given on Saturday afternoons. The audience numbered about 175.

Proceeding to Geneva, via Dijon, a visit was made to the new botanical garden and museum under the direction of Dr. John Briquet, recently established on a plot of ground on the shore of Lake Geneva, presented to the city by one of its public-spirited citizens. Dr. Briquet, was absent in Vienna, but Dr. Hochreutiner, his assistant, who had traveled from New York with us, on his way home from Java, gave me all needed assistance. The institution is readily accessible by train or boat. Special attention has here been given to the bringing together and display of herbaceous perennials characteristic of the different mountain systems of central Europe, planted out in rockwork, and to the establishment of other geographical groups. The mountain plants were largely in bloom at the time of our visit, including a great many species not previously seen by me, and presented elegant masses of form and color. There is also a very extensive systematic collection of herbaceous plants, and a commencement has been made in planting shrubs and trees. The greenhouses of this institution are still at the old site in the city of Geneva.

A handsome and well-equipped museum building has been built here by the city, primarily for housing the Delessert Herbarium and other scientific collections of the garden, which I consulted while there for information concerning certain types of American species.

I also visited the herbarium of M. Casimir De Candolle at Geneva, and he kindly permitted me to examine certain specimens.

We reached Vienna June 10 and found a very distinguished assemblage of botanists gathered there. The sessions of the Congress commenced promptly the next morning, with addresses of welcome by civil and scientific officials of the Austrian government, followed by the election of Professor Wiesner of the Vienna University as president of the Congress, and of a number of vice-presidents, in which category I had the honor to be included.

The meetings were then divided into two series, (1) those of the general body, devoted mainly to the reading of scientific papers and their discussion, and (2) those of the persons delegated for the discussion of the special subject of botanical nomenclature, which has been prepared in advance by an international commission appointed at the congress held in Paris in 1900, of which I had been a member, the various propositions having been brought into available form for comparative consideration by Dr. John Briquet, the general reporter of the congress, whose labors in accomplishing this work were very great, and received the hearty commendation and gratitude of the assemblage. Important results were reached by both series of meetings. A prominent feature, in connection with the congress, was an interesting exposition of specimens and apparatus illustrating botanical research arranged by the International Association of Botanists, which met with the congress. This was well installed in the orangery of the imperial palace at Schönbrünn and was opened to the public for two weeks. Visits to the museums, libraries, parks and gardens of Vienna were made at intervals between the meetings; many excursions to points of botanical interest in Austria and Hungary, both before and after the congress, were arranged by the local committee, but I found my available time insufficient for participation in them.

The botanical garden and institute of the university, situated on the Rennweg, quite within the city, is under the direction of Prof. R. von Wettstein. The extensive plantations exhibit a great number of species, arranged principally in three series. (*a*) The systematic collection, consisting of species illustrating the natural families of plants, in which herbaceous plants, shrubs and trees are brought into close comparative distance, the three not being separated into different plantations; both hardy and tender species are employed. (*b*) A series of geographical groups, being illustrations of the floras of various countries, in which a similar mixture is used; and (*c*) biological groups, consisting of species selected to illustrate various phenomena of plant life, such as parasitism, sensitiveness, vegetative propagation, methods of pollination, distribution of seeds and fruits, and hybridity. The path system is very extensive, so that the great majority of plants set out may be seen without leaving it. Each individual plant or clump in the systematic and biological series is given its own small circular plot in the greensward, these plots averaging about three feet in diameter. The labelling is very complete and accurate, that of the systematic collection showing only, however, the botanical name of the plant, without reference to its geographical distribution, and without any popular names, while the plants in the geographical groups are not labelled at all. The botanical institute is a fine building at one end of the garden, containing thoroughly equipped laboratories for instruction and research.

The main herbarium and principal botanical library in Vienna are elegantly housed on the upper floor of the Natural History Museum on the Ringstrasse, quite distant from the garden, under the curatorship of Dr. A. Zahlbruckner. They are very extensive and valuable collections, and I took advantage of the opportunity to consult the herbarium with reference to specimens of certain species of American plants.

I also examined with interest the great glass plant house in the imperial park and gardens at Schönbrünn, Vienna, and its fine collection of tropical plants, where I took pleasure in examining a number of rare species for the first time.

At the adjournment of the botanical congress, I proceeded to Munich and studied its botanical garden, situated in the heart of the city, under the directorship of Professor K. Goebel. This is divided into a "larger" and a "smaller" garden, separated by the Sophienstrasse. The general plan of the larger area is an elaborate system of narrow paths, subdividing it into numerous small plots of high cultivation, with relatively little greensward. It is essentially level, except small masses of rockwork built up of limestone, providing crevices for the cultivation of mountain plants. The systematic collection is composed of herbaceous plants, shrubs and trees intermingled or in juxtaposition by relationships, and the number of species under cultivation is very large. As a rule, each subdivision of the area is occupied by the specimens illustrating a natural family, but this arrangement is somewhat complicated by the growing of many trees and shrubs out of place. Within each family subdivision the individual herbaceous species are given relatively large plots, averaging perhaps three feet square so that considerable masses of them are obtained, this being a striking feature of the plantation. In addition to this systematic series, there are plantations illustrating plant ecology and others devoted to geographical botany, and one end of the garden contains a small arboretum. The labelling throughout is very complete and accurate, showing both the botanical names and the German names of the plants, and their natural distribution. The "smaller" garden contains a number of greenhouses containing a large collection of tropical plants; an extensive rockwork devoted mainly to the cultivation of mountain plants, and an elaborate biological series. The fine building containing the laboratories and other facilities for teaching and research is at one side of this smaller garden.

On leaving Munich, we proceeded to Amsterdam, by way of Mayence and Coblentz, and on June 22, visited the botanical garden of Amsterdam, of which Professor Hugo de Vries is the director. It occupies a city square. The out-of-door collections are systematically arranged, thoroughly labelled and contain many interesting species; the shrubs are kept separate from the herbaceous plants; the limited area does not permit the growth of many kinds of trees. There are several greenhouses, containing a select collection of tropical plants in very good order.

I naturally took great interest in seeing there the specially enclosed plots devoted to Dr. de Vries' famous experiments on plant mutations, which have been repeated and elaborated by Dr. MacDougal at our own institution.

Arriving at Kew on June 23, two weeks were devoted to the study of the collections there. The fire-proof extension to the herbarium and library building, work on which was in progress at the time of my last visit, has been completed, giving this collection about double the space it previously had, and providing much additional room for books and charts. The old herbarium building has also been completely overhauled and fire-proofed. The immense task of moving the collection twice has been successfully accomplished, and it has now all been brought into one series. The present equipment and facilities provided for work here seem as complete and convenient as could be devised, and I thoroughly enjoyed consulting the herbarium and library during my visit, my principal work with them being the comparison and determination of a large number of specimens of Bahamian and other West Indian specimens obtained during our explorations of the past four years; my studies brought out a considerable number of species new to science among these specimens, and many other illustrating rare or little known plants. A similar series of comparisons of mosses from our collections was made by Mrs. Britton, and valuable information secured bearing on the North American moss-flora.

An important addition to the Kew greenhouses is the new succulent house, a large structure devoted entirely to cacti, Crassulaceae, agaves, and other plants requiring much light and little moisture for their best cultivation, and containing a great many fine specimens, previously grown in other houses not so well adapted to their needs. Many additional species have been brought into the various Kew collections since my last visit and I observed some of these with great pleasure and interest. Sir William Thiselton Dyer, the director, kindly gave me valuable advice, and continued his liberality by handing me a number of books and specimens for our collections.

Mr. George Massee, the mycologist of the Kew staff, indicated to me his desire to sell all his original drawings, notes and specimens, illustrating an unpublished monograph of the large fungus class Discomycetes, which his present duties prevent his completing; I bought these studies, comprising over 1000 objects; they will be of value and importance in future research on these plants in America.

I took much interest in examining portions of the collections of coal-plants formed by Dr. D. H. Scott, honorary director of the Jodrell Laboratory at Kew, which have shed such a flood of information upon the true nature of many of the carboniferous species long supposed to be ferns, but now proven, largely by Dr. Scott's researches, to be seed-bearing plants allied to the living cycads or sago-palms; I have to thank him for his kindness in showing me typical specimens and for his gift to our library of his published papers concerning them.

Mr. C. B. Clarke, of Kew, kindly continued his valuable aid in enabling me to get a better knowledge of the American sedges, and I now plan to publish my monograph of the North American species of this family in a forthcoming number of "North American Flora."

Respectfully submitted,

N. L. BRITTON,

Director-in-Chief.

THE SUWARRO, OR TREE CACTUS.

In a recent number of the Journal (June, 1905) attention was called to the fact that *Cereus giganteus* was probably known to civilized man much earlier than the date customarily given (Emory, 1846) and accepted by Sargent (Silva, **5**: 54. 1893). Coronado's expedition across Arizona in 1540–1542 passed through the region inhabited by this singular tree, but the earliest printed record that has come to notice is that which relates to the journey of Oñate a half century later (1604). In descending into the valley of the Colorado by way of the valley of the Bill Williams Fork his company passed through a region in which it is very abundant and he noted that the "petahaya" was seen in the "tierra caliente." No other large arboreous cactus which might be confounded with the suwarro (or sahuaro) is to be found in this region.

In all of the older literature this plant was designated as a "petahaya" but in more recent times it is called the "suwarro" by both Mexicans and Indians, while the original term is restricted to various smaller cylindrical forms, including both opuntias and cerei.

An extended description of a pitahaya was given by Hernandez in 1690 (Medici atque Historici, etc., **3**: 94. 1690) which is regarded by some writers (see Bartlett, J. R., Personal Narrative, **2**: 191–193. 1854) as referring to the tree in question. It is to be noted, however, that this as well as notes by Baron Humboldt possibly refers to *Cereus Pringlei* or *C. Pecten-aboriginum* which also attain the stature of trees. Both Venegas in the middle of the eighteenth century and Salva Tierra in the latter part of the seventeenth century could not have avoided seeing the suwarro and their notes on large pitahayas undoubtedly refer in part at least to this plant.

Early in the nineteenth century Lieut. R. W. H. Hardy passed through the southern portion of the region inhabited by the suwarro, although it cannot be definitely stated that he refers particularly to this plant in the record of his travels (Travels in the Interior of Mexico. 1829). No such doubt exists, however, as to the observations of Pattie, an Indian trader and trapper who passed up and down the Gila river several times where he saw a tree (1825) of which he says "It grew to a height of forty to sixty feet. The top was cone-shaped and almost without foliage. The bark resembles that of the prickly pear; and the body is covered with thorns. I have seen some three feet in diameter at the root, and throwing up twelve distinct shafts" (Pattie, J. O., Personal Narrative of Six Years Journeyings. P. 68. 1833).

The references given above include many notes to as to the uses to which the pitahaya was put by the Indians; the woody skeleton for houses and shelters and the pulp and seeds for food. During my recent explorations in the southwest it was found that this plant is to be added to the list of those furnishing water for the use of the animals on the desert. It is asserted that birds of various species pierce the softer upper portions of the stems and eat the juicy pulp for the moisture contained. Travellers are also reported to have secured water from the trunks for their animals. To do this young trees were felled and the ends of the prostrate trunks were supported a few feet above the ground with the middle sagging in such manner that it rested on a kettle or bucket partly buried in the soil. Incisions were made in the trunk over this vessel and fires were built under the ends of the trunk, which resulted in driving out quantities of sap. The amount of water obtainable by this method is by no means inconsiderable. Thus a young unbranched tree 15 feet in height weighs in the neighborhood of half a ton and must therefore contain about nine hundred pounds of water, a large proportion of which might easily be expressed.

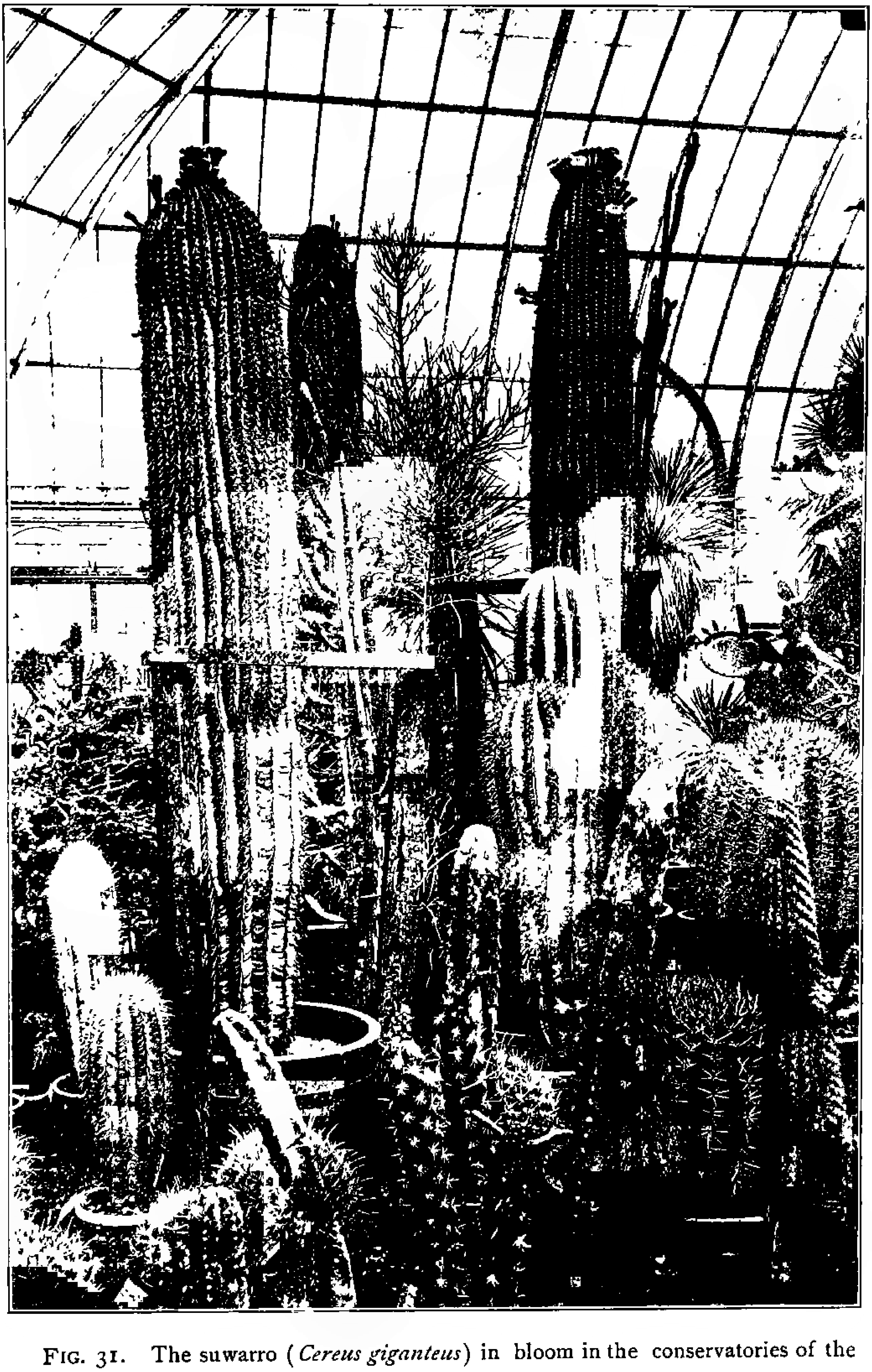

FIG. 31. The suwarro (*Cereus giganteus*) in bloom in the conservatories of the New York Botanical Garden.

The habitat of this plant is usually given as "Arizona and Sonora." According to my own observations, however, it crosses the river into California at a point opposite the mouth of Bill Williams Fork; how far it extends to the westward can not be stated. It is to be seen near the river on the Arizona shore at many points, and I was informed by miners that it was to be found in the mountains south of Picacho in California, although this was not verified. The range of the suwarro is there-

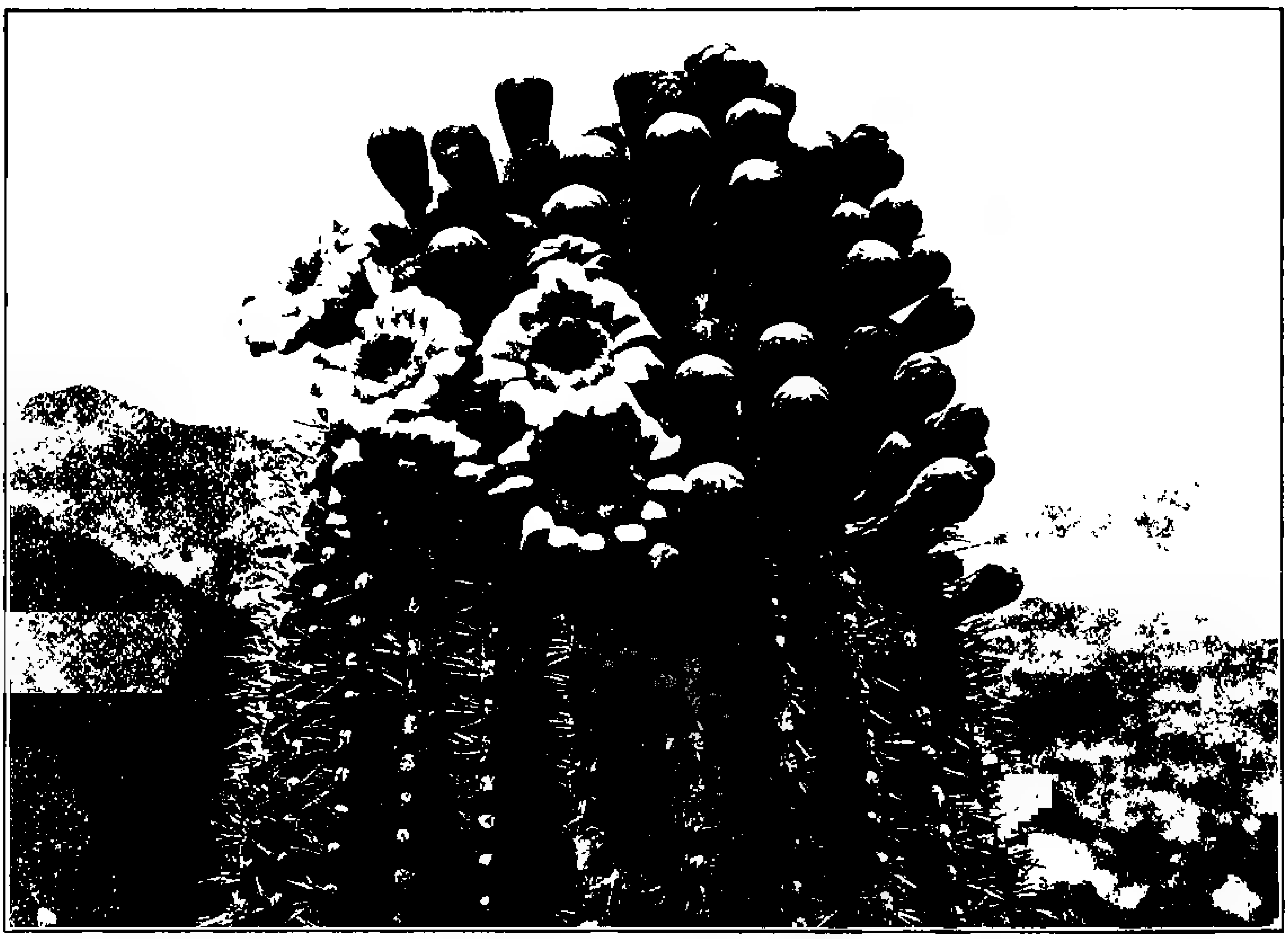

FIG. 32. Cluster of flowers at apex of stem of suwarro (*Cereus giganteus*) near Tucson, Arizona. Photograph by Prof. F. E. Lloyd.

fore known at the present time to include from about 27° N. in Sonora to 34°20′ in Arizona and extending westward into California. It is found in the Tonto basin in central Arizona, near the northern limit of distribution.

The tree cacti which were obtained from the vicinity of Tucson, Arizona, in February, 1902, and added to the collections in our conservatories included specimens from 9 to 14 feet in height and they have grown in length at a rate of about 6 inches annually during the last three years.

A profusion of flowers has also been produced in May of each year at about the same time as in the specimens bloom in the open air of the desert. The plant seems incapable of self-pollination and as the animal which customarily carries the pollen was not present no fruits were formed until the present year, when this deficiency was supplied by hand pollination. The half dozen which were allowed to attain full size matured and split open early in July exposing the mass of pulp and seeds which constitutes such an important article of food for the Papago, Pima, Maricopa, Yaqui and other Indians. The illustration accompanying this note shows the three larger trees in the conservatories in the flowering season.

It is to be seen from the foregoing notes that the suwarro was seen and described by various travellers from 1604 to 1825 and its actual discovery antedates that of Emory by nearly two and a half centuries.

D. T. MacDougal,
Assistant Director.

NOTES, NEWS AND COMMENT.

Professor Howard J. Banker, of DePauw University, Greencastle, Ind., spent a few days at the garden early in July in consultation of the collections.

The total rainfall in the garden during July, 1905, amounted to 4.13 inches. Maximum temperatures of 88° on the 9th, 90° on the 10th, 89° on the 11th, 88½° on the 12th, 85° on the 13th, 92° on the 14th, 87° on the 15th and 88½° on the 27th were observed; also minima of 57° on the 9th, 60° on the 15th, and 54° on the 24th.

ACCESSIONS.

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The New York Botanical Garden

EDITOR

DANIEL TREMBLY MACDOUGAL

Assistant Director

CONTENTS

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OF

The New York Botanical Garden

VOL. VI. September, 1905. No. 69.

RECEPTION DAYS AND LECTURES.

The Director-in-Chief and other members of the staff will be pleased to receive members and their friends at the grounds in Bronx Park, every Saturday for which lectures are announced.

Train leaves Grand Central Station, Harlem Division, N. Y. C. R. R., at 2:35 P. M., for Bronx Park. Returning train leaves Bronx Park at 5:32 P. M. Excursion fare twenty-five cents.

Opportunity will be given for inspection of museums, laboratories, library, herbaria, the public conservatories, the herbaceous collection, the hemlock forest and parts of the arboretum site.

The autumn course of lectures will be delivered in the lecture hall of the Museum on Saturday afternoons at 4:30 P. M., as follows:

October 7, Autumn Features of Native Trees and Shrubs, by Dr. N. L. Britton.

October 14, The Faculties of Plants, by Dr. D. T. MacDougal.

October 21, Botanical Explorations in Hayti, by Mr. Geo. V. Nash.

October 28, A Summer in the Desert, by Prof. Francis E. Lloyd.

November 4, The Sea-gardens of Tropical America, by Dr. M. A. Howe.

November 11 (subject to be announced), by Dr. W. A. Murrill.

November 18, Fossil Plants, by Dr. Arthur Hollick.

November 25, Tropical Fruits, by Prof. H. H. Rusby.

The lectures will be illustrated by lantern slides and other material. They will close in time for auditors to take the 5:32 train from the Bronx Park Railway Station, arriving at the Grand Central at 6:02 P. M.

The Museum Building is reached by the Harlem Division, N. Y. C. R. R., Bronx Park Station, by trolley cars to Bedford Park, and by Elevated Railway, Third Avenue to Bronx Park Terminal.

THE FOUNTAIN IN FRONT OF THE MUSEUM BUILDING.

In the original general plan of the Garden, approved by the Board of Managers and by the Commissioners of Public Parks in 1897, provision was made for the location of a fountain immediately in front of the Museum Building. Consideration of plans for this fountain was taken up by the Board of Managers shortly after the completion of the Museum Building and its approaches in 1899, and the marble basins, whose position had been established by the general plan in 1897, were constructed at the time that the path approaches and marble seats, garden fountain and drinking fountain were built on the driveway, leaving only the character of the bronze fountain itself to be determined, and its construction secured.

A competition of sculptors was arranged in 1900, but none of the designs secured at that time were acceptable to the Board. Subsequently two other designs were obtained from individual sculptors, neither of which was, however, accepted. In 1902 the managers voted to request the coöperation of the National Sculpture Society in the work of obtaining a suitable model, and in the fall of that year this Society appointed a committee consisting of Messrs. Karl Bitter, Daniel C. French and Chas. C. Haight, to report a plan of competition for the proposed fountain; this plan of competition was drawn up by this committee, and approved by a committee of the Board of Managers who had meanwhile been appointed to take charge of the matter. A printed program and rules for this competition was issued January 15, 1903, the competition being an open one, and designs were called for not later than March 1, 1903. The jury of award, appointed by the Council of the National Sculpture Society, at the request of the committee of the Board of Managers, consisted of Messrs. J. Q. A. Ward, Daniel C. French, Chas. Grafly, Lorado Taft and Geo. B. Post; Mr. Taft being unable to serve at the meeting of the jury on April 16, 1903, to examine the model, Mr. Herbert Adams served in his place. Models were received from 15 sculptors in response to the invitation, and on April 16, 1903, the jury appointed by the National Sculpture Society rendered the following descision:

COMMITTEE OF THE BOARD OF MANAGERS OF THE NEW YORK BOTANICAL GARDENS, DR. N. L. BRITTON, DIRECTOR.

Sirs: Your jury, appointed to examine the designs submitted in competition for a Statuary Fountain for the Botanical Gardens, and to select from among them the one best in their judgment, beg to report:

That, after a careful examination, they find the design submitted by Mr. Carl E. Tefft, to be the best, and they recommend it to the Committee of the Board of Managers, for adoption and execution, subject to the following conditions: that before the commission for the execution of the fountain, in full size and permanent material, is awarded to him, Mr. Tefft shall be required to make a model of the principal group in his design, on a scale of 3 inches to 1 foot, which shall be submitted to the Jury for approval. If this model is approved by the Jury, the contract to execute the fountain, according to the design, shall be awarded to Mr. Tefft. If it is not satisfactory, the Committee shall reserve the right to reject it, and to take such steps as they may deem advisable to procure an acceptable design.

In case of the rejection by the Committee of Mr. Tefft's model, the Jury beg to suggest that, in their opinion, a payment of one thousand dollars should be made to him as partial compensation for the labor and expense of enlarging and developing his design.

Mr. Tefft, the successful competitor, was at once notified of this decision, and he proceeded to make the larger model called for. On November 9, 1903, the Jury examined this model and made the following report:

125 WEST ELEVENTH STREET, NEW YORK CITY,
November 9, 1903.

DR. N. L. BRITTON,
Director-in-Chief,
New York Botanical Garden.

Dear Sir: The Committee appointed by the National Sculpture Society to advise with your Board concerning the models offered in competition for the Botanical Garden Fountain, has, in obedience to the instructions contained in your letter of October 31 to Mr. Ward, visited Mr. Tefft's studio and examined the three-inch scale model. It gives the Committee pleasure to report that the model is an admirable piece of work, giving abundant proof of the sculptor's ability to carry out intelligently and artistically the design recommended to the Board by the Committee in the competition.

The Committee now recommends that the contract for the fountain be given to Mr. Tefft.

Very respectfully,
(Signed) J. Q. A. WARD,
HERBERT ADAMS,
CHARLES GRAFLY,
DANIEL C. FRENCH,
GEO. B. POST.

This report being accepted by the committee, and an appropriation by the city for improving the grounds being available for construction of the fountain, the following letter was addressed to the Commissioner of Parks for the Borough of the Bronx:

November 18, 1903.

HON. JOHN E. EUSTIS, *Commissioner of Parks*,
Zbrowski Mansion,
Claremont Park, N. Y. City.

Dear Sir: Referring to the designs for the fountain planned for completion in front of the Museum Building, which have been on view here for some months, I would say that the Board of Managers of the Garden have been fortunate in obtaining the coöperation of the National Sculpture Society in selecting the one most suitable for execution. This, prepared by Mr. Carl E. Tefft, is further illustrated by means of photographs which I have submitted to you.

I now transmit copies of the following documents:

1. Report of the jury appointed by the National Sculpture Society to examine the designs, dated April 16, 1903.

2. Resolution of the Board of Managers of the New York Botanical Garden accepting and adopting this report.

3. Supplementary report of the jury, approving the model prepared by Mr. Tefft on the scale of three inches to one foot.

I now ask your approval of the design thus selected, and your coöperation in arranging a contract for its execution.

Yours truly,
(Signed) N. L. BRITTON,
Director-in-Chief.

THE CITY OF NEW YORK, DEPARTMENT OF PARKS.

NEW YORK, November 19, 1903.

JOHN E. EUSTIS, *Commissioner.*

DR. N. L. BRITTON,
Director-in-Chief, Botanical Garden,
Bronx Park, New York City.

Dear Sir: Replying to your favor of the 18th instant, in relation to the fountain planned for the front of the Museum Building, enclosing copies of the report of the jury, resolution of the Board of Managers of your institution, and the supplementary report of the jury, I beg to say, the same has my approval, and that I will coöperate with you in the execution of the necessary completion of this work, and will have a resolution introduced to-day by the Park Board, authorizing us to proceed to prepare plans and specifications for contract.

Yours truly,
(Signed) JOHN E. EUSTIS,
Commissioner of Parks,
Borough of the Bronx.

Mr. Tefft was at once authorized to prepare full-size plaster models for casting the bronze, and these were completed in September, 1904, and delivered at the Museum Building. Specifications calling for bids for the bronze, setting it in place, and for necessary minor works connected with it, were at once drawn up by the Department of Parks, advertised, and the contract was awarded by the Commissioner of Parks on December 29, 1904, to the Roman Bronze Company, the design being approved by the Art Commission of the City of New York, January 10, 1905. The contractors finished their work at the end of May, 1905, at which time the fountain was satisfactorily mounted.

Plate XXVIII shows the general character of the work and its position in relation to the Museum Building.

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

MAINTENANCE OF ROADS, PATHS AND BRIDGES.

In July, the attention of the Commissioner of Parks for the Borough of the Bronx was called to the condition of the wooden "Blue Bridge" over the Bronx River at the north end of the Hemlock Grove, its flooring needing repairs. The Commissioner submitted to the Corporation, whether his department was required to defray the expenses of such repairs, to which the following affirmative opinion in reply was returned:

LAW DEPARTMENT.

(*Office of the Corporation Counsel.*)

NEW YORK, August 22, 1905.

HON. HENRY C. SCHRADER,
Commissioner of Parks, The Bronx.

Sir: I am in receipt of your communication bearing date July 25th, enclosing copy of report of N. L. Britton, Director in Chief of the Botanical Garden, asking your department to repair the bridge over the Bronx River in the Botanical Garden, known as the "Blue Bridge."

You asked to be advised whether your department is obliged to take care of the roads, paths, bridges, etc., in the Botanical Garden, particularly the bridges, from the moneys issued to your department under the maintenance account, or whether such work is not properly chargeable to the Botanical Garden appropriation.

I have examined the provisions of law as to the maintenance of the Botanical Garden in the Park, Section 6 of Chapter 286 of the Laws of 1891, which amended the law creating the Botanical Garden.

The section referred to is as follows:

SEC. 6. "The grounds set apart as above provided shall be used for no other purposes than authorized by this act; and no intoxicating liquors shall be sold or allowed thereon. *For police purposes, and for the maintenance of proper roads and walks, the said grounds shall remain subject at all times to the control of the said board of commissioners of the department of parks*, but otherwise after the suitable laying out of the same, and the construction of proper roads and walks therein by the department of parks, the said grounds and buildings shall be under the management and control of the said corporation. The said grounds shall be open and free to the public daily, including Sundays, subject to such restrictions only as to hours as the proper care, culture and preservation of the said garden may require; and its educational and scientific privileges shall be open to all alike, male and female, upon such necessary regulations, terms and conditions as shall be prescribed by the managers of those departments."

It would seem that it was the intent of this legislation that the grounds of the Botanical Garden should remain under the control and jurisdiction of the Park Department for the maintenance and repair of the roads and walks. I would consider, also, that the bridges crossing and forming parts of such roads and walks are also covered by the same provision.

I advise you, therefore, that the work referred to is properly chargeable to the maintenance account of your department.

Respectfully yours,

(Signed) E. F. STERLING,

Acting Corporation Counsel.

It was hoped early in the year that funds might become available for replacing this wooden bridge by a permanent stone one, for which designs have already been approved, but the amount of money voted by the Board of Estimate and Apportionment for construction work during 1905 was not sufficient to permit this very desirable piece of work being undertaken.

A LOST SPECIES OF BEGONIA APPARENTLY REDISCOVERED.

In the course of Mr. Nash's exploration of Hayti in the summer of 1903, he collected seeds and herbarium specimens of a begonia growing on open banks on Mount Maleuvre at an altitude of about 2,500 feet. Plants were raised from this seed, and from these the accompanying illustration was made.

The plant is of particular interest on account of having almost orbicular leaves, showing very little of the lop-sided character so clearly in evidence in the leaves of most begonias, and was not at once recognized. Recently in looking over the plates of Plumier's "Plantarum Americanarum," edited by Burmann, published in 1755, a work containing the earliest descriptions and illustrations of many plants of the West Indies, I noticed on plate *45* of that work, the figure of a begonia which, I think, was certainly intended for the plant collected nearly 150 years later by Mr. Nash. The plates of Plumier are rather crudely drawn, but the description given by him on pp. 33 and 34 of the work seem to agree perfectly well with Mr. Nash's plant. This figure by Plumier was made the basis of *Begonia rotundifolia* Lamarck, Encycl. 1: 394. 1783, who states that the "plant grew in South America, attached to rocks or the trunks of trees." There is no evidence cited that Lamarck saw a specimen. In the revision of the genus *Begonia* by Alphonse de Candolle (Prodromus **15**: 395), *B. rotundifolia* is recorded as a dubious species of American origin, no specimen of it having been seen by him. If my determination of the plant, by the comparison of Plumier's plate and description, is correct, the supposition of Lamarck that

Fig. 33. *Begonia rotundifolia.* A, plant with larger leaves and white flowers. B, with flowers tinged with pink.

it originally came from South America is erroneous; Plumier does not say in the Plantarum Americanarum just where the plant he figures and describes came from. He describes the flowers as rosy, "Begonia roseo flore folio orbicularia"; in the plants raised from the seed collected by Mr. Nash some individuals bear white flowers, while others have flowers distinctly pinkish tinged. In the "Catalogus Plantarum Americanarum," published by Plumier in 1703, and which Plumier cites in the later work, this plant is listed as having come from one of the American islands, and as many of Plumier's species were obtained from Hayti, it would seem that it is very probable that Lamarck was wrong in assigning the species to South America.

The plant is also recorded in the Appendix to Tournefort's "Institutiones Rei Herbariae, pp. 660," 1700, but with no indication of its origin.

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

PALAEOBOTANICAL NOTES.

1. It has become necessary to rearrange and relable a large part of the carboniferous fossil plants, formerly regarded as ferns, in order to include them in the newly established group of the Cycadofilicales or Cycad-Ferns, in accordance with recent discoveries of inflorescence and fruit, which prove them to be higher in the scale of life than was previously thought to be the case.

These discoveries have been largely due to the researches of D. H. Scott in England and David White in this country, resulting in taking the genera *Neuropteris*, *Alethopteris*, *Adiantites*, *Odontopteris* and, in part, *Sphenopteris* out of the ferns and placing them in the new group. These genera, although founded upon specimens which had all the external characters of fern fronds, had long been looked upon with suspicion for the reason that they had never been found with any of the characteristic fruit dots or sori, although these were known to occur in abundance on the fronds of other fossil genera, such as *Pecopteris*.

2. Through the courtesy of Mr. George B. King unusual facilities have recently been given for collecting cretaceous fossil plants in the gravel excavations of J. B. King & Co., in the vicinity of Roslyn, Long Island. These facilities included transportation of the writer to and from the locality, subsistence and the shipping of material collected, without expense to the Garden. The result was the acquisition of a number of new specimens, representing the cretaceous flora of Long Island, which will be added to the already large and unique collection from this vicinity.

ARTHUR HOLLICK.

SUWARRO OR SAGUARO.

The author is in receipt of a number of comments upon the proper form of the common name of *Cereus giganteus*. Saguaro, sahuaro, zuwarrow, suwarrow and suwarro have all been used by various writers, and the last-named form appeared in an article in the August number of the Journal, following the usage of Sargent in his "Silva of North America." Mr. Frederick V. Coville and the author had previously decided upon and used "Saguaro" in the publications of the Desert Botanical Laboratory of the Carnegie Institution, and Mr. Herbert Brown, a naturalist of Yuma, Arizona, asserts that this form is always used by the people in the region included in the range of the plant, and all of the evidence seems to be in favor of the use of this term.

Since the publication of the August Journal a reprint of the "Personal Narratives of J. O. Pattie," edited by Dr. R. G. Thwaites, has been published in which attention is called to the fact that an observation of the *Cereus giganteus* was made in 1825, thus confirming the statement by the author.

Regarding the distribution of the tree cactus in California Mr. Brown also says "The saguaro does not grow in the hills back of Picacho, but it does grow in the Senator Mine basin, on the river 20 miles above here (Yuma, Arizona). There are 12 to 15 trees in the Basin, but not more, and they are scattered over some square miles. It does not occur elsewhere in California until Ehrenberg is reached. I think I told you that I once ran a prospecting outfit over that country and if my memory serves me right the saguaro nowhere occurs far back from the river (on the Californian side). I have also made many inquiries and the information runs about as I have given it."

Cereus giganteus is, therefore, found in two areas in California; the Senator mine basin 20 miles north of Yuma, Arizona, and between the latitudes of Ehrenberg and the Needles.

D. T. MACDOUGAL.

NOTES, NEWS AND COMMENT.

Dr. N. L. Britton and Mrs. Britton sailed for Bermuda on Aug. 30 to carry out some botanical investigations, returning during the last week in September.

Dr. P. A. Rydberg returned from two months' work in western Utah and Nevada, late in August. A large number of herbarium specimens were secured which will furnish much valuable material for the furtherance of his studies on the flora of the Rocky mountains.

Mr. Geo. V. Nash has recently returned from an exploring trip to the interior of Hayti. Some regions hitherto unvisited by the botanist were reached and a large amount of preserved material, seeds and living plants were secured together with many valuable notes on distribution.

Professor F. E. Lloyd, Teachers College, has returned from a summer of work at the Desert Botanical Laboratory of the Carnegie Institution at Tucson, Arizona. Professor Lloyd is carrying out some investigations upon the transpiration of desert plants under a grant from the Carnegie Institution.

The total amount of precipitation in the Garden during August, 1905, amounted to 6.04 inches. Maximum temperatures of 86° on the 3d, 91° on the 7th, 79° on the 18th, and 90° on the 22d were observed: also minima of 56° on the 2d, 62° on the 5th, 49.5° on the 17th, and 51° on the 28th.

The record for July was given in the Journal for August with the omission of the following maxima: 99° on the 17th, 100.5° on the 15th, 100° on the 16th, and 92° on the 17th.

ACCESSIONS.

MUSEUMS AND HERBARIUM, JUNE AND JULY.

30 specimens from Jamaica. (Collected by Mr. W. Harris.)

1 specimen of *Funaria Americana* from Illinois. (Given by Rev. E. J. Hill.)

19 specimens of mosses from the Argentine Republic. (By exchange with Dr. Eugine Autran.)

508 specimens of fungi from the District of Columbia. (Collected by Dr. W. A. Murrill.)

14 specimens of fungi from Cuba. (By exchange with Estacion Central Agronomica, Cuba.)

1 photograph of *Silphium laciniatum* from Nebraska. (Given by Prof. C. E. Bessey.)

6 specimens of *Scirpus* from Vermont. (Given by Pres. Ezra Brainerd.)

1 specimen of *Hemicarpha aristulata* from Wyoming. (By exchange with Prof. A. Nelson.)

2 specimens of mosses from Redding, Connecticut. (Given by Miss Julia T. Emerson.)

5 specimens of mosses from the Argentina. (By exchange with the Museo de Farmacologia, Buenos Aires.)

313 specimens of fungi from Virginia. (Collected by Dr. W. A. Murrill.)

6 specimens of fungi from Sweden. (By exchange with Mr. Lars Romell.)

13 specimens of mosses from Thomasville, Georgia. (Given by Mrs. A. P. Taylor.)

125 specimens "Musci Acrocarpi Boreali-Americani." (By exchange with Prof. J. M. Holzinger.)

53 museum specimens of fungi from Ohio Pyle, Pennsylvania. (Collected by Dr. W. A. Murrill.)

100 specimens "Uredineen" fasc. 38 and 39. (Distributed by Dr. P. Sydow.)

1 specimen of the seeds of *Zostera marina* from the oesophagus of a bird killed on the Kennebec River, Maine. (Given by Capt. H. L. Spinney.)

48 specimens from New Grenada, W. I. (Collected by Mr. W. E. Broadway.)

216 specimens from British America. (By exchange with the Geological and Natural History Survey of Canada.)

100 specimens "Mycotheca Brasiliensis" Cent, 1. (Distributed by Professor E. Ule.)

1 specimen of *Gesneriaceae* from Central America. (Given by Mr. C. Werckle.)

3 specimens of fungi from Maryland and Missouri. (Given by Mr. P. L. Ricker.)

215 specimens of hepatics from the vicinity of New York City. (Given by Miss C. C. Haynes.)

1 specimen of *Rhadinocladis cylindrica* from Rhode Island. (Given by Mr. R. E. Schuh.)

4 specimens of fungi from the Pacific Coast. (By exchange with Dr. Carl F. Baker.)

191 specimens from Montana and Utah. (By exchange with Oberlin College.)

1 museum specimen of the twigs of *Pinus Virginiana* from Vermont. (Given by Dr. J. A. Shafer.)

2 museum specimens of resin from North Carolina. (Given by Mr. F. L. Lehman.)

4,552 specimens from northern Europe. (By exchange with Professor O. Nordstedt.)

25 specimens of fungi from British Columbia. (Given by Mr. A. J. Hill.)

22 specimens from Brazil. (By exchange with Professor O. Nordstedt.)

1 specimen of eucalyptus oil from Mentone, France. (Given by Mrs. H. L. Britton.)

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Assistant Director

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BERMUDA IN SEPTEMBER.

To the Scientific Directors.

Gentlemen: By permission of the President I visited the Bermuda Islands in September for the purposes of making some study of the land flora of the archipelago and of its relationship to that of the West Indies and that of the Southern States, and for obtaining specimens and plants to illustrate it in our collections, which hitherto had contained very little material from this interesting isolated group of islands. I was accompanied by Mrs. Britton and by Mr. Stewardson Brown, Curator of Botany in the Academy of Natural Sciences of Philadelphia, and through their aid was enabled to secure the largest botanical collection that has yet been brought from Bermuda. We were absent from August 29 to September 22. Previous students of the Bermudian flora had demonstrated the fact that a number of the wild plants of the islands were endemic, occurring in the feral condition nowhere else in the world; this was recognized, indeed, by Linnaeus, who in 1753 published scientific descriptions of the Bermuda red cedar (*Juniperus Bermudiana*); the Bermuda blue-eyed grass (*Sisyrinchium Bermudianum*); and of the Bermuda bedstraw (*Galium Bermudianum*); in 1829, Glazebrook ascertained that the Bermuda palmetto (*Sabal Blackburnianum*) was different from the palmetto of the South Atlantic Coast and the Bahamas, although he did not know that it was wild there. A number of popular accounts of the flora were published from 1845 to 1884, the most noteworthy of these being the paper by

Governor Lefroy in Bulletin 25 of the United States National Museum. Lefroy studied the plants very enthusiastically and diligently during his six years' residence, and made considerable collections of them. The only report approximating completeness by a trained botanist, however, is the valuable paper by Mr. W. B. Hemsley, now Keeper of the herbarium of the Royal Gardens at Kew, published in the Reports of the cruise of H. M. S. "Challenger" in 1884, based upon collections made mainly by Governor Lefroy and by Moseley, the naturalist of the Challenger staff, who spent parts of three months in the spring, about 1873, collecting on the Bermudas. Hemsley discovered that the Bermuda fleabane (*Erigeron Darrellianus*), named in honor of a member of a distinguished Bermuda family, and the Bermuda sea lavender (*Limonium Lefroyi* [*Statice Lefroyi* Hemsley]), which commemorates Lefroy's scientific work, were also restricted to Bermuda, as well as the Bermuda sedge (*Carex Bermudiana*); Mr. J. G. Baker, former Keeper of the Kew Herbarium, studied the ferns and contributed an account of them to Mr. Hemsley's work, recording the endemic status of the Bermuda shield-fern (*Dryopteris Bermudiana*); the Bermuda spleenwort (*Asplenium Laffanianum*), named in honor of Governor Laffan, and of the Bermuda maiden-hair fern (*Adiantum bellum*); Mr. Mitten studied the mosses and made out that one of them (*Tortula Bermudiana*) was in the same category. Thus eleven of the native species of the islands were known to be peculiar to them. A preliminary study of our collections indicates that this list is not yet complete.

The total wild land flora of the islands, exclusive of fungi, lichens and algae, comprises about 200 species. With the exception of the endemic elements, its distribution is almost wholly West Indian and Floridian, which indicates that it has been mainly derived from the south and southwest, through natural agencies well known to transport seeds or fruits through long distances — migratory birds, ocean currents and hurricane winds. With the exception of *Erigeron Darrellianus* and *Carex Bermudiana* the eleven endemic species hitherto recorded have close relatives indigenous in the West Indies or Florida, which may have probably been their ancestors, or at any rate are of common ancestry; the two exceptions have no known immediate American relatives living.

The restriction of these eleven or more species to Bermuda (and insular floras as is well known, are often, in large part, composed of endemic species) gives text for a consideration of the causes which effect the modification of a plant into a species different from its parents; from the experiments and observations of de Vries and MacDougal, we no longer need believe that the change must necessarily be a very gradual one, occupying thousands or tens of thousands of years; a new species may be evolved from an old one in a single generation, and if organized so as to successfully dispute the right of way with its parent species, may survive and ultimately displace the type which gave it birth. The immediate cause or causes which induce this mutation of species are as yet obscure, but the isolation of the offspring species from the ancestral one is clearly not necessarily one of them.

Let us take up the case of the Bermuda palmetto and follow briefly its probable ancient history. A hurricane uproots a fruiting Floridian or Bahamian palmetto (*Sabal Palmetto*) and carries it into the sea; the Gulf Stream carries the wreck northeastward, the winds cause it to drift more seaward and it is ultimately cast up in a marshy place upon the old Bermudian shore; its fruits have maintained the life of the seed within them, and one or more of these seeds germinate, and grow into palmettos; either these original palmettos of Bermuda, or some of their offspring mutate; the new palmetto is better adapted to the climate, or soil of Bermuda, or to both the climate and soil, and it survives, giving us *Sabal Blackburniana* instead of *Sabal Palmetto*. As the Bermuda tree is more elegant than its ancestor, loyal Bermudians will doubtless rejoice that mutation has taken place and produced one of the most interesting plants of their islands, a feature which does not fail to attract the attention of all observant visitors.

The natural landscapes of Bermuda, though in general uniform, are charming and indeed sufficiently varied to be thoroughly enjoyable; the rounded hills, rising in places to above 250 feet, alternate with basin-like swales and glades; they are mainly of gentle contour, though locally we see bold cliffs, precipitous to the water. The coast lines, while mainly rocky, are locally white sand beaches, extending in some places a considerable distance back from the sea; the harbors and Sound are irregular in outline, dotted with numerous islets. Over all is spread what seems from the sea a dark green mantle broken only by the white limestone houses which dot it very conspicuously. This mantle is the Bermuda red cedar, one of the most characteristic natural features; after exploring a little, the mantle is seen to be not quite as continuous as it at first appears, but there are doubtless more individual red cedar trees than of all other kinds of trees wild or planted collectively; some of them are of great size, especially in the Devonshire marshes. Mangrove trees, identical with those of Florida and the West Indies, fringe the banks of coves and creeks and the borders of salt and brackish marshes. The rarest trees of the islands are the olive-wood (*Elaeodendron* sp.), the yellow-wood (*Fagara flava*), nettle-tree (*Celtis* sp.) and the wild red mulberry (*Morus* sp.), now confined to a very interesting ridge east of Harrington Sound, which harbors also numerous kinds of shrubs and lowly plants as well, including rare and fascinating ferns and mosses, hidden away in the caves and crevices which abound in this interesting region, known as the "Walsingham Tract"; it was made a special study by Governor Lefroy, who, writing in 1879, says: "This remarkable region is a narrow ridge, about two miles long and from a quarter to half a mile wide, which separates Castle Harbor from Harrington Sound, and does not altogether comprise above 200 acres. It contains nearly the whole of the indigenous vegetation of the group."

Such a unique region must always be a place of great interest, and it should be preserved in its natural condition as a point of attraction and reverence. Since Governor Lefroy's writing, it has become menaced by cultivation, agricultural operations being now in progress at points within very short distances of some of its best natural features. "Walsingham Park" would at once become an additional attraction to visitors and its cost might readily be partly or wholly defrayed by an admittance charge and by the income from proper concessions, put to the credit of a sinking fund ; suitable roads and paths could be laid out through it without damaging its natural beauty and interest; the views afforded by these both over Castle Harbor and Harrington Sound are among the most attractive on the islands; it is accessible from Hamilton or St. George's, the two largest towns, either by land or by water.

Another unique natural feature, on a very much smaller scale, is the remarkable growth of the palmetto in Paget Marsh, a very short distance from Hamilton ; here also a considerable number of rare plants exist, including an evergreen tree related to the northern cherries not seen by us elsewhere. But the growth of the palmetto here is simply wonderful, and the reservation of a few acres of this swale is also very desirable, as it likewise is in proximity to cultivation and has been threatened by fire.

The exotic plants of Bermuda include a very great variety of species from tropical and subtropical lands, most of them growing luxuriantly and including many notable and instructive examples. This already great variety will doubtless be increased through the work of the recently established experimental gardens, now under the able management of Mr. T. J. Harris, who brings to it, from his former duties in the Department of Public Gardens and Plantations of Jamaca, wide experience and critical knowledge of tropical agriculture and horticulture. The exportable products of the islands, now mainly potatoes, onions, lily-bulbs, and arrow-root, will be improved and their cultivation made more successful, and other elements will be added through scientific experimentation and suggestion.

The collections made by us include museum and herbarium specimens, seeds and living plants of about 400 species, illustrated by more than 3,000 specimens, including many duplicates, some of which go to the Academy of Natural Sciences of Philadelphia, whose coöperation gave the expedition the efficient services of Mr. Stewardson Brown, and the remainder may be used in exchange with other institutions. A visit of the same duration some February or March would yield specimens of a considerable number of species not to be found during the summer. We received a most cordial reception in Bermuda ; our thanks are especially tendered to the Hon. Eyre Hutson, Colonial Secretary, to Mr. Harris, Superintendent of the experimental gardens, to Mr. Nicholas L. Peniston, of Paynters Vale, and to Mr. F. T. Frith, Librarian of the Public Library, Hamilton.

The seaweed flora of Bermuda was studied by Dr. Marshall A. Howe, assistant curator, during the summer of 1900, who at that time made extensive collections which have since been placed in our museums and herbarium.

It was a matter of keen regret that our visit was subsequent to this season's session of the Biological Laboratory conducted by New York University and Harvard University under the direction of Professor Bristol and Professor Mark. The buildings are beautifully and advantageously located on a tidal strait, the outlet of Harrington Sound.

Respectfully submitted,

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

EXPLORATIONS IN UTAH.

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

Sir: In accordance with your permission and directions I started the twenty-ninth of May of this year on a botanical exploration trip to Utah, which lasted nearly three months. The trip was undertaken mainly to give me the opportunity of a personal visit to this part of the Rocky Mountain region. While I had spent seven summers in the Rocky Mountains and adjacent country, principally in Montana, Colorado, western Nebraska and the Black Hills of South Dakota, and also made shorter stays in Wyoming and Idaho, I had botanized only two days within the state of Utah, one at Logan and one in the Echo Cañon. The field was therefore practically new to me.

Utah, together with Southern Idaho, constitutes the part of the Rocky Mountain region least well known botanically of all.

Very little botanical collecting has been done in the state, except what was done by Dr. Sereno Watson principally in the northeastern portion of the state in 1868 and 1869, during the expedition commanded by Clarence King; by Dr. Edward Palmer and Dr. C. C. Parry in the extreme southwestern part, the former in 1870 and 1877, the latter in 1874; and by Professor Marcus E. Jones, a resident botanist of Salt Lake City. The regions west and southwest of Great Salt Lake are practically unknown, and the same can almost be said about the part of the state southeast of the Colorado River. My intention was to spend most of the time in the district southwest of Great Salt Lake along the new San Pedro, Los Angeles and Salt Lake Railroad. My plans were changed later, however, for reasons given below.

A round trip ticket to San Francisco and Los Angeles at the time of my starting, cost only a few dollars more than one to Salt Lake City. I therefore bought a ticket reading over the two first mentioned places, especially as you thought it advisable to visit the California Academy of Sciences and make arrangement for exchanges with that institution.

On my way I stopped for a day at Laramie, Wyoming, to make a visit to the State University. I spent a very pleasant time with Professor Aven Nelson and saw nearly all of the types of his new species, of which there are not cotypes in the herbarium of the Garden. This will help me considerably in my work on a manual of Rocky Mountain botany.

On the third of June I arrived at Salt Lake City. Awaiting the arrival of Professor E. C. Carlton, of Gustavus Adolphus College, St. Peter, Minn., who was to act as my assistant during the summer, I set out to collect in the vicinity of Salt Lake City. During these trips I was usually accompanied by Professor O. Garrett, of the Salt Lake City high school. Although Professor Garrett's botanical interests are directed in a different line from mine, his speciality being the rusts and smuts, this collaboration I think was of mutual benefit. The foot-hills and outer mountains facing the Salt Lake Valley are practically destitute of woods. They are, however, covered more or less by shrubs, in some places scattered, in others forming dense chaparrals. These are mostly made up of *Quercus Utahensis* in the foot-hills and of *Ceanothus velutinus* on the higher ridges. The pine, spruce and aspen woods are mostly confined to the higher mountains, especially those at some distance from the valleys, and the cottonwood groves to the river banks and the cañons. The foot-hills are dry, and their flora is made up principally of plants characteristic of the Great Basin. Shrubs belonging to this class, as the different kinds of sage-brush and rabbit-brush (*Artemisia* and *Chrysothamnus*), were common quite high up. I afterwards found that the general character of the foot-hills and lower mountains was the same in all parts of Utah that I visited, only that farther south the place of the oak was often taken by junipers and piñons. In order to find typical Rocky Mountain vegetation, *i. e.*, to reach what Merriam calls the Canadian Zone, one must go up into the mountains, several miles from the open valleys.

One day in the afternoon we reached Beck's Hot Springs; the water is strongly charged with sulphur and the soil around the springs and the lake below is strongly impregnated by salts and alkalies. Here we found a peculiar flora, not to be met with except in the neighborhood of Great Salt Lake and similar regions. The characteristic plants here belong mostly to the Chenopodiaceae and are more or less fleshy, as *Spirostachys occidentalis*, *Kochia vestita*, *Sarcobatus vermicularis* and species of *Dondia* and *Atriplex*. On the road-bed of the Denver and Rio Grande Railroad, we found a large white poppy, *Argemone hispida*, in great profusion; while along the Oregon Short Line and Salt Lake City and Odgen Railroad, only a few rods distant on either side, not a single specimen was found. The explanation may be found in the fact that the line of the first named road from Salt Lake City to Ogden is of a more recent origin and the gravel to make up the road-bed across a marsh had evidently been brought in from some other locality; another striking illustration of the dispersion of plants indirectly by the agency of man.

Through some misunderstanding, Professor Carlton did not meet me at Salt Lake City, but had proceeded from Portland, where he visited the Lewis and Clark Exposition, to San Francisco. I had intended to continue my journey to that place later in the summer, but as the time of the visit was unimportant, I started as soon as I had received the information that Mr. Carlton was there. During my stay in San Francisco I visited the California Academy of Sciences and met Miss Eastwood and also Mrs. Brandegee, in the herbarium. I easily made arrangements for future exchanges with the institution, and saw a small part of the collections, especially of Saxifragaceae, the latter valuable on account of the forthcoming monograph by Dr. Small and myself in the North American Flora. Miss Eastwood invited us to make a trip the following day to Mount Tamalpais. We had a very enjoyable and profitable tramp, and it is no wonder that Miss Eastwood and other San Franciscans are proud of their mountain. I shall not try to describe its flora, as it is outside of the scope of the summer's exploration.

From San Francisco we returned by way of Los Angeles. From the latter place to Salt Lake City we travelled on the San Pedro, Los Angeles and Salt Lake Railroad, which took us through the desert regions of southeastern California and southern Nevada, a very interesting but inhospitable country. At Las Vegas, Nevada, the train stopped for about half an hour, which I used in collecting around the station, but I did not find more than a dozen species in all. The only woody plant was a species of *Prosopis*.

We stopped for a day at Milford, in southwestern Utah. We had intended to spend some time in this part of the state, but I thought it scarcely worth the time and effort. The season was very dry and the spring flora was altogether gone by this time. In this part of Utah very few flowers bloom in the middle of summer. Most flowers bloom in the spring immediately after the early rains, and a number of shrubby plants, mostly composites, bloom in the fall from August to November. For these we were too early. The specimens we secured from the plains consisted mostly of a few species of Cactaceae and Malvaceae. The flora of the mountain east of Milford, which we visited, was nearly identical with that of the mountains around Salt Lake City.

On the twenty-third of June we arrived at Salt Lake City where we stayed a few days to complete our camp outfit and to provision. On the twenty-sixth we secured a team which took us thirty miles up into the mountains. We camped near Silver Lake, near the headwaters of the Big Cottonwood Creek. Here we were joined by Professor Garrett and stayed about two weeks. The Big Cottonwood and its tributaries run through a number of small lakes and the cañons and valleys are surrounded by mountains of an altitude of 9,000–12,000 feet. Our collection was rich in specimens, although the flowers of the alpine flora were not in bloom as yet. I have made arrangements with Professor Garrett who was to spend the month of August in this region to collect a set of the plants blooming later.

After our return from Salt Lake City we took the train to Garfield one day, and collected on the salt marshes and sand dunes along Great Salt Lake.

On July 18 we took the train to Marysvale, which served as our headquarters for the remaining part of the summer. After having collected a few days in the valley of Sevier River around Marysvale, we secured a team which took us up into the Bullion Cañon. Our outfit was transported by wagon for eight miles, *i. e.*, as far as there was a wagon road, and then for a mile or two on pack horses. We collected both in the cañon of the Bullion Creek and on the surrounding mountains, and secured a valuable collection of specimens. Our camp was situated about 8,000 feet above the sea, and we climbed several mountains ranging from 10,000–12,600 feet. The highest of these was Delano Peak, the third in height of the range. We intended to climb Mt. Belknapp and Baldy Mountain, both over 13,000 feet, and started out one day to do so. By taking a wrong trail we found ourselves on a ridge separated from them by a deep cañon. Seeing that the upper parts of both mountains were covered by loose rocks and apparently without any vegetation, we did not think it worth the effort of either crossing the cañon or retracing our steps to the junction of the trail leading to Mt. Belknapp.

After our return to Marysvale we started out for a trip to the Aquarius Plateau and Fish Lake. The former, as far as I know, had not been visited by any botantist. A few very interesting plants had been picked up there by the distinguished geologist

Dr. Lester F. Ward, and we expected much from the trip. We received the information that there were no roads there, therefore we secured three saddle horses, three pack mules and a boy to take care of the animals. However, we found that a fairly good road had been made to the top of the plateau to a dairy-ranch, which was run there during the summer. A part of the plateau is now a government forest reserve, but cattle and sheep are allowed to be pastured on certain parts, which, of course, left us very little to collect. Nobody, who has not seen it with his own eyes, can get an idea of the appearance of the land after a herd of from 10,000 to 40,000 sheep have passed over it, for scarcely a blade of grass or anything else living is left. We had a day of fairly good collecting toward the edge of the plateau, but on the other days we secured very little. We did not stay as long as we intended, but decided to proceed to Fish Lake. We could choose between three ways. The way least troublesome was to retrace our steps down into the valley of the East Fork of Sevier River, follow this down to the reservoir and then up the Grass Valley to the base of the Fish Lake Plateau, but this way meant two extra days of travel. The shortest way led north along the edge of the plateau, but there was only one place where water could be had; if we should miss the little spring at the head of Dry Wash, or find it dry, we should have to go without water for two days. The third way was to go northeast to Bean or Antelope Spring, from there to Loa, in the Rabbit Valley and from there to Fish Lake. We selected the route last mentioned and were told to take the right hand trails and keep well towards the east. We did this so well that we missed Bean Springs, passing east thereof, and had to ride the whole day without water. Late in the evening we reached the Rabbit Valley, near Thurber, seven miles southeast of Loa, and late at night the following day we reached Fish Lake which is situated about 10,000 feet above the sea. The collecting around the lake and along the brooks running into the same was fairly good, that on the Fish Lake Plateau, was fair on the east side but very poor on the west side. Sheep are not allowed here, it being a forest reserve, but some herders had violated the law and one of the rangers of the reserve, whom we met a few days later, told us that two of the sheep owners had to answer before the courts for their trespasses.

From Fish Lake we moved into the valley of Seven Mile Creek, camping at the base of Mt. Marvin. We climbed this mountain but found scarcely anything to collect, the upper half being bare rocks and large fields of broken lava. We intended to visit two other neighboring mountains, but were discouraged by the poor luck we had here, and proceeded to Richfield, the nearest railroad station. Here I took the train to Marysvale to settle our accounts.

The following day we took the train for Nephi, which is situated near the foot of Mt. Nebo. Although the mountain is only a little over 12,000 feet, it seems much higher, rising abruptly from a valley not 5,000 feet above the sea. Knowing from experience that the side facing the valley as a rule is much poorer botanically than the opposite side, we secured a horse and buggy, drove about twelve miles around the southern end of the mountain and up into a cañon on the east side. We started the climbing of the mountain about eleven o'clock and Mr. Carlton reached the top about five o'clock P. M. I being in speaking distance below, asked him if he found anything of interest where he was. His answer being that there were no plants different from those where I was, we decided to return so that we could reach the bottom of the cañon before dark. We had climbed the mountain along some ridges, and now made the descent following a little stream; this soon entered a steep cañon, and made more than a dozen waterfalls from twenty to forty feet high, making the journey very perilous. A peculiarity of the flora of Mt. Nebo was that we did not find more than one truly alpine plant, although the mountain reached more than a thousand feet above timber-line. The flora consisted mostly in species of *Eriogonum*, *Erigeron*, *Artemisia*, *Lupinus*, *Macronema* and other plants characteristic of the plains, foot-hills and lower mountains. Even the sage brush reached here an altitude of nearly 10,000 feet.

As it now was very near the time when I had to return to New York, we did not think it advisable to undertake to visit any other mountain, but returned to Salt Lake City. Here I stayed only one day to arrange our affairs, and returned to New York.

P. A. RYDBERG,
Assistant Curator.

NOTES, NEWS AND COMMENT.

Dr E. J. Durand, of Cornell University, was at the Garden during two weeks in September, carrying on some special work on Fungi.

Dr. B. E. Livingston, of the Bureau of Soils, U. S. Department of Agriculture, Washington, D. C., spent September at the Garden upon some investigations of the effect of water of swamps and bogs upon the growth of plants.

Professor McCloskey, of Princeton University, spent a few days at the Garden during the last month consulting the library.

Mr. Perley Spaulding, of the Bureau of Plant Industry, Washington, D. C., spent a few days at the Garden in the latter part of September, in an examination of the Polyporaceae.

The total precipitation in the Garden during September, 1905, amounted to 6.09 inches. Maximum temperatures of 84° on the 10th, 83° on the 13th, 84° on the 22d, and 89° on the 30th, were observed; also minima of 60° on the 2d, 53.5° on the 10th, 42° on the 15th, 47° on the 24th, and 37° on the 27th.

ACCESSIONS.

LIBRARY ACCESSIONS FROM JULY 15 TO SEPTEMBER 23.

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CHRISTENSEN, CARL. *Index filicum.* Fasciculus 1–3. Hafniae, 1905.

CLEMENTS, FREDERIC EDWARD. *Research methods in ecology.* Lincoln, 1905.

CONZATTI, C. *Los géneros vegetales Mexicanos.* Vol. I. Mexico, 1903–5.

DANA, SAMUEL L. *A muck manual for farmers.* 5th ed. New York, 1855. (Given by Mr. Martin Eiche.)

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INDEX KEWENSIS. *Supplemento secundum: Leucocoryne-Zygostates et emendanda addenda.* Oxonii, 1905.

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JOHNSON, SAMUEL W. *How crops grow.* New York (1868). (Given by Mr. Martin Eiche.)

LISTER, ARTHUR. *Guide to the British Mycetozoa exhibited in the Department of Botany, British Museum* (*Natural History*). Second edition. London, 1905. (Given by Dr. J. H. Barnhart.)

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OF

The New York Botanical Garden

EDITOR

DANIEL TREMBLY MACDOUGAL

Assistant Director

CONTENTS

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JOURNAL

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CONTROL OF THE GROUNDS OF THE BOTANICAL GARDEN.

The following opinion of the Corporation Counsel defines the relationship of the Garden to the Department of Parks:

22—JM. September 30, 1905.

HON. GEORGE B. MCCLELLAN, *Mayor.*

Sir: I am in receipt of a communication bearing date September 14, 1905, from Mr. Franklin Chase Hoyt, Assistant Corporation Counsel, who states that he is directed by you to ask my opinion as to whether the landscape architect mentioned in Section 611 of the Charter has jurisdiction over those portions of the public parks which have been set aside in accordance with the acts of the Legislature for the use of the New York Botanical Society and the New York Zoölogical Society.

Mr. Hoyt states that the societies referred to claim that they have the right to develop the grounds allotted to them without reference to the approval of the landscape architect.

After careful consideration of all the provisions of Chapter 285 of the Laws of 1891, I have reached the conclusion that the Legislature thereby formulated a general scheme to set aside and allot certain portions of Bronx Park for the exclusive use and development of a botanical garden which should be, with two exceptions, under the complete control of the Botanical Society. Except for the exercise of police power and the liability to construct and maintain suitable walks and roads, I am of the opinion that the jurisdiction of the Botanical Society over the reservation set apart for its use is exclusive.

The provisions of Section 611 of the Charter, as far as mere literal phraseology goes, would seem at first inference to imply that the assent of the landscape architect is necessary for the development and ornamentation of the Botanical Garden. The words "Parks, squares, parkways and public places" by a literal interpretation include the Botanical Garden, yet by a strict construction of this provision of the Charter, perhaps many of the essential aims and objects of the Botanical Society would be defeated. The ideas and designs of the Society and the landscape architect relative to the ornamentation and development of the reservation might conflict, and in that event the Society would be compelled to subordinate its views to those of the landscape architect. The architect might be able to exercise the power of veto over the planting of vegetation, its grouping and arrangement, and in this way the ends of the Society might be defeated.

I advise you, therefore, that Section 611 of the Charter is not applicable to the territory embraced within the Botanical Gardens. [The residue of the opinion relates solely to the Zoölogical Garden.] Respectfully yours,

(Signed) JOHN J. DELANY,
Corporation Counsel.

FURTHER EXPLORATIONS IN THE REPUBLIC OF HAÏTI.

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

Dear Sir: I submit herewith a report upon the exploration recently made by myself, assisted by Mr. Norman Taylor, in the Republic of Haïti. This was a continuation of the explorations begun in 1903, a report of which appeared in the Journal for November of that year.*

We left New York on the Hamburg-American Line steamer Valdivia, arriving at Cap Haïtien on July 12. The return was

*Journ. N. Y. Bot. Gard. 4: 205. 1903.

made via Turks Islands on the Clyde Line. I arrived again in New York on September 6, Mr. Taylor following two weeks later.

Upon our arrival at Cap Haïtien we were met by Mr. Paul Dévé, representing Mr. Cassé, who was unable to leave the plantation at that time. Mr. Dévé, to whom I wish to extend warmest thanks for his many acts of courtesy, explained to the customs authorities the object of our visit to the country, and upon this representation our baggage was immediately passed. This enabled us to start early the following morning for Bayeux, where I was again to be the guest of the plantation of Mr. Hermann, which is directed by Mr. Cassé, our immediate host. I need hardly say that Mr. Cassé received us with the same open hospitality extended to the expedition of 1903. Every facility was given to us in organizing our trips, including the supplying of horses and mules; so far as the work on the estate would permit, these were furnished from the supply at the plantation, the remaining animals required being secured for us at a low rental. I presume it is necessary to visit Haiti to fully appreciate how much this contributed to the success of the expedition, for it is hard otherwise to understand the difficulty experienced in securing reliable animals, without which exploration in the mountains is impossible. As I stated in my report upon the expedition of 1903, Mr. Cassé is deeply in sympathy with this work of exploration, and this was personally shown by his giving much of his time to the work of equipment. With one or two exceptions he accompanied us on our trips, his knowledge of the country, its people and language, greatly expediting the work. Our experiences of 1903 made plainly evident the necessity for a camping outfit, so that the expedition for this year was supplied with two tents — a wall tent for us and an A tent for the servants — and such supplies, including utensils and canned provisions as would make us independent of native products.

That the itinerary for this expedition, as well as that of 1903, may be better understood, and that the plant formations to which I refer may be located and better appreciated, I present with this report a map of the island of Haïti, indicating the principal rivers of the island and its main mountain ranges, together with the departments into which the Republic of Haïti is divided, and such towns of the island as are necessary to an understanding of these explorations.

Upon our arrival at the plantation on July 13 an extended drought of several weeks had been in progress, following a much reduced precipitation in the second rainy season which occurs early in the year. For this reason the wild vegetation in the vicinity of Bayeux was pretty well dried up, so far as herbaceous things were concerned. The system of irrigating ditches, supplied from the river which finds its outlet into the ocean near the plantation, prevented any serious damage to the cultivated plants. The hills to the west and south of Bayeux were extremely dry, the ferns and other plants of a similar habitat which grew there so luxuriantly in 1903 were now but shriveled effigies of their former beauty. It was not possible, therefore, to collect to any extent in that neighborhood; this was not a serious loss, as a large collection was made there in 1903, and as the expedition of this year covered about the same period, few additions would have been made.

During my trip of 1903, I felt exceedingly the lack of instruments for determining altitudes, temperature and humidity, and before starting this year provided myself with a good aneroid barometer, a thermometer registering maximum and minimum temperatures, an ordinary thermometer for miscellaneous observations, and a hair hygrometer. I found, after a number of readings, that the aneroid did not vary more than one tenth at Bayeux, ranging between 30.30 and 30.40, one-tenth on the scale indicating 100 feet. I decided to take as an average sea-level reading, Bayeux being practically at sea level, 30.35, so that all altitudes given in this report and indicated upon herbarium labels can, with a fair degree of safety, be considered within 100 feet of the actual elevations.

At no time during my stay, according to the records kept by me, did the temperature at Bayeux go below 70° Fahrenheit (all temperature readings are in this scale), and usually not below 75°, these being recorded at night. The highest tem-

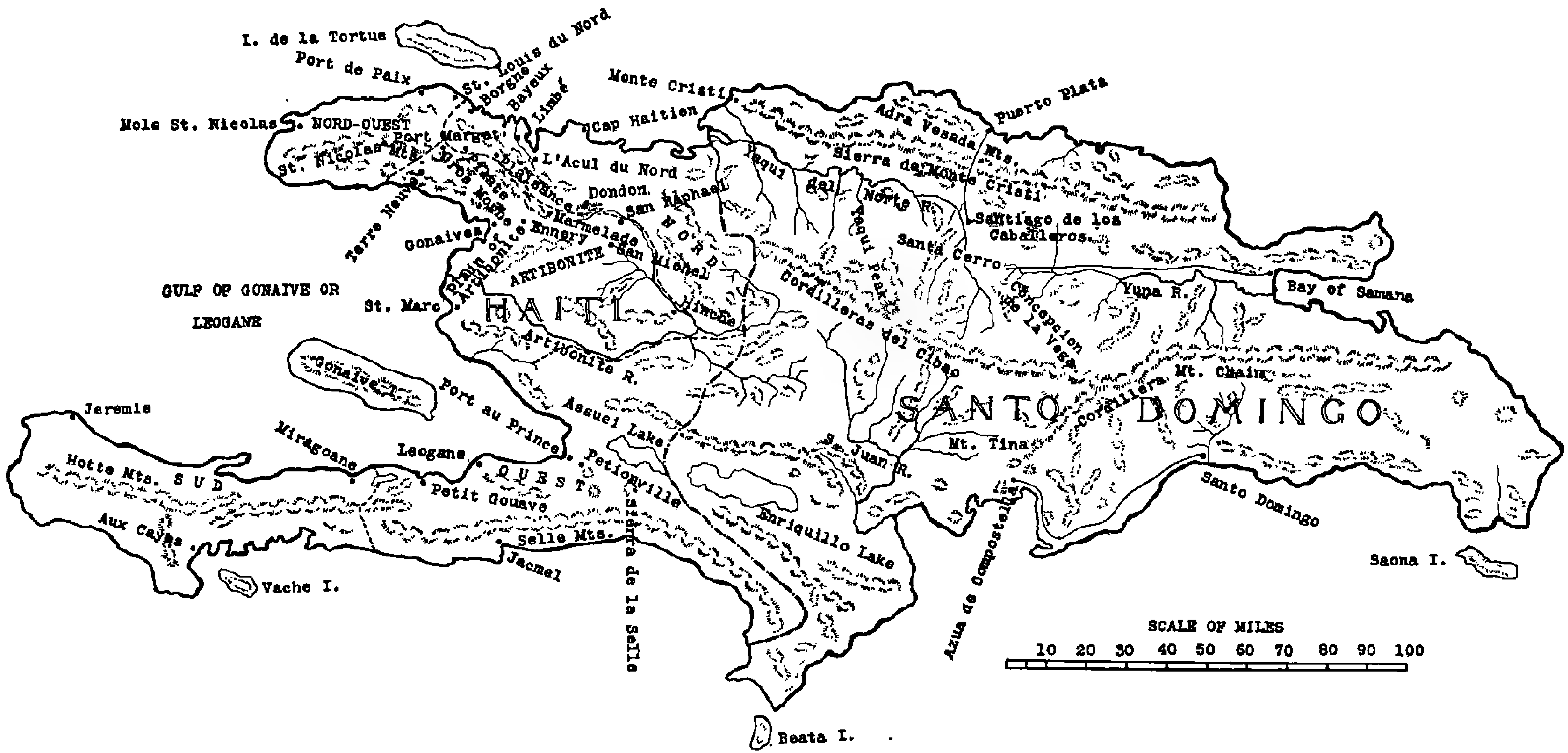

FIG. 34. Map of the island of Haïti.

perature during the day was 94°, the usual midday temperature ranging around 90°. Such temperatures, with a humidity going up sometimes to over 90 per cent., made conditions at times quite depressing. The reason for this was made evident to me later when I had opportunity one afternoon to view these low-lands from the ocean, at a distance of a dozen miles — a mantle of mist hung over them to a height of several hundred feet, banking up against the mountains to the west which offered an obstruction to the trade winds sweeping in from the northeast. Above this stratum of mist, as outlined against the tall mountains referred to, the atmosphere was bright and clear, thus making plain why, even at relatively low altitudes with the temperature but little if any less than that on the low lands, an ascent of but a few hundred feet made such a vast difference in comfort.

A little collecting was done around the plantation on July 14 and 15, covering field numbers 1009–1016, continuing the sequence of 1903. The greater part of these two days, however, was devoted to organizing our first trip to the mountains, which was on July 16 to the Corail region, to the westward of Port Margot some six or eight miles. It was this region which was intended by the word "Correil" on the herbarium labels for 1903. That spelling was found to be incorrect; it should be as above, Corail. Our camp, designated as camp no. 1, was located on a mountain side at an elevation of 1,500 feet. I had been repeatedly warned against drinking the cold water of these mountain brooks when overheated, as it would surely induce fever. I tested the temperature of the water of the little brook near our camp and found it to be 74°. From the standpoint of the north, this would hardly be called cold water. A mountain to the northward of camp was climbed, an elevation of 2,800 feet being indicated at its summit. Everything here was dry, it being within the area covered by the drought referred to above. The plantation at Bayeux was plainly visible from this mountain. From this camp as head-quarters nos. 1017–1117 were collected. A return was made to the plantation on July 18.

On July 22 the second trip was begun, this one destined for Mt. Maleuvre, which is on the road from Port Margot to Pilate, and in the same range to which the first journey extended, but some eight or ten miles farther south. Camp no. 2, as this was called, was located in the commune of Port Margot, but a short distance from the pass, which has an elevation of about 1,700 feet; the camp was at 1,640 feet. Although this was so near camp no. 1, the conditions were extremely different. The rainy season was on here in full force, so that every afternoon during

FIG. 35. Camp No. 2, at Mt. Maleuvre.

our stay heavy showers were of frequent occurrence, making collecting a rather precarious and wet undertaking. Here, on steep clay banks, was again found, in great abundance, *Begonia rotundifolia* Lam., concerning which your interesting article, accompanied by an illustration, appeared in the September number of this Journal for the present year. Its bright flowers, either white or more rarely pink, nodded in every breeze and gave a dainty touch to the vegetation.

The temperature here was only five or six degrees lower than that on the lowlands, but the clearer and more bracing air made the difference seem much more. A mountain 3,000 feet high to the west of camp was ascended, and in a patch of dense humid woods near its summit many interesting plants were found. It was not until elevations of over 2,500 feet were reached that the flora became really interesting, the lower reaches exhibiting a vegetation which became most monotonous by its constant repetition. It is for this reason that I am desirous of visiting some of the higher mountains, some of which are to the south of the savannah region and could be plainly seen from San Michel, their summits being mantled with clouds. The highest mountains occur, according to colonial records, I am told, in the Cibao and Cordillera ranges of the Republic of Santo Domingo, where elevations of 9,000 to 10,000 feet are said to occur, and in the southern part of the Republic of Haïti.

Returning again to this mountain, I would say that its lower reaches were bare of trees and covered with guinea-grass, *Panicum maximum*, and so steep were its sides that it was necessary to pull one's-self up by grasping the tussocks of grass — the angle was surely 45°. The left-hand slope of this ridge, up which we were climbing, had an angle of about 30° from the perpendicular; much to my surprise, upon this was located a garden of beans. It is difficult to understand how these people clear and plant such steep slopes. Mt. Piment, nearly northwest across the valley from camp, was also visited, and its summit found to be 2,550 feet. This showed me how useless it was to rely upon the judgment of the natives as to the height of mountains, for the mountain people assured me that Mt. Piment was the highest point around there, and yet it was 450 feet lower than the mountain we ascended the day before, and which was plainly in sight from Mt. Piment. The summit of this mountain was flat and covered with a growth of a fern, a species of *Pteridium*, which gave quite a northern aspect to the surroundings. Several melastomads were also found.

Many of the mountains in this region are bare of all arborescent vegetation, and in its place is a dense growth of guinea-grass, due to the improvident methods of the mountain people.

They select a piece of land and clear it by burning down the trees. It is then roughly tilled, and, so I am informed, crops grown on it for about two years, or until its surface richness is exhausted. Then, instead of properly tilling this ground, they abandon it, repeating the process with another piece of woodland, the first piece soon being seized upon by the guinea-grass already referred to. This has been going on for many years, and the disastrous results thus obtaining can well be imagined.

FIG. 36. *Begonia rotundifolia* Lam., near camp at Mt. Maleuvre.

In the country visited while at camp no. 2, nos. 1118–1210 were collected, those following and including no. 1179 being secured on the trip to Mt. Piment. A return was made to the plantation on July 25. The succeeding three days were employed in taking care of the collections, and in resting the animals and preparing for a long trip then in contemplation. On July 28 a small collection was made in the vicinity of the plantation, nos. 1211–1216.

As stated above, it was planned to make the next trip an extensive one, but plans in Haïti are very apt to go wrong, as the sequel here will show. The route outlined was to Marmelade, via Limbé ; from thence to San Michel, in the savannah country ; continuing westward from there over a low range of mountains and through the plain of Gonaïves to Gonaïves, via Ennery ; from Gonaïves it was my intention to go to Gros Morne, and if possible also to take in Terre Neuve ; thence by way of Plaisance, with a side trip to Mt. Casse, to Bayeux.

We left Bayeux on the afternoon of July 29, going direct to Limbé, via Port Margot, and spending that night at the house of the priest. We made an early start the following morning, Sunday, ascending the valley of the Limbé River, here a rather broad and peaceful stream. Early in the afternoon we arrived at what appeared to be a desirable camping place, at an altitude of about 700 feet. Accepting the earnest invitation of the proprietor of the land, we pitched our camp, called camp no. 3, and made ourselves comfortable. But alas, comfort frequently precedes trouble, for early the next morning, when I went to take a picture of the camp, the camera, which I had guarded so carefully, could not be found. I offered fifty gourdes (equivalent at that time to about $8.00 gold) for its return, and no questions asked, but unfortunately no response was made. Nos. 1217–1228 were collected in the vicinity of this camp.

The loss of the camera was the first mishap on this trip, but it was only the forerunner of a series of misfortunes, none of them serious, but all extremely irritating. Of course, immediately upon discovering the loss of the camera, we broke camp, as the people round about, knowing we suspected them, might have taken an early opportunity of poisoning our animals, such things having occurred before. When we reached Marmelade, the next stopping place, we found two of the mules so worn out that we had to detach one of the servants and send him back with them to the plantation. On our arrival at San Michel two more mules gave out and two men were taken sick. Our supply of pack animals was now reduced to six, barely enough to transport our supplies. It was not considered safe to continue the journey as originally planned, so we again returned to Marmelade, intending to await there the arrival of fresh mules from the plantation, and to proceed then to Gonaïves, via Ennery, climbing a high mountain on the road. But, unfortunately for our plans, the mare on which Mr. Cassé was riding stumbled in a miry place in the road,

FIG. 37. Mountain boys eating breakfast supplied from camp.

tearing off one of her shoes. This made it impossible to carry out even our altered plans. The rest of the journey to Marmelade was a very slow one. The following morning Mr. Cassé and I started for the plantation at five, arriving there about three in the afternoon, after a continuous ride of ten hours in the saddle, tired, dusty and thirsty. Mr. Taylor brought the pack train and servants down the following day. Thus ended a trip so auspiciously begun — a trip, every detail of which we had carefully gone over — but such things are liable to happen in a country where the roads are as abominable as they are in Haïti.

To return to this trip, so abruptly terminated. The Limbé River wends its way between high mountains, through deep valleys with precipitous sides. The road, or rather rough trail, follows the contour of the mountain sides, with steep ascent on the one hand, and on the other at times a descent of 800 to 1,000 feet into the valley below, where the silver thread of the river could be seen, and the faint sound of its roar heard as it tumbled and rushed over the rocks and stones. We followed this valley for some miles, gradually ascending, until we finally passed from it through a mountain pass, at an elevation of about 2,200 feet, into the Plaisance plain. A few miles beyond this point we came to Marmelade, which I had visited during my trip of 1903. This place, as I stated in my report on the explorations of that year, is on the edge of the pineland country, and has an elevation of about 2,500 feet. The general in command here was our host for the night. We spent the afternoon of our arrival in collecting on a small mountain with an elevation of 2,750 feet, about one half mile to the east. This had been desolated by the destruction of the timber around it, and vegetation, once that of a humid forest, was fast falling into a decline. The collections made here, including a number of interesting forms, comprised nos. 1229–1249. One of these was the wild carrot, *Daucus Carota*, which was becoming a weed in the fields.

The following day, August 1, we pitched camp along the road to San Michel, about two miles from Marmelade. This camp, no. 4, was in the pineland, at an elevation of 2,450 feet, surrounded on all sides by mountains rising 500 to over 1,000 feet higher. The mountain immediately across the road from our camp was ascended, and proved to be 3,050 feet high. Another mountain, ascended on the following day, August 2, had an altitude of 3,150 feet. The ascent of a third mountain was attempted, but one of the party was not equal to the occasion, for those who have lived any length of time in Haïti do not seem to be good mountain climbers, and we were obliged to desist after reaching an elevation of 3,500 feet. I presume the mountain was 4,000 feet high. Nos. 1250–1298 were secured on August 1, and on August 2 nos. 1299–1328.

On August 3, guided by the general already referred to, we visited a ravine about one hour's ride to the northwest of Marmelade. It was a wild and picturesque place, with perpendicular sides, the water rushing down in silvery cascades. Nos. 1329–1373 were secured here, comprising many interesting species.

FIG. 38. Xerophytic region on the Gonaïves plain, at La Hotte Rochée. Clump of grass in center is *Uniola virgata* (Poir.) Griseb.

The vegetation, that of humid conditions, was quite in contrast with that of the pinelands of the day before.

The atmospheric conditions at our camp in the pinelands interested me exceedingly. The minimum temperature for the three nights we spent there was 62° with a humidity of 98 per cent. This, of course, resulted in heavy dews, the vegetation in the morning dripping with moisture. The day temperature during the same period did not exceed 83°, with a humidity of about 50 per cent. To me this was an ideal condition of things for comfort, but to those who were not accustomed to our northern cold the nights were extremely disagreeable. The temperature of the brook between our camp and the road was 70°.

On August 4 we started for San Michel, which is in the savannah region, arriving in the afternoon ; at this place we were the guests of the commanding general, so the camp was not necessary. This was to me entirely new territory, and I thoroughly enjoyed journeying through it. The mountains of the pinelands gradually merged into foothills. The pine, *Pinus occidentalis*, continues down through these foothills, and associated with it is a species of *Thrinax*, a palm reaching a height sometimes of fifty feet. Indications of this palm were first observed in the pinelands at Marmelade. These were diminutive, but as one descended into the foothill region they became more and more numerous and of much larger proportions, until finally they were the dominating feature of the landscape in many places, giving to such spots a palisaded appearance. A species of *Agave* also abounds, both in the pinelands and in these foothills. Nos. 1373*a*–1381 were collected on this trip.

These foothills run out into what is known as the savannah region. This is a large level plain, many thousands of acres in extent, with a general elevation of about 1,500 feet. Its soil appeared to be a heavy clay loam. I was informed that it was well adapted to the growing of sugar cane. If so, there are wonderful possibilities for the sugar industry here when the new railroad, now in course of construction, reaches this place. This region is surrounded on the north, east and south by the foothills already alluded to. To the westward a descent is made into the plain of Gonaïves, a region which I will describe later. The flora of the savannah proper is not an extensive one, as was to be expected, the conditions being too uniform. On the edge of this savannah, as we approached it from Marmelade, appeared what I have called a xerophytic belt or formation. It was characterized by scattered low shrubs, resembling much those later seen in the plain of Gonaïves. A number of gullies were noted penetrating this, these evidently being the beds of streams which probably carry off the water in wet weather. The vegetation on their banks was of a different character and quite luxuriant in comparison with the surroundings. The most conspicuous feature of this region, at least at the time of our visit, was a species of *Duranta*. This frequently attained to the dignity of a tree fifteen feet tall, its bright yellow fruit, hanging in long racemes, making it most attractive. This seemed to me quite different from the species so common along seashores.

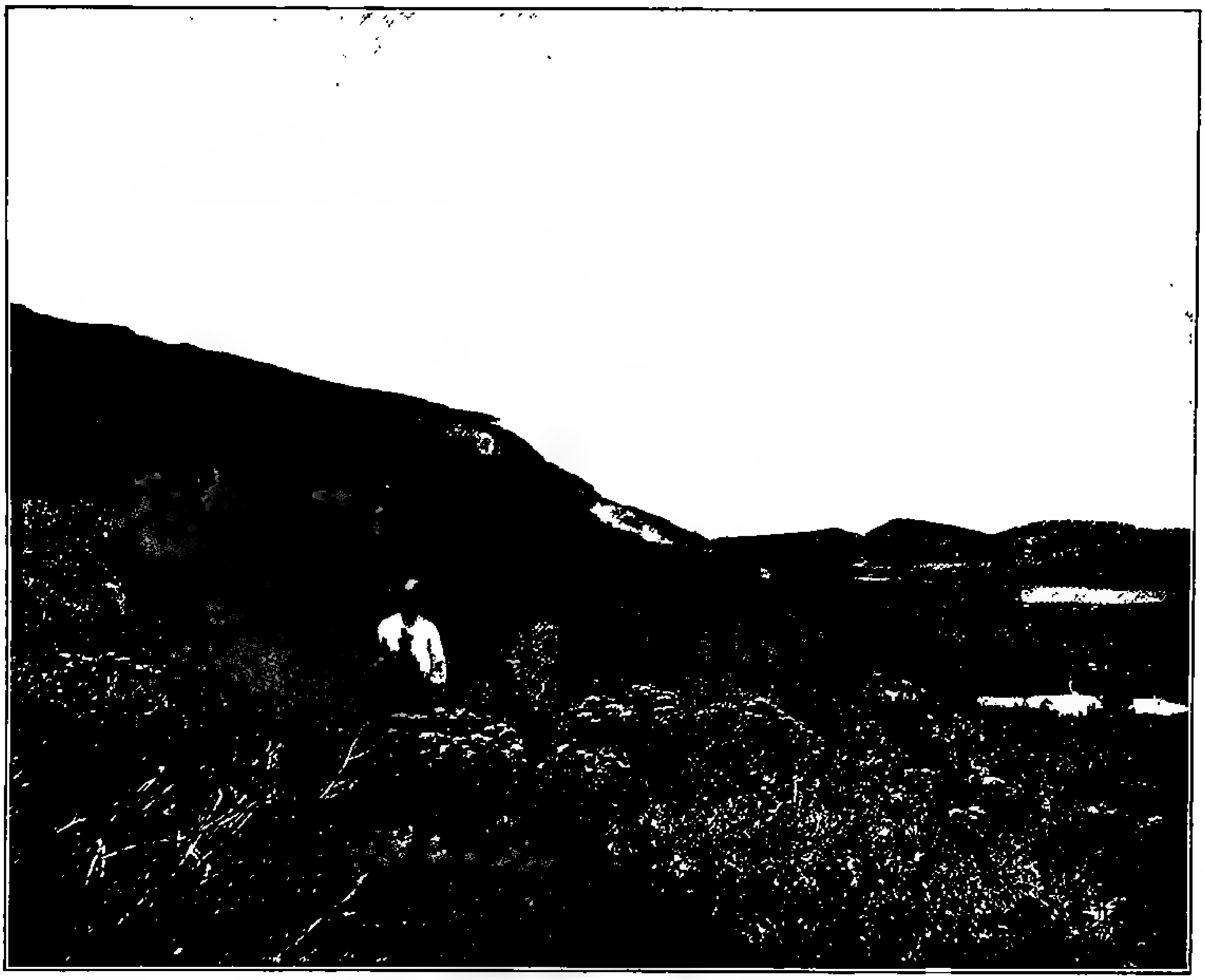

FIG. 39. Grand Turk, looking south, showing sand ridge on eastern shore, the home of *Euphorbia vaginulata* Griseb. Salt ponds to right.

The day of August 5 was spent collecting around San Michel. Nos. 1382–1423 were collected in this xerophytic formation; and nos. 1424–1446 on the savannah.

It was desirable to visit some of the high mountains to the south of San Michel, and plans were made to that end, but unforeseen contingencies made a hasty abandonment of these necessary.

On August 6 the return was made to Marmelade, as already described, nos. 1447–1454 being made in this xerophytic formation, and nos. 1455–1474 in the foothill region. By August 8 the entire expedition had arrived safely again at Bayeux.

We rested at the plantation until August 10, utilizing the intervening time in preparations for another trip to complete in part the exploration of the territory which we were obliged to omit from the previous journey. On the tenth, everything being ready, we left early in the morning for Plaisance, via Limbé, arriving at the former place in the afternoon. Here I again had impressed upon me the necessity for being armed with good permits from high officials. A tent had never before been seen by the mountain people, and of course to them, unused to such sights, our expedition seemed a large one. That we were collecting plants was not received seriously — was looked upon as a mere blind. Their reasoning was, and it was all sufficient for them, that the white man was not a fool, and that he would not come all the way down there to get a lot of weeds of no use to anybody; no, there is only one valuable thing in the world and that is gold, and of course the white man is after that. This was the basis of all their suspicions, and do what we would we could not disabuse their minds of it.

We wasted so much time parleying over our permit with a petty official at Plaisance that before we could get our camp pitched a tropical shower was upon us, soaking us to the skin and drenching all our belongings. We had to spend that night in a decidedly humid condition in the one tent, two white men and four negroes. The dawn of the following day, August 11, was joyously welcomed. This camp was designated as no. 5, but no collecting was done from it.

We had no permit enabling us to travel in the arrondisement of Gonaïves, which borders on that of Plaisance. After our recent experiences, I did not feel like venturing with a large outfit into a region where we were not protected. Early on the morning of August 11, therefore, I started for Gonaïves, accompanied by a negro interpreter and one pack animal with a servant, leaving Mr. Taylor to move the camp as near to the border as he felt it wise; this he did, and the camp was our last one, no. 6.

The three referred to above proceeded on our journey to Gonaïves. We soon came to a place known as Les Roches, which has a wide reputation in those parts on account of its bad road, and I must say, after traversing it, that this reputation is well-earned. The pass, for such it is, through which the gorge is entered, has an

FIG. 40. Grand Turk, south end near cable station, looking east. Rock formation, with no overlying sand, the home of the cacti.

elevation of 1,925 feet. From this point down for the next 600 feet is about as bad a piece of road as one can imagine. At one time it was evidently a colonial road, for extended sections still have the old paving stones put down by the French over 100 years ago. At that time they were covered with earth, the stones forming a basis, but now these stones are exposed and covered with a thin coating of slippery clay; add to this a straight-away course in some places several hundred feet long at an incline of about 30°, and you have the components for an exciting descent. Even the Haïtian generals, as reckless as they are in riding, dismount when they get to this place, and no one will pass through it after dark. The sides of this gorge are perpendicular, 300–400 feet high, the shaded side supporting quite a dense vegetation; the opposite side is more exposed to the sun and presents a xerophytic vegetation, largely made up of agaves and bromeliads. Nos. 1475–1514 were secured here.

Leaving this gorge, we entered upon a densely wooded tract, containing some of the largest trees I have seen in Haïti. Several stops were made here to collect, nos. 1515–1528 being secured; more time could profitably have been given to this section, but it was necessary to reach Gonaïves before nightfall, as we were in a strange country without camping facilities and without permits to travel. After traversing this region for several miles the road suddenly leads out into the plain of Gonaïves which begins at an elevation of about 850 feet. I think the flora of this region is the most interesting I have yet seen in Haïti. At first the vegetation consists of small trees, mingled with which are numerous shrubs, the former supporting many bromeliads, especially great masses of *Tillandsia usneoides* L. As one advances into the plain, the shrub element takes a more prominent place. Cacti are quite common. The first species noted was *Opuntia Dillenii*, with its viciously armed joints. Soon an arborescent member of the genus, entirely unknown to me, was encountered. This had an unbranched stem ten to twelve feet tall, densely armed with tufts of long spines. At the apex the trunk is diffusely branched in a dense manner, giving a very compact appearance to the general effect. The whole of the stem and branches is a gray green. This grows in company with one of the columnar forms of *Cereus* and also with a *Pilocereus*, the three forming characteristic features in the landscape. There is in addition a second species of *Cereus* of the slender columnar type. A third species of *Opuntia* is also very common. This belongs to the section having the fragile joints which break away so easily, forming large mats on the ground, into which one is apt to walk with most disastrous results.

On this trip to Gonaïves, in this xerophytic region, nos. 1529–1537 were obtained.

Arrived at Gonaïves, I immediately called upon Mr. W. Buch, who has done considerable collecting in that region and other parts of Haïti. I had previously written to this gentleman informing him of my proposed visit, but when I arrived there I found he had not received my letter, so was not prepared for my arrival. He immediately introduced me at the club, the Cercle du Commerce, where I put up for the night. The following day, accepting an invitation from Mr. Berlin, a member of the contracting firm which is installing the only large railroad in Haïti, and whose acquaintance I had made the previous year on my way to Inagua, I moved my headquarters to his place; I was his guest for the remainder of my stay in Gonaïves. Mr. Buch went collecting with me the morning following my arrival, August 12. We visited a region to the north of Gonaïves, called La Hotte Rochée, on the road to Terre Neuve. Many interesting plants were secured, representing nos. 1538–1587.

The Gonaïves region was the first place I desired to visit this year on arriving in Haïti, but try as I would I could not get permits to do so. Writing to officials is of no use in that country; one must make a personal visit if he desires to receive attention. After waiting and waiting for a reply to my letters, and putting off my Gonaïves visit as long as possible, I finally had to proceed personally as described above. It required two days to secure papers at Gonaïves permitting me to travel in that arrondisement. This delay used up valuable time. I was enabled with these permits, and a letter of introduction from Mr. Berlin, to make a visit to a place called La Brande, some twenty miles distant, in the direction of Gros Morne and Pilate. This trip was taken on August 14, accompanied only by my interpreter. Nos. 1589–1622 were secured on the journey out.

We arrived at La Brande about the middle of the afternoon, and were hospitably received by Mr. L. Bourgain, to whom I had the letter of introduction from Mr. Berlin. Nos. 1623–1642 were secured at La Brande, at an elevation of about 750 feet. That same afternoon a guide was engaged to conduct me to the summit of Mt. Balance, the object of my visit to this place.

At five the next morning, August 15, I set out with the guide on the ascent of this mountain. The whole distance, about nine miles, had to be done on foot, as the guide assured me the path was not possible for a horse. After traversing it, I fully agree with him. The first 1,250 feet of the ascent, up a preliminary peak, exhibited an interesting flora, which seemed to be in part a continuation of that of the plain of Gonaïves. I do not believe I have ever seen trees so covered with *Tillandsia usneoides* as were many of those encountered on this trip below the 2,000 foot altitude. The *Agave* found on the plain of Gonaïves was also very common here up to an elevation of 2,000 feet. This xerophytic character then ceased and was replaced by the vegetation of the humid areas. This continued to the summit of Mt. Balance, which had an elevation of 3,700 feet. The last two hundred feet of this was of red clay, and the vegetation there indicated conditions which must be exceedingly humid. There were evidences of heavy showers the previous afternoon. The tree trunks were covered with hepatics and filmy ferns, and the rocks and cliffs in the dense shade were clothed with big masses of ferns, peperomias, orchids and other plants of this character. Tree-ferns were quite abundant at and near the summit, and I wished many times that I might transport some of them to the conservatories at the Garden. It was impossible, however, as we were too far from facilities of any kind. Gathering showers in the distance made necessary a precipitate retreat, after about two hours of most interesting collecting. On this trip to Mt. Balance nos. 1643–1763 were secured. A return was made to Gonaïves that evening, after a short rest at La Brande.

The next day, August 16, I started for the plantation, Mr. Taylor breaking camp the same day and likewise proceeding for the same destination, he arriving that day, I early the morning of the day following. Nos. 1764–1776 were secured on this return trip to the plantation.

The following miscellaneous collections were made: 1777 and

1783–1795 by Mr. Taylor at camp No. 6, in the vicinity of Plaisance, at elevations between 2,000–2,200 ft.; 1782 at Bayeux; 1778–1780 at Cocoa Point, over the mountain from Cap Haitien about six miles; and 1781 at Cap Haitien.

On the morning of August 21 we left the plantation for Cap Haïtien, intending to take there the following day a steamer for Jeremie, connecting at that point with the steamer for New York. On our arrival at Cap Haïtien that afternoon the first news we received was that the sailing of the steamer we had come to take had been cancelled, and the first steamer would not leave until a week later. After canvassing the matter thoroughly, I finally decided to charter a schooner and go to Turks Islands, from which we were desirous of securing material. These are 117 miles to the northeast, and I was assured I would catch there an early steamer to New York, via the Clyde Line. We left on a small schooner, about 48 feet long, at 6 P. M. on August 23. After an exciting and rather rough passage of over 48 hours we cast anchor at Grand Turk at 7:30 P. M. of the twenty-fifth. The first Clyde steamer was not expected until the Friday following. She arrived two days late, so it was September 3 before I set sail for New York.

Grand Turk, the largest of the group of three islands and several cays, is about seven miles long and with a maximum width of about one and a half miles. As in the Inaguas, the foundation is coral rock, and upon this are built up ridges of sand. This is especially evident along the eastern coast, which is fringed with a line of low hills, perhaps sixty feet high. To the west of these and lying between them and the west coast, is a low-lying area which has been converted into salt ponds, the manufacture of salt from the sea water being the one important industry of the island. In the southern part of the island the coral rock is at or near the surface, while in the northern end this is overlaid by a considerable depth of sand. Two salt creeks penetrate the island, one at the southeastern and the other at the northern end. The vegetation resembles to a great extent that of the Inaguas, but on a smaller scale. One of the commonest shrubs is a *Pithecolobium*, growing sometimes eight to ten feet high and forming impenetrable masses along the road. The commonest small shrub is *Euphorbia vaginulata* Griseb., which for many years was known from a single herbarium specimen at Kew, collected by Hjalmarsson many years ago at Turks Islands. So common is this at some places that it gives a grey-brown appearance to the landscape. It is called milkbush by the inhabitants, and is largely used for feeding goats. I found this also very plentiful on Little Inagua. The cactus vegetation is quite extensive for so small an island. *Opuntia Nashii* Britton is found to some extent, but much smaller than on Inagua. A species of the genus *Cactus* is sparingly found; while the turk's-head cactus, formerly so numerous there, is now quite scarce. *Opuntia Tuna* and *O. Dillenii* are both very common, often growing side by side, when the difference in habit is most striking. In addition there is one other species of this genus, if not two. A very common plant which gives character to the salina formation, and which, so far as now known, occurs only on this island, is *Limonium Bahamense*. It is called heather by the people there, and its slender leaves, habit of growth and purple flowers do not make inappropriate this common name.

With the exception of the short visit made by Baron Eggers in July 1887, I can not find that a botanist has visited these islands in recent years. I heard of one who made a visit there about fifty years ago, but could not find any one who could remember his name. He seemed, from all accounts, to be a rather solitary individual who kept to himself, and left little record of his doings.

Mr. Moffat, the American Consul at Grand Turk, did everything possible for us. His energy and influence secured us excellent and comfortable quarters with a private family, which made our stay there much more pleasant than it would otherwise have been.

As a result of the expedition 787 numbers were collected in Haïti, represented by 1,350 specimens; collections of living plants and seeds were also made. A considerable number of photographs were secured before the camera was stolen. At Grand Turk 136 numbers were collected, represented by 250 specimens; and living specimens of the uncommon cacti were successfully transported. A camera was borrowed there, which enabled me to make a series of photographs illustrating the vegetation of Grand Turk.

Early in this report I referred to the Cibao range of mountains in Santo Domingo. I think an expedition to this little known region would produce highly interesting results. An insular flora at an elevation of 9,000 or 10,000 feet must contain features which would be extremely novel. Baron Eggers, in 1887, visited a limited region in these mountains, but since that time no expedition, to my knowledge, has visited these parts. Eggers started from Puerto Plata, striking the Yaqui del Norte River at Santiago de los Caballeros, to the southward of the Sierra de Monte Cristi; from there going apparently southward along this river to Constanza, on the south side of the extreme easterly end of the Cordilleras del Cibao; thence southeastwardly to an unknown valley, where he climbed a high peak, Pico del Valle, of 2630 m., claimed to be the highest point reached by a European explorer. The vast regions of the Cibao range to the west of the portion reached by Eggers are totally unexplored. Here we find Yaqui Peak, nearly 9,000 feet high, at the head-waters of the Bao Cibao, which runs northward, joining the Yaqui del Norte near Santiago. This place is now connected by railroad with Puerto Plata, which would facilitate considerably the transportation of an expedition into the interior.

This mountainous region beyond Santiago, I am informed, is almost uninhabited, and to penetrate it would therefore require a large and fully equipped expedition, capable of supporting itself for several weeks, if necessary, without relying upon the surrounding country. The equipping of an expedition of this kind would require considerable time. It could be done with sufficient funds, and the material secured, I feel sure, would warrant the expenditure of a considerable sum of money.

Yours respectfully,

George V. Nash.

NOTES, NEWS AND COMMENT.

Mr. Wm. R. Maxon, Assistant Curator U. S. National Museum, Washington, D.C., is in residence at the Garden during November, being engaged in some systematic investigations on the ferns in consultation with Professor L M. Underwood.

Dr. R. M. Harper has undertaken to prepare a report on the economic plants of Alabama under the auspices of the Geological Survey of that state.

Dr. C. F. Millspaugh, Curator in Botany of the Field Columbian Museum, Chicago, spent the latter part of October and the first week in November at the Garden carrying out some taxonomic researches on the flora of the Bahamas in coöperation with Dr. N. L. Britton.

Mr. R. S. Williams, who has been exploring in the Philippine Islands on behalf of the Garden for about two years, returned late in October and his large and important collections of herbarium and museum specimens, and seeds, have been received in good order. His operations were carried out on the Islands of Luzon and Mindanao, at elevations ranging from sea level up to nearly 8,000 feet, several high and difficult mountains having been visited. The collections include over 3,000 field numbers, represented by 10,000 to 12,000 specimens, a complete set of which will be filed in our herbarium and museums, and the remainder used as duplicates for exchange with other institutions. Through the seeds which Mr. Williams has collected, we shall add a considerable number of living plants to the conservatory collections. Mr. Williams will present an account of his work and experiences in a publication later.

Dr. J. N. Rose, of the U. S. National Museum, spent the summer in Mexico engaged in the observation and collecting of cactuses, of which he secured several hundred specimens, which have been divided between the collections at Washington and those of the Garden; his work was aided by an appropriation from our exploration funds. Accompanied by his assistant, Mr. Painter, he travelled over a large portion of the arid regions of central and southern Mexico, visiting places hitherto botanically unknown, and among the plants secured by him are many of great interest, some of them being new to science. In coöperation with Dr. Rose, Dr. Britton is studying the cactuses of North America, including those of the West Indies and Central America, and special attention is being given at present to making the representation of living specimens of these plants at the Garden and at Washington as complete as is possible; the plants are being photographed as they come into bloom, and their flowers and fruits carefully preserved. Either the flowers or fruits, or both, of many kinds, are hitherto unknown, so that this investigation will gradually accumulate the material for a more complete illustration and description of the cactuses than has as yet been possible. Means are not at hand either at the Garden or at Washington, for making colored illustrations of the flowers as they appear, and some provision for this would render the study much more valuable.

In order to facilitate the study of the cactuses at the Garden, the roof of the potting shed at the propagating houses has been raised, and modified from a flat roof into a peaked roof, thus providing a large, dry and well-lighted room, in which the dried specimens and those preserved in formalin will be kept, thus bringing them immediately alongside of the collection of living plants under study, to which one of the rooms in one propagating house is now devoted, containing duplicates of the specimens on public view at the main conservatories. The principal literature on the cactuses will also be kept in this new room, so that we now have an outfit which will enable the study to proceed with great advantage.

The approaching completion of the retaining walls needed to carry the driveway and paths of the Mosholu Parkway into the Garden at the bridge across the railroad west of the Museum Building, will permit the earth filling to be completed at that point as rapidly as possible after the masonry is built, and this should make it possible to complete this approach early next year, there being sufficient surplus material for filling and road making nearby in the rear of the Museum Building. A glance at the map of the Borough of the Bronx showing the location of its parks and parkways will show the great importance of this connection, which will make it possible for pleasure driving to be continuous on park roads from Spuyten Duyvil to Pelham Manor.

Some work remains to be done by the Park Department on the driveway and the Mosholu Parkway immediately west of the Garden, including the construction of the telford macadam driveway between the railroad and Webster Avenue, but the earth filling is all in at that point, and the roadway can safely be laid on it early next year.

Under the same contract through which the retaining walls at the Mosholu Parkway approach are being built, work is going forward at the approach to the Woodlawn Avenue road in the northern part of the Garden, the masonry work there being well advanced, and the earth filling to carry the roadway being nearly all in place. It is expected that the masonry work, including the cut stone flight of steps at the end of the path at that point, will be completed in December. The heavy filling at this point necessitates permitting the earth to settle for some months, but it should be possible to finish the roadway there early next year. The additional earth filling required for this connection may be obtained at the rear of the Museum Building.

The growth of the giant bamboo clump in the palm house this season has attracted much attention, several of the stalks having grown well up into the upper dome. Much interest was taken in observing the rapidity of the growth of one of these stalks which made 65 feet in 95 days, or, an average of about 8 inches a day during that period, a rapidity of growth so great that one could almost "see it grow," in fact, by stretching a string across the tip of the young shoot and coming back to it again after an hour, a perceptible elongation was readily noticeable.

The total precipitation in the Garden during October, 1905, amounted to 2.87 inches. Maximum temperatures of 85° on the 5th, 76½° on the 14th, 80° on the 16th, and 61° on the 24th were observed; also minima of 38½° on the 7th and 13th, 33½° on the 15th and 26° on the 31st.

Although the thermometer registered one and a half degrees above the freezing point on the 15th, yet frost was found in many parts of the Garden and this date is to be taken as the close of the growing season.

The heavy grading work which was required immediately east and north of the public conservatories, commenced at the time the buildings were constructed and prosecuted intermittently ever since, has now been completed, in accordance with the original plan and contours, all the surfaces covered with top-soil, the water supply established, and the paths finished; the area is thus prepared for the planting of the additional conifers designed to occupy this space. Some of this planting may be accomplished in the spring with specimens already at hand in the nurseries.

ACCESSIONS.

LIBRARY ACCESSIONS FROM SEPTEMBER 24 TO OCTOBER 20.

ABELS, A. P. G. *Het kunstmatig droogen van koffij en cacao.* Batavia, 1866.

ANDERSSON, N. J. *Aperçu de la végétation et des plantes cultivées de la Suède.* Stockholm, 1867.

ANDERSSON, N. J. *Atlas öfver den Skandinaviska florans naturliga familjer.* Stockholm, 1849.

BASKERVILLE, CHARLES. *Radium and radio-activity.* Philadelphia, 1905.

BUHSE, F. *Die Flora des Alburs und der Kaspischen Südküste.* Riga, 1899.

BUISSON, LÉON. *De la valériane officinale.* Paris, 1873.

BUSCH, A. *Der Kartoffelbau.* Berlin, 1876.

CAMPBELL, DOUGLAS HOUGHTON. *The structure and development of mosses and ferns.* Second edition. New York, 1905. (Given by Dr. N. L. Britton.)

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PICTURE COLLECTION.

1 group of portraits from the International Botanical Congress at Vienna, 1905. (Given by Dr. N. L. Britton.)

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DANIEL TREMBLY MACDOUGAL

Assistant Director

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JOURNAL

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COLLECTING FUNGI IN MAINE.

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

It was my privilege to spend four weeks or more during August and September in a delightful region in central Maine heretofore untouched by the mycologist. Mr. P. L. Ricker, of the United States Department of Agriculture, an authority on the fungi of Maine, planned the trip and invited me to accompany him. We left Oldtown in a canoe August 21 and ascended the Penobscot, Piscataquis and the Sebec rivers to Sebec lake, camping and collecting at suitable points on the way. The lake shore was then explored and an excursion of several days made by land from Willimantic to Boarstone mountain. Returning, we left the river at Milo and came direct to Oldtown by railway. I obtained about 1,500 specimens of fungi, many of them not heretofore reported from Maine and some of them undescribed.

The rivers in Maine are low at this season, both from natural causes and because the water is purposely held back in the lakes. In addition, therefore, to the usual number of dams, falls and rapids to be carried, poled or waded, one must often drag the canoe through stretches of shallow water, usually rocky and swift and abounding in holes of uncertain depth. These "rips" are more fatiguing going up stream, but more dangerous to canoe and cargo coming down.

The first ten days of our trip were clear and the woods unusually dry, but on reaching Milo we encountered nearly a week of continuous rainy weather which brought out a large crop of fungi of all kinds. It was then that our drying oven became a necessity as well as a convenience. Our camp stove was a folding sheet-iron one with good draught well regulated. Over this we placed the 18 in. sheet-iron oven supported on metal legs and fitted with sliding shelves of wire net. Large fleshy specimens were placed on the lowest shelf and smaller ones on the shelves above. Boleti were thoroughly dried in this manner in from three to six hours. The oven was often left working over night or during a light rain. Many of the smaller fungi were placed in envelopes in the field and dried without removal : larger specimens, however, were more easily dried by leaving them entirely exposed to the current of hot air or by leaving the paper bags containing them open at the top. The space about the stove was often utilized with excellent results, especially if the plants were supported on slanting boards or within boxes facing the stove. I can heartily recommend an outfit of this kind to any one attempting the preparation of fleshy specimens in the field. It is quick, it is smokeless ; and both the stove and the oven occupy very few inches of space when folded.

Most of the forests along the river and lake shores have been lumbered, leaving much dead and wounded timber, as well as numerous very convenient trails for the collector. The white pine has been practically exterminated and few large trees of hemlock remain, but spruce and balsam are abundant, both in pure forest and intermixed with other trees, and white cedar swamps are by no means rare. Among deciduous trees, the paper birch, the yellow birch, red maple and alder are common throughout, while poplar, elm, sugar maple and beech are found in many localities. Sphagnum bogs are common. Poplar has been cut in abundance for the excelsior mills and birch for firewood.

Such being the character of the forest areas, one would expect to find in a favorable season a great variety of species among the fungi, and this is indeed the case, but not as they occur in Pennsylvania and Virginia, where bushels of large agarics may at times be gathered in a single grove. In the forests of boreal Maine there are no open oak and chestnut groves abounding in species of *Russula*, *Lactarius*, etc., but underbrush nearly everywhere and too much water for many of the large southern forms, so that agarics are found mostly here and there, often singly and largely on stumps, logs and standing trunks, which afford better drainage than the mossy banks and bogs. This part of Maine strikingly resembles certain parts of Sweden, though other portions of Sweden furnish large agarics in great abundance.

The large woody fungi, on the other hand, such as *Pyropolyporus igniarius*, *Elfvingia megaloma*, *Elfvingia fomentaria*, *Fomes ungulatus* and *Piptoporus suberosus*, are exceedingly common, oftentimes on unusual hosts. It is no uncommon sight, for example, to see a dead birch log entirely filled with the mycelium and abounding with the sporophores of *Fomes ungulatus*, a species more commonly confined to coniferous wood. The most common polypore on living birch trees is *Pyropolyporus igniarius nigricans*, which evidently does much damage. The typical form of this species appears to attack elm, where it occurs, to the exclusion of most other deciduous trees, often killing the tree early in life. On an island at Passadumkeag, where we camped, there were a number of elms, as well as maples, birches, etc. The elms were attacked almost without exception even when very young, while the fungus was not found upon a single other tree. Without doubt, more damage is done by wood-destroying fungi in this and many other lumbering districts of Maine than has been suspected and the damage will increase and become more evident as the work of lumbering continues.

It was interesting also to notice that almost all of the wild cherry trees found scattered through the woods were entirely dead and their trunks covered with the sporophores of an undescribed species of *Poria*. The northwest slope of Boarstone mountain, swept by fire three years ago, is now overgrown with dense thickets of birch and cherry, the latter violently attacked by black knot, which is killing the trees in large numbers. I have never before seen the disease so abundant and virulent, except in the high mountains of Virginia where in certain sections every cherry and plum tree, both wild and cultivated, appears to have succumbed to its ravages.

The fungi of boreal Maine exhibit many close relationships with those of the old world, particularly with those found in northern Europe and Siberia. This is due to the land connections which existed in the north in a former geological age when a warmer climate and a richer flora extended through regions now boreal. One of the objects in mind during my trip was the gaining of all possible information throwing light upon questions of geographical distribution and the history of divergence in the North American and the European fungus flora. When the collections made have been worked over, our ideas concerning the distribution of certain northern species will doubtless be considerably clearer.

A list of the various camps made during the trip with location and date is here given in a form convenient for reference :

LIST OF CAMPS.

No.	Name.	Location.	Date.
1.	Birch Camp.	Near Costigan, Penobscot Co.	Aug. 21
2.	Camp Argyle.	Above Greenbush, Penobscot Co.	" 22
3.	Camp Passadumkeag.	Near Passadumkeag, Penobscot Co.	" 23, 24
4.	Choke Cherry Camp.	Near Maxfield, Piscataquis Co.	" 25
5.	Camp Sunday.	Near Medford, Piscataquis Co.	" 26–28
6.	Pleasant River Camp.	At the mouth of Pleasant River, Piscataquis Co.	" 29–31
7.	Camp Milo.	Below Milo, Piscataquis Co.	Sept. 1
8.	Duck Point Camp.	Above Milo, Piscataquis Co.	" 2–6
9.	Camp Balsam.	Near Sebec Village, Piscataquis Co.	" 7
10.	Loon Cove Camp.	Near Greely's Landing, Piscataquis Co.	" 8–10
11.	Camp Willimantic.	Near Willimantic, Piscataquis Co.	" 11
12.	Camp Boarstone.	Boarstone Mountain, Piscataquis Co.	" 12–14
13.	Camp Sebec.	Near Sebec Lake P. O., Piscataquis Co.	" 15–18
14.	Duck Point Camp.	Above Milo, Piscataquis Co.	" 19

WILLIAM A. MURRILL,
Assistant Curator.

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