JOURNAL

OF

THE NEW YORK BOTANICAL GARDEN

VOLUME III, 1902

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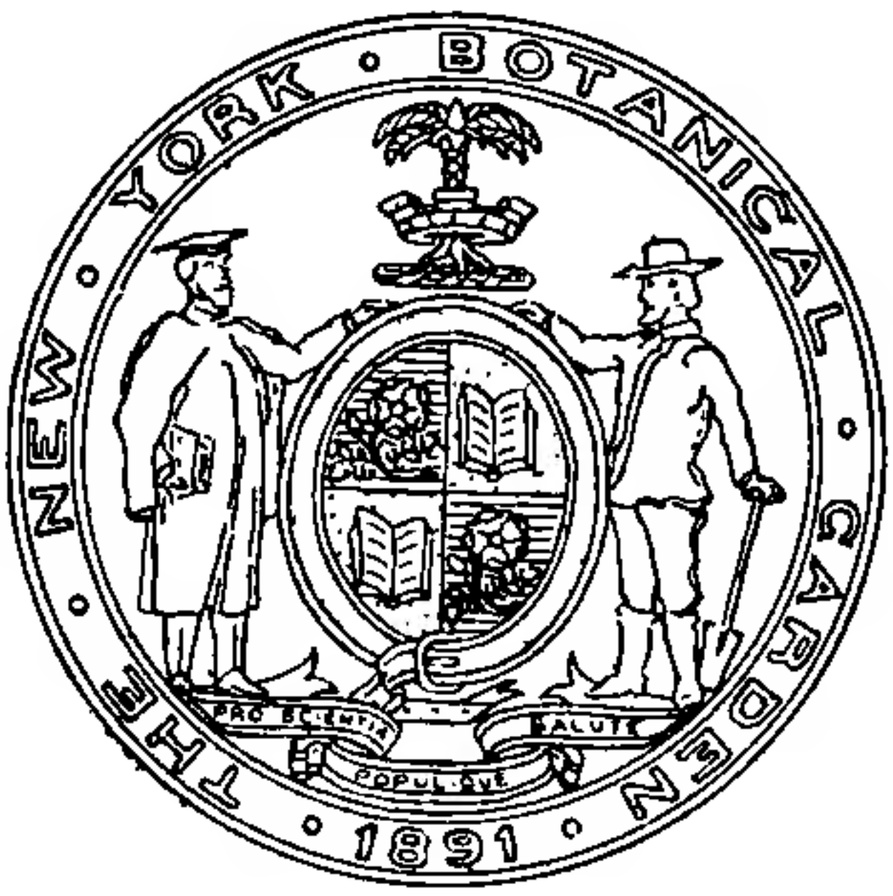
OF

The New York Botanical Garden

EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories



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1902

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THE PRESERVATION OF NATIVE PLANTS.

The thoughtless and indiscriminate picking of flowers and breaking of twigs or branches from wild plants is an offence perpetrated by many persons who ought to know better. Every effort to educate people to realize that plants which are thus picked or broken can not be enjoyed by others who follow them, is a distinct aid in diminishing selfishness and in developing the more healthy taste to preserve natural objects rather than to deface or destroy them. In the vicinity of many of our cities and towns, wild flowers, once common, have become rare by such vandalism, so that the healthful pleasure and interest of woodland walks have become much less enjoyable.

In order that the desirability of preserving native species in their full beauty shall be continuously brought to the public attention, the Misses Olivia and Caroline Phelps Stokes presented to the Board of Managers of the New York Botanical Garden, under date of August 29, 1901, the sum of $3,000, on condition that the interest of this fund should always be used for the investigation and preservation of native plants or for bringing the need for such preservation before the public.

At a meeting of the Board of Managers held October 23, 1901, the following resolution was adopted:

Resolved, That the gift of $3,000 from Olivia and Caroline Phelps Stokes, for the investigation and preservation of our native plants, be and is hereby gratefully accepted, under the conditions of the letter of Miss Olivia E. Phelps Stokes to Professor N. L. Britton, dated August 29, 1901.

At the same meeting it was referred to the Scientific Directors, with power, to determine upon a method for the expenditure of the annual interest upon the fund, and at a meeting of the Scientific Directors held December 6, 1901, the following resolutions were adopted, they having previously been submitted to the Misses Stokes, who made some valuable suggestions concerning the details:

Resolved, That this gift be known as the Olivia and Caroline Phelps Stokes Fund for the Protection of Native Plants.

Resolved, That the annual income from the Stokes Fund be at present applied to 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 published 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.

Resolved, That such essays must be submitted to the Director-in-Chief not later than February first; those accepted for prizes to be published in the March, April and May issues of the JOURNAL; they must not exceed three thousand words in length and must be clearly written or type-written in triplicate; they become the property of the Garden, which does not undertake to return any essay submitted.

Resolved, That for the year 1902 the following prizes be offered, payable April 15th:

1. A first prize of $50.
2. A second prize of $30.
3. A third prize of $20.

Resolved, That the awarding of these prizes be referred, with power, to a committee consisting of Judge Brown, Professor Underwood and the Director-in-Chief.

It is further arranged that in all lectures, bearing in any way on native plants, delivered under the auspices of the Garden, this topic shall be alluded to; it will be brought out in its very important relation to forests by Mr. Van Brunt in his lectures on "Trees, their Flowers and Fruit," to be given at the American Museum of Natural History in April, and will be brought to the attention of visitors to the wild parts of the Garden by suitable notices and restrictions.

Presentation of essays in competition for the three prizes now

offered is invited from anyone interested, under the conditions outlined in the foregoing resolutions.

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

RESEARCH WORK IN THE GARDEN.

A description of the general facilities for botanical investigation offered by the Garden was printed in the JOURNAL for January, 1901 (No. 13). During the past year the equipment and organization of the various departments concerned have been made much more efficient by the addition of apparatus and other material facilities as well as by the appointment of new members of the staff. As a consequence the number of subjects which may be pursued to advantage is increased, notably in palaeobotany, economic botany and plant pathology, and the opportunities for work in other lines have been broadened. The coöperation of the botanical staff of Columbia University, of Professor Rusby of the College of Pharmacy and of Professor Burgess of the Normal College has been continued.

The library has received additions of more than a thousand volumes and twice as many pamphlets and now includes over ten thousand volumes. The most notable additions were made by the deposit of the paleobotanical library of Columbia University, and by the purchase of several hundred volumes by means of money contributed by several friends of the Garden.

The equipment of the laboratories has been increased by a number of important pieces of optical, chemical and physiological apparatus, and a number of special desks for investigators have been constructed after a design by the director. In addition to the appliances for cultural work in the skylighted rooms, dark chambers and constant temperature rooms in the laboratories, one of the working greenhouses has been set aside for the use of experimenters.

The collection of living plants now embraces more than ten thousand species and affords material for diverse investigations. Furthermore it may be readily enriched in any group when

necessary to secure material for special work. The presence of this large number of living forms materially lessens the task of preparing an adequate collection of preserved material for morphological and anatomical work, except in the algae and fungi.

One of the most important results of the exploring expeditions sent out by the institution consists in the acquisition of living and preserved material necessary for the extension and completion of investigations in progress at the Garden. These explorations are so planned and executed that they are among the most valuable researches prosecuted by the staff, securing much needed data on plant geography, distribution, climatic relations and other general ecological problems, which may be successfully attacked only by a careful survey of large areas of territory. Expeditions have been made to Java, Singapore, Singkep, Porto Rico, St. Kitts, Florida, Newfoundland, Nova Scotia, Colorado, Nebraska and Montana during the past year while numerous persons in the field have coöperated more or less in such work, and in many other parts of the world including Mexico, New Zealand and Bolivia.

The museum collections have been notably increased in herbarium specimens and dried material. The appointment of Professor F. S. Earle as assistant curator in charge of the fungi has resulted in greatly accelerating the systematic arrangement of the vast Ellis collection, and also enables the Garden to offer opportunities for investigations in plant diseases, in which Dr. Alex. P. Anderson, of Columbia University, also participates.

Dr. M. A. Howe has been appointed assistant curator in charge of the algae, to which collection the large number of Characeae owned by Dr. T. F. Allen has been generously donated. The marine material obtained by Dr. Howe from Newfoundland and Nova Scotia during the season greatly extends the range of work which may be carried out with these forms. A good variety of living specimens are also accessible at tidewater less than three miles distant from the Garden.

Perhaps the most important accession to the museum collections during the year consists of the fossil plants of Columbia University. This collection was begun by Professor Newberry over fifty years ago and consists of about 8,000 specimens, containing a large

number of types. Dr. Arthur Hollick who was formerly associated with Professor Newberry, and under whose care the collection has grown to its present proportions, has been appointed assistant curator in charge of palaeobotany, and is constantly increasing the collection as the result of his own explorations.

The weekly conventions held on Wednesday afternoons in the conference room of the Laboratories have proved a most stimulating feature to the attending botanists. Subjects have been recently presented as follows:

Germination of *Poa pratensis*, by Mr. E. Brown, U. S. Seed Laboratory.

Physical and floral features of Porto Rico, by Professor L. M. Underwood.

Behavior of pollen tubes, and tetrad formation in *Diodia*, by Professor F. E. Lloyd.

Plants and climate of the San Francisco Peninsula, by Mr. W. A. Cannon.

Dascysypha resinaria, a fungus parasitic on *Abies balsamea*, by Doctor Alex. P. Anderson.

Flora of Newfoundland and Nova Scotia, by Doctor M. A. Howe.

Epithelial cells of *Zea*, secreting diastases, by Mr. John Torrey.

Taxodium in eastern United States, by Mr. R. M. Harper.

Problems in systematic mycology, by Professor F. S. Earle.

The following schedule shows the special subjects in which special facilities are offered for research work. In addition it is to be said that a large number of problems in almost any subdivision of botany might be taken up by investigators of experience, and every effort is made to furnish the material facilities necessary for such work. The laboratories are open during the entire year and persons desirous of availing themselves of the facilities afforded should address the Director-in-Chief:

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

Ecology.—Plants studied in relation to their environment and

the problems of evolution involved. Field and laboratory; conferences. Professor Lloyd.

Morphology of Algae.—Study of the structure and development of the Algae. Field and laboratory. Doctor Howe; Doctor Richards.

Morphology of Fungi.—Study of the structure, polymorphism and development of the Fungi, including culture methods. Field and laboratory. Professor Underwood; Mr. Earle.

Morphology of Bryophyta.—Study of the structure and development of Musci and Hepaticae. Field and laboratory. Professor Underwood; Mrs. Britton.

Morphology of Pteridophyta.—Study of the structure and development of Ferns and Fern-allies. Field, garden, conservatories and laboratory. Professor Underwood.

Morphology of Spermatophyta.—Study of the structure and development of the Flowering Plants. Field, garden, conservatories and laboratory. Doctor Rydberg.

Experimental Morphology.—A study of variation of form and structure, and determination of the causes. Professor Lloyd; Doctor MacDougal.

Taxonomy of Algae.—Study of the diagnostic characters and relationships of the principal families and genera. Field, herbarium and laboratory. Doctor Howe.

Taxonomy of Fungi.—Study of the diagnostic characters and relationships of the principal families and genera. Field, herbarium and laboratory. Professor Underwood; Mr. Earle.

Taxonomy of Bryophyta.—Study of the diagnostic characters and relationships of the principal families and genera. Field, herbarium and laboratory. Professor Underwood; Mrs. Britton.

Taxonomy of Pteridophyta.—Study of the diagnostic characters and relationships of the principal 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.—Study of the diagnostic characters

and relationships of the principal genera of grasses. Field, herbarium and laboratory. Mr. Nash.

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

Developmental Taxonomy.—Fossil ancestors of some family of plants. Comparative study of form and structure. Laboratory and museum. Doctor Britton, Doctor Hollick.

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

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

Physiology of Nutrition.—Treated from a chemical standpoint. Laboratory. Doctor Richards.

Ecological Physiology.—Problems in adaptive reactions, in form, structure and movements, to external energy and environmental factors. Field and laboratory. DoctorMacDougal; Doctor Curtis.

Physiological Anatomy.—Problems in the relationships of tissues and functions. Laboratory. Doctor Curtis.

General Physiology.—Problems in absorption, excretion, nutrition and transformations of energy, growth, the general irritable organization of the plant and mechanism of movement. Laboratory. Doctor MacDougal; Doctor Curtis.

General Pathology.—Study of diseases caused by parasitic fungi, and bacteria with special attention to the morphology of

the pathological organisms. Also problems in immunity, and effects of unfavorable environment. Field and laboratory. Mr. F. S. Earle and Doctor Alex. P. Anderson.

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.

REPORT OF DR. D. T. MACDOUGAL, FIRST ASSISTANT, ON EXPLORATIONS IN MONTANA IN 1901.

(Presented to the Scientific Directors Oct. 22, 1901, and ordered printed.)

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

Dear Sir: I have the honor to submit the following account of my operations in Montana in June, July and August, 1901. I left New York June 1st and proceeded to Missoula, Montana, in accordance with arrangements made with the University of Montana for the coöperation of the Garden in the biological expedition to be sent out from that institution. The journey was broken by stops of a few days for the purpose of making collections and observations in the valley of the Platte River, and in the sand hill region in northern Nebraska, in which more than two hundred species of living plants and herbarium specimens were obtained.

Similar work was accomplished in the vicinity of Missoula, Montana, during the week in which the outfit of the expedition was being completed and an ascent of Sentinel Mountain, east of the city, was made. An arrangement was made, which has since been carried out, by which the entire collection of unmounted plants belonging to the university, numbering several thousand, was shipped to the Garden for investigation, the Garden to retain duplicates. President Craig and Professor M. J. Elrod, director of the biological expedition, made every effort to facilitate my work, and the plans of the expedition were arranged to give every possible opportunity for botanical work.

The biological expedition moved out of Missoula on June 14th, and during the next two months we lived under canvas or in flying camps without shelter. Our main outfit was transported in a large wagon which followed the route along the plains nearest the mountains, and short trips were made from the main camp up into the two regions accessible only by pack animals and afoot.

FIG. 1. Eastern end of Lake Placid showing outlet masked by willows. The trees in the foreground are *Abies grandis*. (After a photograph by Professor M. J. Elrod.)

The main route lay northward along the western foothills of the Mission and Kootenay Mountains, and along the eastern shore of Flathead Lake. Only our more important camps may be mentioned. A thorough exploration of the valley of Sin-yale-a-min lake and its outlet, Post Creek, was made during the middle portion of June. The author made the ascent alone of Sin-yale-a-min peak (9,500 feet) on June 20th finding its summit

covered with snow to a depth of 10 to 40 feet and extending in drifts far down the slopes even on the south side. Many interesting alpine forms were encountered.

After descending to the plain a second excursion into the mountains was made at McDonald Lake where rain and snow storms, most unfavorable for work, were encountered. A third region to which much attention was given was that of a peninsula at the southern end of Flathead Lake, from which an ascent in the mountains at South-end pass was made by the author. Big

FIG. 2. Sand dune on Flathead prairie. A clump of *Symphoricarpos*, has been nearly submerged by the advancing sand. (After a photograph by Professor M. J. Elrod.)

Fork, a small settlement near the mouth of Swan River on Flathead Lake was reached on July 4th. A small frame building at this place serves as a summer biological station for the university.

The building furnishes facilities for the preparation of museum material, fixing and hardening of forms for morphological study, facilities for photography, and the usual dissecting and microscopical practice. Rowboats, sailboats, and a naptha launch were used in making collections and observations on Flathead Lake and its tributaries, and long excursions were made by chartering one of the two large steamers which ply regularly across it. Among the smaller boats was a canvas rowboat which could be taken

to distant waters by wagon, and used in a similar manner. In this way, the animals and plants of the large lake, swiftly running mountain streams, morainal lakes, and swamps were obtained, while the prairie, primitive forest, and adjacent mountain slopes still further diversify the fauna and flora, and were visited with profitable results.

The material secured is unusually rich in rare and novel forms, in opportunities for securing statistics in variation as affected by temperature and altitude, for continuous limnological investigations in inland waters of low temperature, for the study of general and vertical distribution of both plants and animals. The nearness of the high ranges of the Kootenay mountains brought within easy reach the arctic-alpine forms which are so interesting from a phylogenetic point of view, and the diversity of the country offered a rich field in physiographic ecology, as well as a geological field practically unworked.

FIG. 3. Dodge mountain: a recently explored peak in the southern Kootenays, about 7,500 feet high. (After a photograph from summit of a peak to the west, by Professor M. J. Elrod.)

The station was made the base of operations during July and August, and a number of students visited the place and carried on observations under the direction of the members of the party. Dr. H. C. Cowles, of the University of Chicago, accompanied by nineteen students, made a stay of a week here and secured some valuable data in physiographical ecology. In addition the entire party was successfully conducted to the summit of a neighboring

mountain and given the opportunity for a brief study of xerophytic and alpine forms.

Numerous ascents were made of the westernmost ranges of the Kootenay mountains, and the director of the expedition, acting in conjunction with members of the U. S. Geological Survey, has named one of the largest explored by us, Dodge mountain, in honor of Mr. Wm. E. Dodge of the Board of Managers, in recognition of the valuable service rendered by him in promoting botanical investigations in Montana.

Rost lake, Echo lake and Silloway peak were thoroughly explored and the curious phenomenon of "red snow" was encoun-

FIG. 4. Exploring party from biological station of University of Montana, on summit of Silloway Peak. (After a photograph by Mr. M. Ricker.)

tered during one of these excursions. A special trip with one packhorse was made by Professor Elrod and the author early in August across one of the mountain ranges into the valleys in which Trail lake, Lake Placid and View lake lay, and some of the most valuable material of the entire expedition secured.

Mr. Wilson P. Harris of the Cornell Forestry School accompanied me on the expedition as voluntary assistant, and paid

special attention to lichens. A set of these plants will be placed in the herbarium of the Garden. About 3,000 herbarium specimens were obtained during the course of the summer's work, and a number of living plants were added to the growing collections in the Garden. Much of the territory traversed had not been visited by a botanist before, and the results of our observations should make many extensions in ranges of species, furnish material for the critical delimitation of forms but little known, and add to our knowledge of the plant geography of one of the most interesting regions in the Rocky mountain domain.

Respectfully submitted,

D. T. MacDougal.

NOTES, NEWS AND COMMENT.

Miss Maria Morgan has recently presented the Garden with a complete set of the *Bulletin of the Torrey Botanical Club*. Although the Garden already possesses two sets of this periodical, we are very glad to have a third one, inasmuch as complete sets are now very difficult to obtain, and the volumes are consulted as much, perhaps, as any books in the library, herbarium or laboratories. The *Bulletin* was founded in 1870, by Mr. William H. Leggett, from whom many of the present generation of New York botanists received their first interest and enthusiasm for their science; it has been published monthly since its commencement and contains an invaluable store of botanical information; it is now edited by a committee of the Club, Professor Underwood being editor-in-chief.

A recent and valuable addition to the library is the presentation by the Rev. Haslett McKim, of about ninety volumes, mainly on microscopy, which heretofore has been but poorly represented there. This gift includes sets of *The American Microscopical Journal*, *The Monthly Microscopical Journal of London*, and of *Zeitschrift für Mikroscopie und für Mikroskopische Technik*, as well as complete set of *Botanisches Centralblatt*, which will be of great service in the laboratories.

The total amount of precipitation in the Garden during Decem-

ber, 1901, amounted to 8.82 inches. Maximum temperatures of 49 on the 1st, 59 on the 14th, 33.5 on the 23d, and 50 on the 29th; and minima of 8 on the 7th, 15.5 on the 16th, 3.5 on the 18th, and 21 on the 26th were observed.

ACCESSIONS.

LIBRARY ACCESSIONS FROM OCTOBER 8TH TO DECEMBER 31ST.

ALLEN, TIMOTHY F. *Contributions to Japanese Characeae*, 1–3. New York, 1894–98. 2 copies. (Given by Dr. Timothy F. Allen.)

ALLEN, TIMOTHY F. *The Characeae of America*, 1888–96. 2 copies. (Given by Dr. Timothy F. Allen.)

American Monthly Microscopical Journal. Vols. 1–12. New York, 1880–1891. 6 vols. (Given by the Rev. Dr. Haslett McKim.)

American Naturalist. Vol. 4. Salem, 1871. (Given by Dr. John Hendley Barnhart.)

American Quarterly Microscopical Journal. Vol. 1. New York, 1878. (Given by the Rev. Haslett McKim.)

Aus allen Welttheilen. Edited by Dr. Otto Delitsch. Vols. 1–4. Leipzig, 1870–73. 3 vols. (Given by Martin Eiche, Jr.)

Aus der Heimath. Edited by E. A. Rossmässler. Hogan, 1861–63. 5 vols. (Given by Martin Eiche, Jr.)

BAILLON, H. *Histoire des Plantes.* Paris, 1867–1895. 13 vols. (Given by the Rev. Dr. Haslett McKim.)

BALTET, CHARLES. *The Art of Budding and Grafting.* London, 1873. (Given by Martin Eiche, Jr.)

Berichte der Beyerischen Botanischen Gesellschaft zur Enforschung der heimischen Flora. Vol. 2. München, 1892. (Given by Dr. Timothy F. Allen.)

BISCHOFF, G. W. *Die Kryptogamischen Gewächse mit besonderer berücksichtigung der Flora Deutschlands und der Schweiz.* Nurnberg, 1828. (Given by Dr. Timothy F. Allen.)

BISHOP, JAMES N. *Catalogue of all the Phaenogamous and Vascular Cryptogamous Plants at present known to grow without cultivation in the State of Connecticut.* Hartford, 1901. (Given by Dr. N. L. Britton.)

BLACKMAN, GEO. E. *On Angular Aperture of Objectives for the Microscope.* New York, 1880. (Given by the Rev. Dr. Haslett McKim.)

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EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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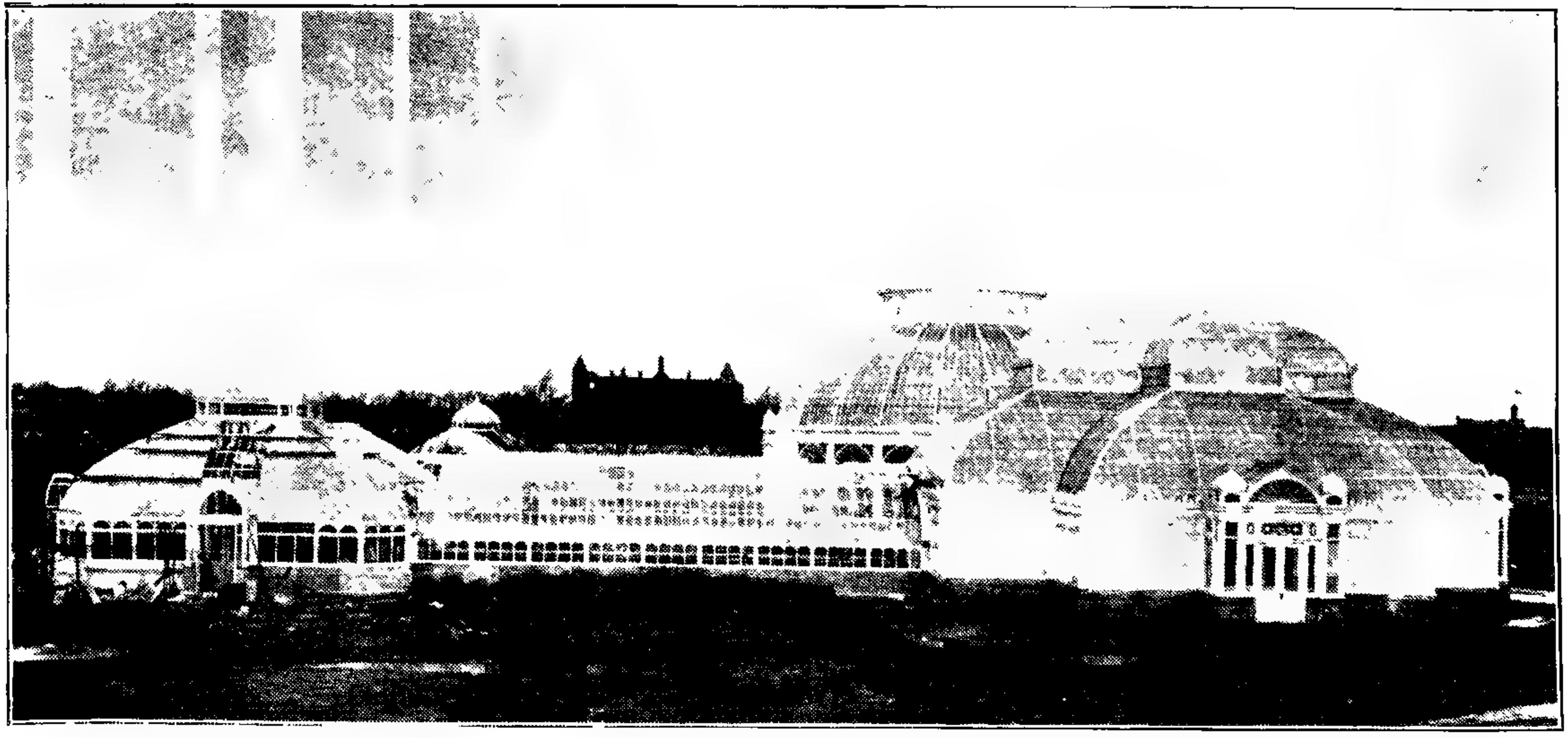


PUBLIC CONSERVATORIES FROM THE SOUTHEAST.

JOURNAL

OF

The New York Botanical Garden

VOL. III. February, 1902. No. 26.

THE NEED OF ADDITIONAL ENDOWMENT.

(Submitted to the Board of Managers, Jan. 13, 1902, and ordered printed.)

Attention is called to the need of additional endowment for the New York Botanical Garden. Although active work in development has been in progress only since 1897, it has already taken high rank as an educational institution, because of its efficient scientific organization and its proved capacity for public instruction. Through the researches of its staff and numerous students, it is contributing largely to the world's stock of knowledge. While the city of New York has appropriated over $700,000.00 for the construction of building, roads, paths and the general improvement of the grounds in Bronx Park, and supplies this year $65,000.00 for the maintenance of the Garden, its museums, laboratories and conservatories, it does not supply funds for obtaining collections, and for other scientific and educational work.

It is desired to obtain an Endowment Fund of not less than $500,000, the interest to be used for purposes of education and investigation, the exploring of little-known regions, the obtaining of collections, books and apparatus, and for publication.

The income from this endowment and from annual membership fees now amounts to about $22,000 annually. If the endowment were increased to $500,000 the income would be about $30,000 annually, and this would for the present carry on the educational and research work of the Garden in a satisfactory manner.

The endowment already secured has been contributed as follows:

Columbia University,	$ 25,000.00
J. Pierpont Morgan,	25,000.00
Andrew Carnegie,	25,000.00
Cornelius Vanderbilt,	25,000.00
John D. Rockefeller,	25,000.00
D. O. Mills,	25,000.00
Hon. Addison Brown,	25,000.00
William E. Dodge,	10,000.00
James A. Scrymser,	10,000.00
William C. Schermerhorn,	10,000.00
Mrs. Esther Herrman,	10,000.00
Hon. Charles P. Daly,	5,000.00
Oswald Ottendorfer,	5,000.00
Samuel Sloan,	5,000.00
George J. Gould,	5,000.00
Helen M. Gould,	5,000.00
John S. Kennedy,	5,000.00
William Rockefeller,	5,000.00
Arnold, Constable & Co.,	5,000.00
Mrs. Antoinette Eno Wood,	5,000.00
Morris K. Jesup,	2,500.00
Mrs. Melissa P. Dodge,	1,000.00
C. P. Huntington,	1,000.00
Tiffany & Co.,	1,000.00
David B. Ivison,	1,000.00
Hon. Seth Low,	1,000.00
Samuel Thorne,	1,000.00
H. C. von Post,	1,000.00
Mrs. Percy R. Pyne,	1,000.00
Fred. F. Thompson,	1,000.00
John Innes Kane,	1,000.00
Hugh N. Camp,	250.00
Life Membership Fees,	10,100.00
Caroline and Olivia Phelps Stokes Fund for the Preservation of Native Plants (Stokes Fund),	3,000.00
Bequest of the late Judge Chas. P. Daly (David Lydig Fund),	20,465.18
Students' Research Fund (from fees of students),	1,082.75
Total,	$307,397.93

The collections of living plants, museum and herbarium specimens, books and apparatus, already brought together by gift, purchase, exploration and exchange are valued at not less than $250,000.

About $100,000 has been expended from the Garden's own funds for plants, exploration, obtaining collections and their installation, publications, lectures and for other educational work, and about $25,000 has been contributed for special purposes by members of the corporation and others interested.

The total income in money and material derived from private sources therefore aggregates not less than $682,309.87.

Checks should be drawn to the order of the New York Botanical Garden and mailed to Mr. C. F. Cox, Treasurer, Grand Central Station, New York City.

Any information concerning the Garden which may be desired will be furnished by Professor N. L. Britton, Director-in-Chief, New York Botanical Garden, Bronx Park, New York City.

The contribution of $5,000 or more at one time constitutes the donor a Patron of the Garden.

The contribution of $1,000 or more at one time constitutes the donor a Fellow-for-Life.

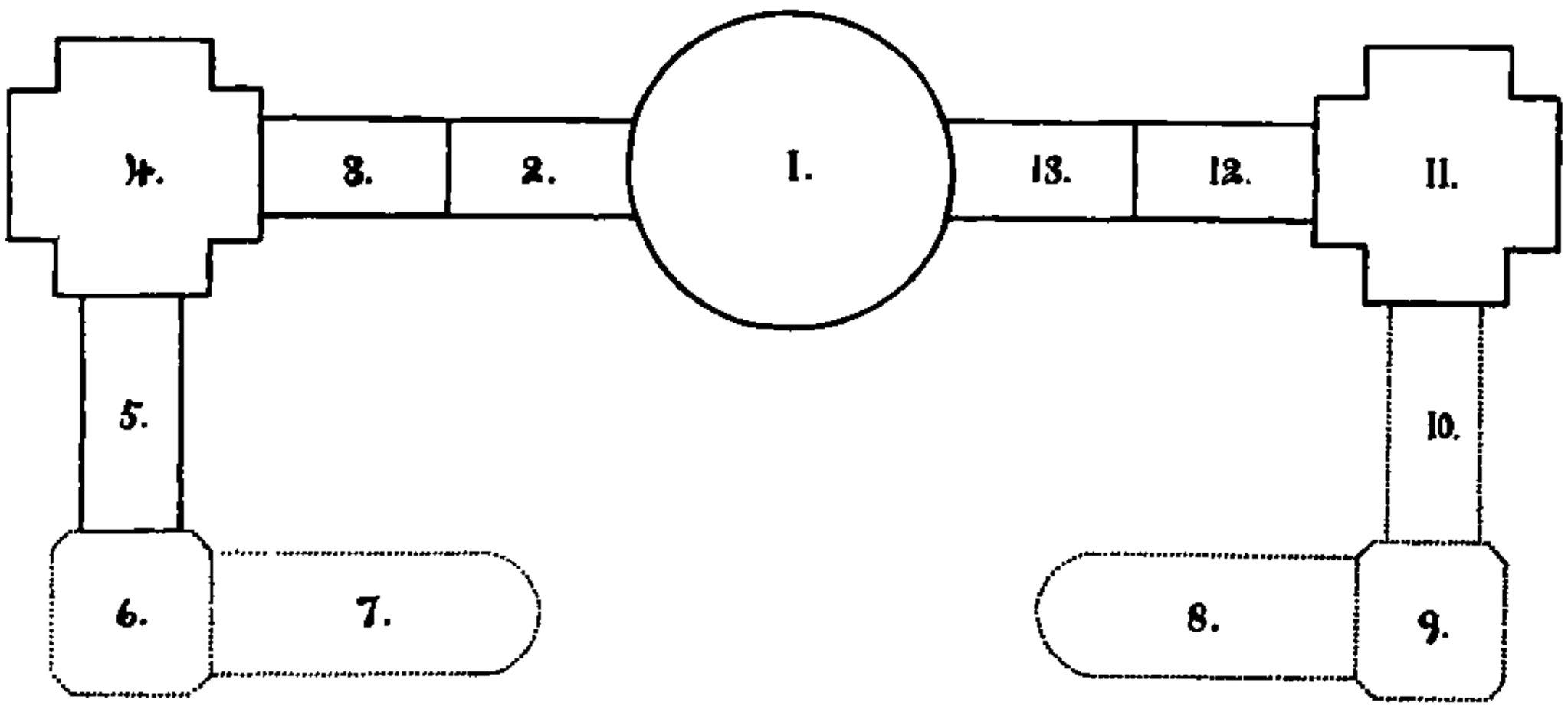
JAMES A. SCRYMSER, Chairman,
D. O. MILLS,
J. PIERPONT MORGAN,
SAMUEL THORNE,
C. F. COX,
Finance Committee.

COMPLETION OF THE PUBLIC CONSERVATORIES.

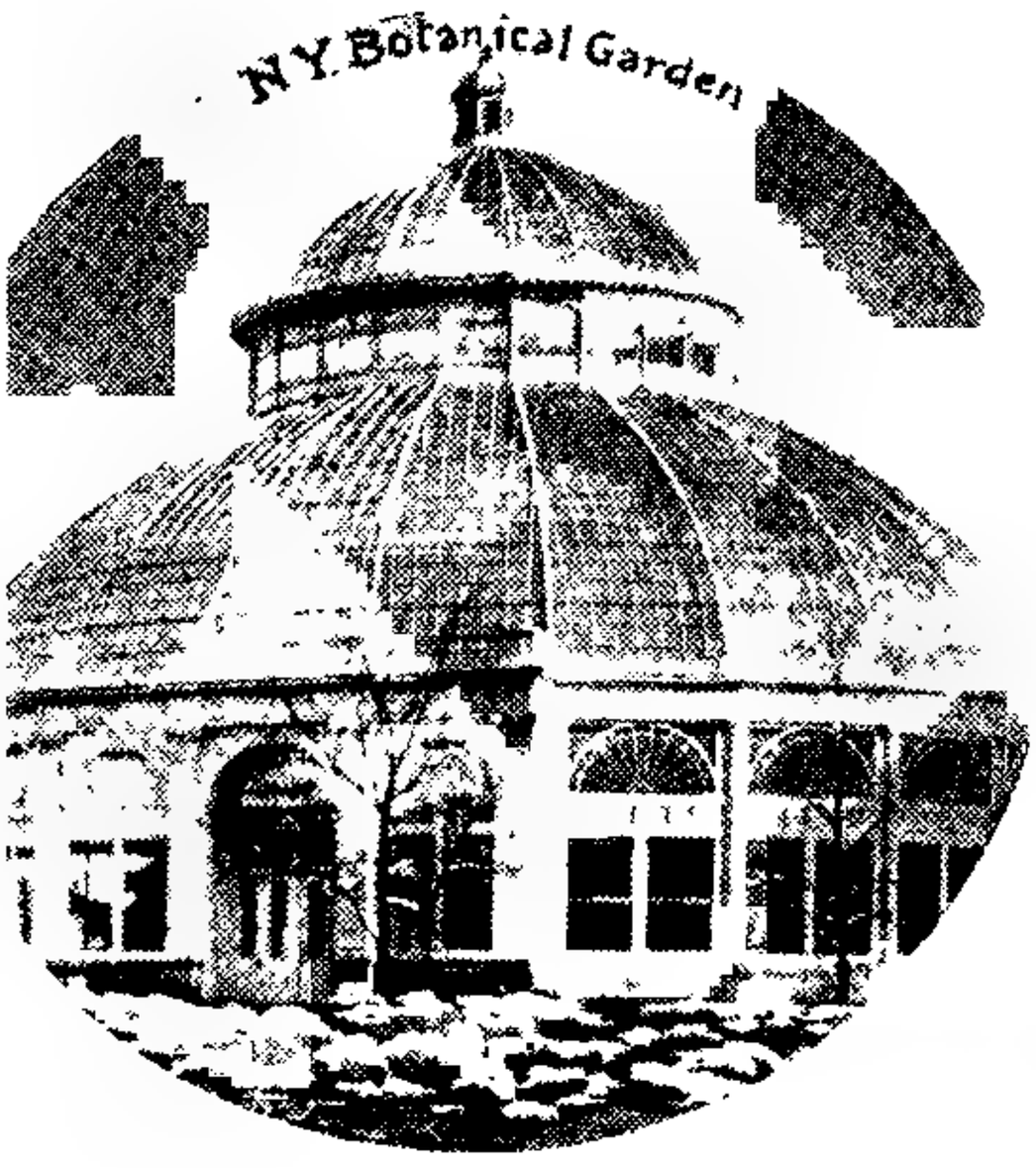
The additional glass houses built during the past year, to complete the range of Public Conservatories, were finished late in January, accepted by the Commissioner of Parks of the Borough of the Bronx, and turned over to the Garden for operation. The work of building these houses was commenced early in May, 1901, under a contract awarded by the Commissioner of Parks

to John R. Sheehan & Co. The contract price was $68,300 and no extras have been added; the cost of the portion of the range previously built was $112,000; the total cost of the whole range has therefore been $180,300.

The part just finished consists of five houses, two of which are divided by glass partitions, there thus being seven compartments in the five houses: these added to the eight houses already filled with plants, afford fifteen compartments in all, in the entire range.



The ground-plan of the completed range is shown by the accompanying figure, and a general view of the houses, photo-



graphed just before their completion from the hill southeast of them, is shown on Plate IX.; the work of fitting up the new

houses with gravel and soil, the hanging of shades, and the stippling of the glass where needed, are now going forward.

The large amount of additional space for plants, provided by the new houses, necessitates and permits almost the entire re-arrangement of the collections already installed in the old houses, with the exception of the palms, sago-palms, and bamboos, which will remain in the central house No. 1. House No. 9 will be occupied almost entirely by tree-ferns and other tropical

ferns; house No. 10 will be operated as a temperate house. House No. 8 contains two compartments, one of which will be given over principally to the smaller tropical ferns; the other compartment contains the tank for tropical water plants, around the sides of which will be placed tropical grasses and sedges. House No. 6 will be operated as a succulent house, to contain the larger cacti, century-plant, aloes, and other fleshy plants, the smaller kinds of this category remaining where they are, with

considerable re-arrangement, in house No. 5. House No. 7, containing two compartments, will be operated as a tropical house, occupied by some of the groups now in houses 3, 4 and 13.

The collections already in the older houses and a considerable number of plants grown during the year in the propagating

houses on the eastern side of the Garden, will go part way toward stocking the large additional space, but several thousand more specimens than those thus in hand are needed to effect even a preliminary stocking of the new houses. To obtain some of these, three expeditions have been arranged; Dr. MacDougal has gone to Arizona to secure cacti and other succulents; Dr. Britton may go to Cuba in March, after Dr. MacDougal's return, for the purpose of obtaining certain tropical species, and Mr. Nash will go to Europe in April in order to arrange for some additional exchanges with botanical gardens. A considerable number of

plants can also be obtained from American botanical gardens in exchange. Meanwhile, gifts of desirable plants will be very acceptable.

N. L. BRITTON.

PALEOBOTANY AT THE GARDEN.

The Columbia University collection of fossil plants, recently deposited with the Garden, under a supplementary agreement between the two institutions, dated May 3, 1901, is both interesting historically and valuable scientifically. It was almost entirely due to the labors of the late Dr. John Strong Newberry that the specimens were gathered together and they represent about forty years of active work on his part, largely in the several geological surveys and exploring expeditions with which he was connected.

Dr. Newberry was one of the pioneers in paleobotany in this country, having read papers on the Carboniferous flora of Ohio in 1853, before the American Association for the Advancement of Science, and the Cleveland Academy of Natural Sciences. These papers, with descriptions and plates of new species, were published during the same year in the Annals of Science and the Proceedings of the Cleveland Academy of Natural Sciences. The type specimens and many others collected while Dr. Newberry was at the head of the Geological Survey of Ohio are of special interest as representing one of the earliest attempts to describe the flora of the Carboniferous Period in America.

Triassic, Cretaceous and Tertiary plants are represented by specimens collected during Hayden's exploration of the Missouri and Yellowstone Rivers in 1859–60; by the Macomb and Ives Explorations of the Grand, Green and Colorado Rivers, in 1859 and 1861, and by an extensive suite of specimens from the clay beds of New Jersey, upon which Dr. Newberry based his "Flora of the Amboy Clays." An exceedingly interesting series, on account of its local character, is that collected by Dr. Arthur Hollick during the past decade on Long Island, Block Island and Martha's Vineyard, described and figured in a series of reports in the Annals and Transactions of the New York Academy of Sciences, while the smaller collections represent almost every section of the world and every geological horizon.

The fossil plants have been installed in the east basement hall of the Museum Building and an arrangement adopted, based on the sequence of the geological time divisions: Eozoic, Paleozoic, Mesozoic and Neozoic. Specimens belonging to each of these divisions are displayed in the four table cases and five wall cases at present available, as follows:

North side, first table case and three wall cases, plants of Eozoic and Paleozoic time, including the Laurentian, Cambrian, Silurian, Devonian and Carboniferous Periods.

North side, second table case, plants of Mesozoic time, including the Triassic and Jurassic Periods.

South side, following around the east end, third floor case and fourth wall case, plants of Mesozoic time, Cretaceous Period.

South side, fourth floor case and fifth wall case, plants of Neozoic time, including the Tertiary and Quaternary Periods.

The relative amount of space occupied by the plants of each of the time divisions is tentative and the particular specimens at present displayed are subject to change in the future, in the event of more cases being provided and after specimens now in storage have been sorted and examined.

By far the larger part of tne specimens is yet in trays, only partially arranged or else packed in boxes and entirely unsorted.

The two rooms recently built at the east end of the hall are being fitted up for sorting and systematically arranging the material not required for display. Stacks of drawers built around the walls of the rooms will be constructed for this purpose, plans for which have been submitted. By this means collections from different localities may be kept separate and at the same time all may be arranged in their proper geological sequence.

Careful work, for many months, will be necessary in this connection in order that any type specimens or specimens which may have been the subjects of illustrations in reports or monographs may be noted and suitably labelled, and the best specimens for display purposes separated out. Type specimens are designated by a red star and such as have been used for purposes of illustration, but which are not types, by a blue triangle.

In the meantime work has been started in the designation of

those specimens which are the property of Columbia University, by painting a small red "C" on each one. Such specimens as belong to the Garden, or which may hereafter come into the possession of the Garden, are to be designated in a similar manner by a yellow "B."

Two collections have been added to the Museum since last June: the first a collection of Devonian plants from the Pocono Mountain, Pennsylvania, by Dr. Britton, the second representing the Pleistocene flora of Maryland, by Dr. Hollick. These collections have not as yet been critically examined or reported upon.

The collection contains not less than 8,000 specimens, and illustrates the succession of plant life on the earth from the most remote era at which plants are known to have existed to the present time. Its installation at the Garden will give to the public an insight into the wonderfully interesting problems involved in the study of plant evolution, through the remains of species long extinct, entombed in the strata of the earth's crust, the function of these plants in the formation of coal, and the relations of living species to their ancestors. It has been shown by experience that research along these lines is more readily prosecuted in conjunction with botany than with geology. A precedent for the presence of a paleobotanical collection at a botanical garden is found at the famous Jardin des Plantes at Paris, where the fossil plants brought together by the noted French savant Brogniart are deposited and displayed, although with much inferior accommodations than we are able to afford the Newberry collection.

ARTHUR HOLLICK.

REPORT OF DR. J. K. SMALL AND MR. G. V. NASH UPON A TRIP TO FLORIDA.

DR. N. L. BRITTON, *Director-in-Chief*:

Sir: We submit herewith a report of our recent collecting trip to southern Florida, made for the purpose of securing living plants and seeds for the conservatories, and such museum and herbarium material as could be incidentally obtained.

We left on the night of October 23d, arriving at Jacksonville on the forenoon of the 25th behind schedule time, which necessitated a delay of 24 hours in reaching our destination. Part of this enforced delay was spent in exploring the pine lands in the immediate vicinity of that city, where observations were made and many desirable plants located, which were secured on our way north several weeks later. During the afternoon of the same day we moved over 100 miles farther south, along the east coast, to Daytona, where we spent the morning of the following day in observing the seabeach flora, as well as that of the sand dunes, and also that of the hammocks several miles back from the coast. Here, as at Jacksonville, we located desirable and rare plants, which were likewise collected on our return north. We took our departure in the afternoon of the same day for Miami, our objective point.

The Florida East Coast Railway, the only rapid means of communication with the eastern part of the peninsula, runs practically parallel with the shore, frequently within a few feet of the water's edge, thus giving unobstructed views of the Halifax and Indian rivers. The country is in great part wooded, the most conspicuous tree for a long distance south being the palmetto (*Sabal Palmetto*), which in many places forms dense forests to the exclusion of all other trees. It is in this region that the palmetto evidently reaches its maximum development, trees or groups of trees 70 feet in height being by no means uncommon, and forming quite a contrast to the dwarf and relatively more stunted appearance of the same tree in southern Florida and Georgia. The tall slender trunks, crowned with the showy mass of leaves, gave quite a tropical aspect to the whole landscape. While in the great majority of the trees the trunks were not clothed with the persistent bases of the old leaf-sheaths, in some cases the reverse of this obtained, the trunks being more or less clothed, in some cases entirely so, with the old sheaths, giving the tree quite a different appearance. This rarely occurred where the trunk was over 20 feet high. From our observations it seemed evident that this character of the old leaf-sheaths was merely an individual peculiarity, as the trees were otherwise alike.

Trees of this nature were frequently noted in the vicinity of Jacksonville and Daytona and in the Biscayne Bay region.

After leaving the palmetto formation, an extended stretch of alternating pineland and scrub is encountered, the timber in the former being composed almost entirely of *Pinus heterophylla*, while in the scrub the only and characteristic tree is *P. clausa*; *Ceratiola ericoides*, shrub peculiar to this latter formation, was commonly observed.

Upon arrival at Miami, headquarters were established at the Tropical Laboratory of the United States Department of Agriculture, on the kind invitation of Professor P. H. Rolfs, who is in charge there. He placed at our disposal every convenience and facility in his power, and we were thus enabled to accomplish much more than had been anticipated. We wish to express our hearty appreciation of the kindness and courtesy of Professor Rolfs, and also of his assistant, Mr. Hendrickson.

The rainy season was about over when we reached our field of operations. With this condition in our favor, by careful planning for all the time at our disposal, and by husbanding our funds, we were able to make a collection of considerable size. Shipments were made every second or third day, and we are pleased to report the safe arrival of all these. Sixteen days were spent in collecting in the Biscayne Bay region; of these, two days were allotted to the Keys, and one day and a part of another to the Everglades, or Glades, as they are locally called, the remainder being devoted to the partial exploration of the vicinities of Miami and Cocoanut Grove, and to the country south of the latter place. This region is entirely of coral formation and consequently honey-combed limestone rock is everywhere. This in some areas, principally along the water-courses and in the hammocks, has a thin covering of soil, composed of white sand and leaf-mold. For the most part, however, the coral rock comes right to the surface, and what little soil occurs is found only in the cavities. Strange as it may seem, this apparently almost impenetrable rocky condition supports a very luxuriant vegetation, not only of native growth, but also of cultivated plants. It was soon made evident that digging plants under such conditions was

a tedious and laborious operation, and in many cases a half dozen specimens would be ruined before the requisite number, with sufficient root system to warrant shipping, was secured. The surface of this region is almost flat, with occasional low coral ridges, and is a succession of pine-land, hammocks and mangrove swamps.

The pine-lands are characterized by a scattering growth of *Pinus heterophylla* and numerous shrubs, shrubby herbs and herbaceous perennials, together with a few annuals. The more conspicuous plants, other than the pine referred to above, are four species of palms, representing the three genera, *Sabal*, *Serenoa* and *Coccothrinax*, and a handsome representative of the sago palm family, *Zamia Floridana*, which is very common, but has been somewhat depleted by the extensive digging of the root for the manufacture of starch. These pine-lands are light and airy, the growth of timber being scattered and affording little shade.

In great contrast to this are the hammocks, which are in perpetual twilight and gloom, and, as stated above, the overlying soil is thicker here than in the pine-lands. These formations, varying in size from an acre to many hundred acres, are scattered throughout the pine-lands, and consist of a dense growth of hardwood trees and shrubs and vines, in some cases forming an almost impenetrable tangle. The ground is well covered with the seedlings and suckers of the trees and shrubs, supplemented with a greater or less number of fungi, hepatics, mosses and ferns. The herbaceous vegetation, however, is scant, being forced to a refuge on the trees, which have, in many cases, fully one-half their trunk and branch surface covered with a dense growth of ferns, orchids, bromeliads, and other less conspicuous plants.

The mangrove swamps, owing to their great root growth, are almost impenetrable, and are located along the coast and neighboring water-courses. Their vegetation is confined almost entirely to the mangrove trees, and such few tillandsias and orchids as grow on their branches. Frequently on the borders of these swamps occurred a large, showy species of *Acrostichum*, with leaves often six to eight feet long.

These mangrove swamps are particularly abundant along salt or brackish shores, and, as might be expected, occur frequently along the sea-islands, the so-called Florida Keys. Many of the keys observed during our trip to this interesting region were surrounded by a belt of mangrove trees, some of the smaller ones being entirely given over to this particular tree, while others had the interior covered, as in the hammocks of the mainland, with hard-wood trees and shrubs and vines. The formation here, as on the mainland, is of coral origin, but the rock is even more prominent and accompanied by less soil. Nevertheless, the pine-apple industry is a flourishing one, many acres being under cultivation and devoted to the growth of this fruit. The slips are inserted in the cavities of the rock, with no attempt at arrangement, and make a wonderful growth. The scarcity of the soil, however, renders a prolonged use of a field impossible, on account of the early exhaustion of the soil, and a new clearing of land is made imperative. We were informed that the abandoned fields are soon recovered with a new growth of tropical vegetation, and at the expiration of a number of years become again available for cultivation.

Landings and collections were made on three of the keys, viz.: Elliott's Key, Old Rhodes' Key, and Totten's Key. On all of them we found the uncleared portions heavily wooded, but, as in the hammocks on the mainland, very little herbaceous vegetation occurred. A peculiar feature of the vegetation, and one hardly to be expected as an associate with the tropical hard-wood trees, is a species of *Cereus*. This was very common, its straggling 3-angled thorny stems sometimes attaining a length of twenty-five feet and sprawling on the ground or leaning on the surrounding vegetation. Another plant, quite in keeping with the *Cereus*, was a species of *Agave*, also of frequent occurrence. Insect life, represented by mosquitoes and highly ornate spiders, was very abundant, but of other animal life there was little; the almost entire absence of bird life made the silence of the woods intense.

In order properly to make this trip to the keys, it was necessary to secure a naptha launch. The one we hired was about

thirty-five feet long, and drew only three feet of water, but even with this light draft it was impossible in some cases to approach nearer than one-half mile to the shore, on account of the exceeding shallowness of the water, and the services of a small flat-bottomed row-boat were at all times necessary to actually make a landing. The keys visited were at the extreme northern end of the chain. The vegetation seems to change considerably farther south, a number of palms making their appearanee, so that a future visit to the more southern keys, including Key West and the Marquesas group west of it, and to the Thousand Islands on the west coast, visiting also the mainland, would undoubtedly prove interesting and would surely yield much of value to the collections. To accomplish such a trip properly a launch of some size would be necessary with sufficient storage room for quite a cargo. Many of the keys, and the Bahamas but a short distance east, probably contain botanical treasures which would be well worth securing. The palms, in particular, seem to be very local in their distribution.

Perhaps no part of the trip afforded a greater surprise than did the Everglades, for their character differed so entirely from the conception formed from descriptions. To understand this vast region, covering an area of about one hundred miles wide and perhaps one hundred and fifty miles long, the elevation of which is said to be about eighteen feet above the ocean, one must imagine the keys on a large scale. In place of the surrounding ocean is an extended saw-grass swamp, as far as the eye can reach, transversed by winding river-channels, and covered with islands of varying size, from an acre to many acres in extent, the surface of which is but little raised above the surrounding water. In the time of high water most of them are entirely submerged, as was the case at the time of our visit, and collecting on them meant a continuous struggle through tangled underbrush, clambering over decayed and moss-covered logs, and wading up to the knees in mud and water. The discomfort and trouble were well repaid by the many interesting observations made and the securing of desirable material. We were assured by our boatman and guide, an indispensable adjunct on such a trip, that dur-

ing the winter these islands are dry and that the wading is then eliminated from the struggle.

One is impressed on all sides with this island formation. As shown above, the hammocks are really islands surrounded by the pinelands. At the keys the islands are again present, but there the ocean is the surrounding medium. Here in the Everglades they occur in countless numbers in the midst of a vast saw-grass swamp. And everywhere they are devoted to a growth of hard-wood trees and shrubs with a very scant herbaceous vegetation.

The results of the trip have proved satisfactory, although the obstacles met with in securing material were at times extremely tantalizing. About 1,200 specimens of living wild plants were secured, fifty packets of seed, about 1,200 herbarium specimens, and some museum material. A considerable amount of the material was not procurable outside of the Biscayne Bay region, notable among these being the showy little palm, *Coccothrinax Garberi*, of which a good supply of plants was obtained and a liberal quantity of seed. A number of specimens of three other palms were collected, together with the seed of each.

In addition to the plants referred to above, a large exchange, consisting of about one hundred and fifty plants, was arranged with Mr. R. H. Hegen, who has charge of the grounds of the Royal Palm Hotel. This gentleman has quite a large collection of cultivated plants, among them a number of species of palms, some of which were secured at the Keys. Among many other valuable plants were ten large palms, six of them representing four species which are peculiar to that region; two large cocoanut palms were also among the number. The palms, as well as the other cultivated plants, arrived in good condition and give promise of doing well. Mr. Hegen did much to facilitate our work, accompanying us to desirable collecting grounds and aiding much in packing and shipping. We desire to express our full appreciation of his aid and advice.

Respectfully submitted,

J. K. SMALL.
GEO. V. NASH.

NOTES, NEWS AND COMMENT.

The "Botanische Centralblatt" has become the property of the Association Internationale de Botanistes, which was organized at Geneva, Switzerland, in August, 1901. The Centralblatt is managed by an executive committee of the Association consisting of Professor Goebel, of Munich, Germany, Professor Bower, of Glasgow, Scotland, Dr. Goethart, Leyden, Holland, and Dr. Lotsy, of Leiden, Holland.

The editorial staff consists of Dr. Lotsy with a number of special editors in every country in which any considerable botanical interest has been shown. The special editors from America with the subjects to which they will devote special attention are as follows:

Dr. D. H. Campbell, Stanford University: Morphology.

Dr. C. J. Chamberlain, University of Chicago: Cytology.

Dr. D. T. MacDougal, New York Botanical Garden: Physiology.

Dr. G. T. Moore, Bureau of Plant Industry: Algae.

Dr. D. P. Penhallow, McGill University: Palaeobotany.

Dr. H. von Schrenk, Shaw School of Botany: Fungi.

Dr. Wm. Trelease, Missouri Botanical Garden: Phanerogams.

Reviews are printed in any one of four languages. This reorganization of the Centralblatt is the most important step yet taken toward a general bibliography of current botanical papers and gives an opportunity for the publication of a short abstract of a botanical paper from any part of the world, within two or three months after its appearance.

The total amount of precipitation in the Garden during January, 1902, amounted to 3.40 inches. Maximum temperatures of 42.5 on the 5th, 41.5 on the 6th, 44 on the 16th, 50 on the 21st, and 22nd, and minima of 9.5 on the 14th, 14 on the 12th, 9.5 on the 18th and 20th, and 17.5 on the 21st were observed.

No. 18 of the Contributions from the Garden consists of four papers by Dr. Small under the title of "Shrubs and Trees of the Southern States." Many interesting notes upon the habits and

synonymy of the trees native to the region in question are given, and new species of oak, hackberry, cherry, *Leucothoë*, St. Johnswort, buckeye, azalea, and *Dendrium* are described. Contribution No. 19, "The American species of *Limnorchis* (swamp-orchids) and *Piperia*, North of Mexico" by Dr. Rydberg is a discussion and critical arrangement of the orchids included in these genera and a description of several new species. Contribution No. 20, "The Morphology and Physiology of the Seedlings of *Arisaema triphyllum* and *A. Dracontium*" by Miss R. J. Rennert includes the results of two years' study of the germination of the seeds of jack-in-the-pulpit, and green dragon. It is noted in this work that the seedling of the latter species does not appear above the surface of the soil until the second year of its growth.

ACCESSIONS.

MUSEUM AND HERBARIUM.

6 specimens of Crassulaceae. (By exchange with Mr. L. Abrams)

36 specimens of Australian plants. (By exchange with the Royal Gardens, Kew. England.)

50 specimens "Phycotheca Boreali-Americana," Fasc. 18. (For the Columbia University Herbarium.)

3 specimens of *Dryopteris* from Vermont. (Given by Dr. T. E. Hazen.)

15 specimens from Lake George, N. Y. (Given by Prof. J. F. Kemp.)

26 specimens of *Crataegus* from Lake George, N. Y. (Given by Mr. S. H. Burnham.)

1 specimen of *Riccia* from Louisiana. (By exchange with Mr. W. N. Clute.)

6 specimens of recently described grasses. (Given by Mr. Geo. V. Nash.)

4 specimens from Arizona. (Given by Dr. D. T. MacDougal.)

100 specimens "Fungi Columbiani." Fasc. 16.

16 specimens "Ohio Fungi Exsiccati." Fasc. 1.

65 specimens of Florida fungi. (By exchange with Prof. S. M. Tracy.)

57 specimens of fungi from California. (By exchange with Mr. C. F. Baker.)

5 specimens of smuts from western North America. (Given by Dr. D. Griffiths.)

65 specimens of Pennsylvania fungi. (By exchange with Mr. A. A. Heller.)

560 specimens of Georgia plants. Collected by Mr. R. M. Harper.

87 photographs of Georgia vegetation. (Given by Mr. R. M. Harper.)

2 specimens from California. (Given by Mr. S. B. Parish.)

1 specimen of *Calamintha* from Maryland. Collected by Dr. A. Hollick.

888 specimens of Rocky Mountain plants, collected by Mr. C. S. Shear.

34 specimens from Wyoming. (By exchange with Mr. E. Nelson.)

325 specimens of Utah and California plants. Collected by Miss S. Stokes.

53 specimens of flowering plants from Franz Joseph Land. (Given by Mr. Ralph L. Shainwald, Jr.)

181 specimens from western Montana. (Given by Prof. M. J. Elrod.)

625 specimens from southwestern Colorado. Collected by Professors Underwood and Selby.

SEEDS.

2 packets *Hibiscus* seed. (Given by Mr. J. L. Powell, Millbrook, N. Y.)

1 packet seed *Asimina triloba*. (Given by Dr. Addison Ballard, University Heights, City.)

1 packet seed *Simmondsia Californica*. (Given by Mr. J. Burtt Davy, Berkeley, Cal.)

1 packet seed *Campanula sulphurea*. (Given by Mr. Arthur K. Bulley, Ness, Neston, Cheshire, England.)

2 packets seeds of cacti. (By exchange with the Buffalo Botanic Garden.)

28 packets seed. (By exchange with the Botanic Gardens, Buitenzorg, Java.)

92 packets fern spores. (By exchange with the Botanic Garden, Buitenzorg, Java.)

1 packet seed of *Warea cuneifolia*. (Given by Mr. P. H. Rolfs, Miami, Fla.)

4 packets seed from New Zealand. (Given by Mr. L. Cockayne.)

1 packet seed from Arizona. (Given by Mr. T. D. A. Cockerell.)

3 packets of seed. (Given by S. B. Parish.)

26 packets of seed from Colorado. (Given by F. K. Vreeland, Colorado Springs, Colo.)

1 packet of seed from Porto Rico. (Collected by Prof. L. M. Underwood.)

1 packet of seed of *Falcata comosa*. (Given by Mr. A. Huger, Hendersonville, N. C.)

29 packets of Georgia seed. (Given by Mr. R. M. Harper.)

PLANTS.

64 plants for the conservatories. (By exchange with Missouri Botanic Garden, St. Louis, Mo.)

32 plants for the conservatories. (By exchange with Mr. Holbrook.)

11 filmy ferns from New Zealand. (Given by Mr. L. Cockayne.)

17 cacti from Bolivia and Peru. (Collected by Mr. R. S. Williams.)

3 plants of *Rosa stellata* from New Mexico. (Presented by Prof. E. O. Wooton.)

3 plants for the conservatories. (Given by Mrs. M. C. Havens, 8th Street and White Plains Avenue.)

1 plant for the conservatories. (Given by Miss C. C. Haynes.)

4 plants for the conservatories. (By exchange with the New York Zoological Society.)

35 plants for the conservatories. (Given by Mrs. Geo. E. Barre.)

2 plants for the herbaceous grounds. (Given by Mr. W. A. Manda.)

8 plants for nurseries and conservatories. (Given by Mr. C. L. Allen, Floral Park, N. Y.)

2 plants for the conservatories. (Given by Dr. J. N. Rose, Washington, D. C.)

6 plants for the conservatories. (Given by Mr. Wercklé.)

2 plants of *Elliottia racemosa*. (Given by the P. J. Berckmans Co., Augusta, Ga.)

5 plants for the conservatories. (Given by Mr. John Bestelmeyer.)

2 plants for the conservatories. (Given by Mr. Hamblet.)

4 plants for the conservatories. (Given by Mrs. N. L. Britton.)

27 plants for the conservatories. (By exchange with Mr. Weinberg.)

42 plants for the conservatories and nurseries. (Given by Mr. Wm. H. S. Woods, Greenwich, Ct.)

22 plants for the conservatories. (By exchange with Fairmont Park, Philadelphia, Pa.)

7 cacti for the conservatories. (Given by Mr. E. G. See.)

184 plants for the conservatories. (Given by Mr. W. B. Kunhardt, in memory of his mother, Catharine Kunhardt.)

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2 plants for the conservatories. (Given by Mrs. J. Doornbos.)

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Director of the Laboratories

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SUGGESTIONS FOR THE PRESERVATION OF OUR NATIVE PLANTS.*

As man began to pass from the so-called pre-human state into the human state, he doubtless early made a crude classification of the plants by which he found himself surrounded, distinguishing those that could in one way or another be made useful from those found from experience to be without value, which latter he presumably soon further subdivided into those distinctly harmful, and those that were simply without any useful properties. Later, probably as a result of increasing numbers, he was forced to occupy new territory, where he found himself surrounded by new plants and animals of which he acquired knowledge, and, when possible, adapted to his needs. It seems beyond dispute that for many centuries early man wandered over wide areas, driven hither and thither in his pursuit of means of subsistence, and so it came to be established that the animals and plants in nature belonged to him who could take and hold them. Notwithstanding the fact that certain prescribed areas came to be recognized as the "hunting grounds" of the individual, the family, the tribe, or the nation, countless generations passed before private ownership of the soil was established as we know it at the present day. Plants and animals were, in large measure, common property. But with advancing civilization private ownership became more and more firmly fixed and carried with it, as a matter of course, jurisdiction over the plants and animals, but as wild animals have ever been held as of greatest importance, laws and

* Awarded the first prize of fifty dollars, competition of 1902, from the Caroline and Olivia Phelps Stokes Fund for the Preservation of Native Plants

regulations governing their disposition have been most prominent. Beyond restrictions regarding forests and a relatively few plants of economic importance, plants as they occur in nature were, and are even at the present day, looked upon largely as common property. It is thus seen to be difficult, indeed impossible, to estimate the impress that these countless generations of license have left on the present generation. To stem the tide seems well nigh impossible, but as certain of our more delicate or showy plants seem on the verge of extinction, as the result of thoughtless, not to say wanton, destruction, it would seem that the time had come when steps must be taken before they are numbered with the relics of the past. The problem is how this end may be accomplished.

As already suggested it is practically only those plants and animals that enjoy a real or fancied economic importance that have been the objects of protective enactment, and even in this respect laws for the protection of plants have lagged far behind those safeguarding animals. More or less rigid laws have been in force in England for several centuries, having as their object the protection of the so-called game mammals and game birds. When America was first settled by European races, game of all kinds was found so abundant that its supply seemed inexhaustible, and it is only within the past two or three decades that the public conscience has been awakened to the danger of its total extermination, and as a result of this awakening every state and territory in this country now has, for the most part, a carefully drawn game law, and within the past year we have had the first effective national legislation—the so-called Lacey act—which makes the transportation of game of all kinds, or birds used for decorative purposes, from one state to another, a crime against the United States.

Parallel with this in large measure is the case of our forests. This country is so vast and the forest area was so enormous that the supply seemed illimitable. But wise heads long ago foresaw the parallel between this country and the various European states regarding forest denudation and sought to stay the tide of destruction. But it was only when the actual end was in sight that

remedial measures were seriously thought of, and as a result forestry has gained more ground within the past ten years than during all the world's history. As proof of this quickening interest it may be stated that the U. S. Department of Agriculture, through its bureau of forestry, which in 1898 offered to take charge of and administer private forest lands along the lines of scientific forestry, now has actually under its management 176,975 acres, and has on file applications from private owners covering over four million acres. Add to this the fact that the U. S. Government has set aside 41 forest reserves in various parts of the country, having a total area of 46,827,969 acres, and we can appreciate how forest protection has grown.

We may return for a moment to the consideration of the birds that are not ranked as game birds, for they furnish the closest parallel with our plants. As they are practically valueless for food they were not at first included under protecting laws. They were common property to be destroyed at will. Under the caprice of fashion millions were destroyed annually simply for decorative purposes. Owing to this ceaseless persecution not a few species were threatened with absolute extinction, and only then did the sentiment for their protection begin to gain ground. At first confined to a few nature-lovers, the agitation has spread, until, within the past ten years, we have seen a veritable wave of sentiment for bird-protection extend from end to end of this country. Dozens of societies for the study and protection of birds have been organized, magazines of similar scope have been established, numerous books have been written, and finally legislation has been enacted making it a crime against the state or the nation to traffic in our song or insectivorous birds. As the result the birds of the sea-shore, plain and forest are to be spared to us.

I have ventured to indulge in this somewhat lengthy preamble for the purpose of showing on the one hand, the difficulties that naturally inhere in the problem before us, and on the other hand, to set forth the measure of encouragement afforded by kindred undertakings. To devise means for the adequate protection of our native plants will not be easy, but the same might have been said a few years ago about our birds, yet their protec-

tion by legislative enactment and an awakened public sentiment is an accomplished fact. It is but reasonable to suppose that the same may in time be accomplished for our vanishing plants.

It seems to me that all legitimate effort that can be made for the conservation of the native flora is naturally divisible into two fields—first the broader, higher plane of enlightened public sentiment regarding the protection of plants in general, and second the immediate steps that must be taken to save certain of the more showy or interesting forms now threatened with extermination. The first is something we may reasonably hope for, even if it comes slowly; the second is a practical question that must be solved quickly or it will be too late.

It has been pretty conclusively shown above that as the plants most in need of the safeguarding are without a definite money value, it can only or largely be accomplished by an appeal to sentiment. As forests possess this economic value, their conservation may safely be left in the hands of interested parties. Under the guidance of this growing band of expert foresters the future is reasonably assured. The public must be educated up to the point where it will be possible for them to enjoy the flowers and plants of field and forest without destroying them. They must be led to see that it is only selfishness which prompts the indiscriminate plucking of every bright-colored flower or shapely fern that attracts their eye. A walk afield, enlivened by the presence of flowers and birds, leaves behind a memory that may be cherished for years. The ruthless breaking up of this rounded symmetry of nature, simply for the gratification of the moment, leaves a void impossible to fill.

As a means of awakening this more or less dormant public sentiment, I would make the following suggestions:

In large measure it can be accomplished by the aid of the public press. As perhaps the best means of reaching this field, I would advocate the formation of what may be called a *press bureau*. That is, an individual or a set of individuals should be charged with the duty of preparing, from time to time, short, crisp, readable accounts of this movement. These should be printed on slips in the form of "copy" and distributed as widely as pos-

sible to newspapers and other periodicals, accompanied with a request to the editor for publication if found available. Some will of course find their way into the waste basket, but if supplied in this convenient form, many will undoubtedly be printed. This work should not be sporadic, nor on the other hand would it be wise to crowd it.

As a further means of spreading this movement I would advocate the establishment of a national society, aiming to do for plants what the Audubon Society has so well done for our birds. This of course should be in no wise a technical botanical society, but an organization adapted especially to children, young people and nature-lovers in general. With relatively slight modification the constitution of the Audubon Society could be adapted to the needs of an organization of this kind, for which I venture to suggest the name *Torrey Society*. There could be no more fitting memorial to this celebrated botanist than a society devoted to the preservation and popular study of the plants he loved so well.

The establishment of chapters of this society should be urged in centers where interest, however slight, is manifested, and in time a journal devoted to it its needs could be inaugurated. At first, however, it might be best to affiliate with some existing publication, after the manner of the magazine *Bird-Lore*, which is the official organ of the Audubon Societies.

Another fruitful field to be cultivated is the public school. Probably no class in the general public is so destructive of flowers and plants as the average school child. Most children are naturally destructive, but most of this comes from thoughtlessness which can be in large measure corrected by judicious instruction. As a first step toward securing this correction the aid of teachers of nature classes should be secured. Leaflets setting forth the objects of this movement should be widely and systematically distributed among teachers, and if practicable a reading book adapted to the lower grades of public schools should be prepared, in which interesting accounts of plants and plant-life should be woven with appeals for plant protection.

The establishment of school gardens should be heartily en-

couraged, for the abundant success attained by these gardens, both abroad and in this country, shows beyond question that children are easily interested in watching the processes of plant growth, and when once their interest is aroused half the battle for plant protection is won, at least so far as they are concerned.

We may now turn our attention to ways and means calculated to produce immediate results. "Immediate" is the only word that can be used here, for in certain localities such as the proximity to large centers of population, watering places, summer resorts, etc., many plants are approaching dangerously near the point of being destroyed absolutely.

As a first step toward this end, it seems to me that the public should be informed once and for all, that none of these plants that it is desirable to protect have any definite intrinsic value. They should be made to understand that the plants are simply a part of the definite setting of nature that it is important for esthetic or scientific reasons to maintain. The cupidity of the average human being is so great, that, if it were simply rumored that these plants could command a money price, their doom would be fixed.

Wherever it is possible, signs should be erected containing warnings against the plucking of flowers or fruits or bright-colored leaves from shrubs and trees. Most residents of cities are already familiar with rules against mutilating plants in parks and along public streets, and similar warnings, if posted conspicuously in the more rural locations, will undoubtedly have a salutary effect. There should be no disposition to exclude the public from the enjoyment of the beauties of nature, so long as the rights of others are recognized. I have in mind a very large landed estate, which the public is invited to enjoy, the only condition being that the plants and animals must not be disturbed.

Whenever certain species of plants are becoming rare on account of devastations by man, signs should be posted along conspicuous routes requesting moderation in gathering, or even abstinence, on the part of the public. These should not be worded so as to direct the public to the exact spots where the plants may be found, but rather of a general nature, calculated simply to call attention to the fact of their rarity.

As many persons may not recognize a plant by its common or scientific name, it might be well to post in a conspicuous place a colored drawing of it, or in the absence of this a dried specimen (suitably protected by glass) and requesting that if the plant is found in the vicinity that it be not disturbed. Teachers of nature classes could be of great assistance in bringing rare plants to the attention of their pupils in this manner. In public lectures forming parts of nature courses, speakers should be urged, when possible, to inform their audiences of this movement, and request their coöperation.

In this connection I can but urge again the formation of local societies for plant protection, perhaps under the guidance of a central or national organization, which could supply them with leaflets for distribution and otherwise direct their energies into the most fruitful channels.

And finally, after having dealt with the so-called "general public," it may not be amiss to say a word to the botanist. It has not usually been thought necessary to protect plants from botanists, for of all people they should be interested in the protection of our flora. No true botanist will in any way endanger the perpetuation of a rare or interesting plant, nor will he knowingly become a party to such a crime. It would be small encouragement indeed to the public for the botanist to preach moderation to them and be known to indulge in unlimited or indiscriminate personal accumulation.

F. H. KNOWLTON.

U. S. NATIONAL MUSEUM, WASHINGTON, D. C.

MR. A. HENRY'S COLLECTION OF CHINESE PLANTS.*

This collection of plants from different part of China and Formosa, which has lately been purchased by the New York Botan-

* The very important collection here described at our request by Dr. Henry, the indefatigable collector, gives us the best herbarium series representing the Chinese flora in America, and it will serve to answer many botanical and horticultural questions, as well as others made likely by the recent establishment of the Chair of Chinese at Columbia University. It was purchased by means of contributions kindly made by members of the Garden.

ical Garden, consists of nearly 8,000 sheets of dried specimens. Ferns and their allies with a few mosses number about 500 sheets, the remainder being flowering plants. The greater part of this herbarium was gathered and dried by Mr. Henry himself and natives working under his direction. Still there are a good many specimens which he received from other collectors; and the most important of these contributions will now be briefly alluded to.

Dr. Ernst Faber in 1887 made a botanizing trip to Mount Omei, the famous sacred mountain of western China; and a complete set of plants collected, some 1,200 numbers, was presented to Kew. More than 100 new species have already been described out of this material. Dr. Faber also gave a second, less complete set to Mr. Henry, which forms part of the present collection. This set is now very valuable, as Dr. Faber's own herbarium was afterwards accidentally destroyed by fire in Shanghai, and duplicates of the Omei plants are not extant elsewhere.

The flora of Hong Kong and of the adjacent mainland as far as the Lofau Mountains in the province of Canton, is fairly well represented in this collection, as Mr. Ford, the superintendent of the Hong Kong Botanical Garden gave to Mr. Henry from time to time many specimens which were collected in this area. Other collectors in differents parts of China have also contributed, as may be seen by the labels of numerous specimens, which bear the names of these collectors and the exact localities where the plants were gathered.

Mr. Henry's own great collections were made in four regions, namely: Central China, Hainan, Formosa and Yunnan. In the present herbarium there are nearly 1,000 specimens from central China, by which is meant the mountainous parts of Hupeh and Szechwan in the vicinity of Ichang, a town on the river Yangtse inland from Shanghai about 1,000 miles. Hainan is scarcely represented at all in the collection, as the material collected there was not extensive enough to be divided into sets, and was given in its entirety to Kew.

The Formosan plants number about 1,000 species and constitute a large proportion of the known plants of the accessible part of that island. Its eastern half, a great mountain mass, is

inhabited by savages, and is as yet little explored botanically. The flora of Formosa, the northern neighbor of the Philippine archipelago, is, since the acquisition of that group of islands by the United States, of especial interest to Americans, and any study of Philippine plants necessitates comparison with those of Formosa. This part of the collection should be appreciated in New York.

The Yunnan part of the collection contains about 4,500 numbers, comprising probably 3,000 species. All those plants were collected in the years 1896 to 1900 from two stations as centers, Mengtse and Szemao. These are frontier customs posts, close respectively to the borders of Tonking and Burmah. With the aid of native collectors the country within a radius of 100 miles from each station was fairly well botanized over. Southern Yunnan is an entirely mountainous region, a succession of deep valleys and high ranges. Collecting was carried on in a wide range of altitude, from 1,000 feet above sea level in the deep defiles of the Red River to 10,000 feet, the height of many peaks, both to the north and south of that river. Collecting near Szemao touched upon the watersheds of the Mekong and of the Black River. The flora of the lower levels in these regions is quite tropical in character: higher up, it is like that of the temperate parts of China, and many Ichang plants were here again met with. Purely alpine types scarcely occur in Yunnan even at 10,000 feet altitude.

The Yunnan plants are now being gradually identified and described as regards new species at Kew: but half of the natural orders are as yet not worked up. Still it is possible to glance at some interesting features of the collection. The immense number of ferns, about 250 species, is astonishing; and they include, besides many new species, two new genera, one of which, *Archangiopteris*, is a striking new type in the small group of Marattiaceae. *Cheiropteris* has been described as a new genus by Christ of Bâle; but Baker regards this as merely a novel species of *Polypodium*. Whatever may be determined ultimately concerning the proper seat of this fern, it is very remarkable and distinct in several characters. *Scolopendrium Delavayi* is a pretty

Yunnan fern, only comparable in habit to a curious Mexican species.

A hasty glance through the flowering plants impresses us with the great preponderance of woody species, the great variety of trees, shrubs and lianas. Even amongst Compositae we find two or three trees. *Leucosceptrum* is a small tree belonging to Labiatae, which is almost universally a herbaceous order. The series of oaks and *Castanopsis* is extreme, and striking in the great diversity shown in foliage and fruit. *Quercus Rex* Hemsley, from Szemao is perhaps the most beautiful oak known, whether we regard its delicate large leaves or its magnificent acorns, the cups of which are two inches across. There are many peculiar genera, some of which are new, as *Bretschneidera*, *Itoa* and *Hartia*. The first of these may be described popularly as a horse-chestnut with pinnate leaves. Attention is directed to *Rhodoleia*, a large tree with crimson flowers of peculiar structure and extreme beauty. *Tupidanthus* is the most curious member of the Aralia family ; each flower has about 100 stamens and an ovary of 160 cells. *Trevesia palmata*, belonging to the same order, is remarkable for its enormous leaves, most variable and *bizarre* in cutting and lobing. Dimorphic leaves, the signification of which is unknown, occur in several genera, as in the new species, *Lespedeza diversifolia* and *Shuteria sinensis*. The two most beautiful species of *Lonicera* known occur in Yunnan : *L. calcarata*, which has a long spur to the corolla, and *L. Hilldebrandiana*, with flowers seven inches long.

The herbaceous plants include many interesting types. Three of the four known genera of the primitive family Saururaceae are represented in the collection, *Saururus*, *Houttuynia* and *Gymnotheca ;* and different stages in the development of attractive floral organs are well shown in the various types. All are destitute of any perianth : one whitens the stamens ; another whitens at the time of flowering the uppermost leaf of the stem ; and a third develops a colored involucre of white bracts: The Cyrtandraceae, characterized by dainty foliage and pretty flowers, are represented by about 70 species, half of which are probably new. *Lysimachia insignis* is the most remarkable species of this widely spread genus.

The collection, so far as Mr. Henry's plants are concerned, is a duplicate of sets presented at various times to Kew; and while not so extensive, is of great value, as containing numerous type specimens of new species.

In a short paper like this only a few points of interest have been touched upon. For more details concerning Mr. Henry's botanical explorations, the reader is referred to an article by him, entitled "Midst Chinese Forests," which appeared in the *Garden* of January 4th last. This article touches upon the different parts of China and Formosa botanized over, and has references to some of the plants contained in the collection now described.

AUGUSTINE HENRY.

LONDON, February 1, 1902.

PRODUCTION OF CINCHONA BARK AND QUININE IN THE EAST INDIES.*

Among our very early historical writings we find references to diseases which can have been only malarial in their nature, and, from that time until the present, the conflict with this plebeian disease has occupied a large part of the attention of physicians and has consumed an important part of the resources of mankind, in many and extensive territories. No nation but has had the operations of its armies checked or interfered with by encountering this adversary; no great industry but has been at times partly paralyzed by it; no explorer but has suffered from it; scarce a country whose development has not been modified by it in some direction, while it has actually rendered many regions almost uninhabitable.

Its nature and ultimate cause remained unknown until very recently. Hippocrates attributed it to the use of marshy waters, while Galen recognized a marsh poison which contaminated the atmosphere, and it was many centuries before we advanced farther than to speculate upon some form of one or the other of these theories.

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* Abstract of a public lecture given at the New York Botanical Garden, Nov. 9, 1901.

Up to the seventeenth century, our efforts in the direction of its treatment were scarcely more successful than in ascertaining its nature. It was known that substances which were tonic rendered the system stronger to resist its action, as they do in all diseases, and that some of these vegetable bitter tonics seemed to exert a stronger preventive action in this than in other diseases ; it was also known that arsenic, mercury and some other drugs seemed markedly to check its development and favor recovery ; but until the year 1638, the world knew of no substance which could be justly regarded as specifically fatal to the unknown cause of the malarial disease. In that year it was made known that a royal personage of Spain had been cured of malaria by the use of a bark brought to her attention by the Jesuit missionaries in the tropical South American Andes, and on this account it was long known as Jesuits' Bark. It was also, for other reasons, called Crown Bark, Peruvian Bark, Quina, etc. Ignorance, prejudice, jealousy, ultra-conservatism and mistaken and presumptuous theology met it with an unusually liberal share of that opposition which falls to the lot of most drugs, and which does not a little toward establishing their success, if worthy. This opposition helped to make it known and to secure its trial, and the result of trial proved its special activity. From having used it experimentally, physician and patients alike came to rely upon it with security, and its use became world-wide. Early in the nineteenth century efforts, many of which had formerly been unsuccessful, resulted in the discovery of a crystalline constituent having the medicinal action of the bark in a degree greater than the latter, in proportion to its existing percentage. This was cinchonine and its discovery was soon followed, in a different variety of bark, by that of the more energetic alkaloid quinine. The extension and use of these alkaloids did something of far greater importance than to contribute to the convenience of physicians, patients, travellers and armies and of those who desired to fortify themselves against anticipated attacks of the disease ; for it permitted more exact experimentation as to the nature of the malaria and the effects of drugs upon it. This and other influences pertaining to the modern exact sciences

have at last solved the problem of malaria, and of the relation of quinine to it. Any one who is a trained observer and who will take ordinary care can now perform the following experiment: He can allow a mosquito to feed upon a person who exhibits the malarial disease and in whose red blood corpuscle the malarial animal has been found by microscopical examination. He can then permit this insect to feed upon another person who has presented no such symptoms and whose blood has been found uncontaminated. As a result of this, and of no other process, the second individual can be brought into the same condition as the first. The cinchona products can then be administered to either, resulting in the removal of the disease and its cause, while both persist in the other individual. The blood of the latter can now be drawn and tested with the cinchona products, while under microscopical observation, and the fatal effects of the latter upon the malarial animal seen to result, thus completing the chain of evidence to prove that this drug is a true specific for this disease. There is, of course, much still to be learned about the conditions and methods for producing the best results, but the malarial dragon is practically slain. The little fear that the explorer or the soldier now feels for it results from his lack of power to control the circumstances, rather than from any consciousness of a want of means at command.

Let us now supplement this glance at the history of the science of our subject by a brief review of the practical development of our present ready means for utilizing such knowledge.

In 1638 the first undoubted cures by cinchona bark were made known to scientific medicine, such as it then was. One hundred years later the plant producing it became known to botanists, and unsuccessful attempts were made to bring it alive to Europe. During the next century the use of the bark increased to a phenomenal extent. The original districts were exhausted and new ones levied upon, new and superior species being discovered in the meantime, and their stores, in turn, alarmingly depleted. All of the 30 or 40 species of the genus were sought out and experimented with, but most of them were found either wholly or largely wanting in active constituents. Every related plant which

appeared likely to possess the desired property was investigated, but in spite of this employment of all resources, the supply steadily decreased and the necessity for artificial propagation became more and more apparent to thoughtful men. Such efforts in the producing countries were seen to be hopeless and strenuous efforts were made to transplant the industry to the old world tropics. In 1847 the first plants were brought alive to Paris, but were not put to any practical use. In 1854, Hasskarl, in the face of great natural and artificial obstacles, including persecution and imprisonment by the natives, succeeded in actually securing the propagation of the plants in Java. Much money was expended in the multiplication of this stock, both here and in India, but the investment was lost because the wily natives had supplied Hasskarl with the seeds of a worthless species. In and about 1859, Markham and his associates, aided in a miserly way by the British Government, secured the propagation in India of various species, possessing different degrees of value. Later, Ledger, one of Markham's former assistants, through the knowledge and self-sacrificing efforts of an old native servant, who was afterward beaten to death for it by the natives, introduced the best of all known species, later named after Ledger. His stock of seeds was purchased by the Dutch for cultivation in Java and was afterward distributed also in India.

The subsequent extension of this industry has been enormous, but during its incipiency a period of very great scarcity was encountered. Our Civil War dealt the last severe blow in the process of depleting the world's stock of cinchona trees; or perhaps we might better say that the Franco-Prussian war did this. In the latter part of 1870 to '80 decade the price of good cinchona bark advanced to $4 or more per pound, and that of quinine to two or three times as much per ounce, thus stimulating to the utmost the cultivation operations then in progress. British India, which has always been one of the severest sufferers from malarial disease, required a cheap supply of the specific for its soldiers, as well as for its native population. India therefore not only cultivated it extensively but entered upon the plantation-manufacture of a cheap alkaloidal mixture. Private enter-

prise there embarked in the business to some extent, but this interest did not reach any really great proportions, and has since declined, so that in India proper the industry is more particularly known as a governmental and a domestic one. In Ceylon, private capital was invested upon a very extensive scale. In fact, cinchona cultivation there became a craze, and was overdone. The Ceylon bark was not particularly rich and this fact, coupled with its enormous amount, forced a disastrously low price, so that a sudden and violent reaction followed, the crop being largely uprooted to make way for tea-plants. Later, a root disease attacked and almost completely exterminated the remaining cinchona plants and the Ceylon product has since been scarcely a factor. Considerable plantations were established in South America, from stock reimported from the East, and were for a long time highly profitable, but cost of production does not admit of competition with the East and they too have ceased to be influential. Experimental plantations were established in various other countries but, with the exception of Java, either became extinct or never reached any importance.

In Java, the operations, while under government direction, have always presented a more distinctly commercial aspect than elsewhere. They have been continuous and steady, conservative but progressive. Not only has their extent increased, but the quality of the bark has steadily improved, until now twelve per cent. of alkaloid, or occasionally even fifteen per cent., has replaced the three or four per cent. which was formerly considered an excellent yield. At the same time, the processes of cultivation, harvesting, packing, shipment and commerce have become revolutionized in every detail, until the best of bark can now be had at from twenty-five to forty cents per pound, and the price has actually been very much lower. A further economy is sought by the Java producers through the manufacture of the alkaloid at home and this industry is apparently established upon a perfectly successful basis. For the ten or fifteen dollars an ounce, formerly charged, the price of less than twenty cents has been substituted. The price is now about 30 cents and the Java operations bid fair permanently to maintain it thereabout. It is

apparent therefore that Java is to be regarded as our great commercial source of the cinchona products.

A few years since I carefully compiled statistics of cinchona production and consumption. Making reasonable allowance for subsequent changes, I judge that there are now about 70,000 acres planted with about 75,000,000 cinchona trees and that the annual consumption of bark is in the neighborhood of 30,000,000 pounds.

About a year since, my friends, Mr. and Mrs. F. L. Seeley, of St. Louis, made an extended visit to these Java cinchona districts. Mr. Seeley thoroughly studied the industry and secured a large number of characteristic illustrations. I hoped to induce him to favor you with a personal account of his observations. This he found it impossible to do but suggested that I should use his slides and notes and perform the service for him. I have therefore presented this historical introduction and now propose to exhibit and comment as well as I can upon the illustrations.

H. H. Rusby.

THE ENDOWMENT FUND.

Since the publication in the February Journal of the statement of the Finance Committee of the Board of Managers on the need of additional endowment, the following contributions have been received:

Amount reported in the statement	$307,397.93
From Mrs. George Whitfield Collard, in memory of the late Josiah M. Fiske	5,000.00
Sixteen Life Membership fees	1,600.00
Student's fees added to Students' Research Fund	105.00
Total	$314,102.93

NOTES, NEWS AND COMMENT.

Through the kind interest of the Hon. John E. Eustis, Commissioner of Parks of the Borough of the Bronx, over two thousand specimens of plants have been added to the collections

in the Public Conservatories, through the distribution of the collection previously accumulated in the nurseries of the Department of Parks near the Lorillard Mansion in Bronx Park. The Commissioner has directed that these nurseries be used only for the propagation of decorative plants suitable for planting in the public parks, and will thus avoid the large expense of maintaining there a miscellaneous greenhouse collection. The specimens thus obtained are now being labelled and incorporated into the public collections.

Mr. S. H. Hamilton, of the Philadelphia Academy of Natural Sciences, has been commissioned to collect material for the Garden during his expedition to Santiago, Cuba, and vicinity. Mr. Hamilton proposes to secure a large collection of both plants and animals during his trip, which will be extended over some eight weeks. While stopping off at the Bahamas on his way to Santiago, he obtained a small collection of museum and herbarium specimens, which has already been received.

The large collection of fungi recently presented to the Garden by Dr. John S. Billings has now been incorporated into the herbarium. This collection contains much valuable and interesting material; besides numerous specimens collected by Dr. Billings in the vicinity of Washington, D. C., there is a nearly complete series of Ravenel's Texan collections; it is particularly rich in representatives of the Sphaeriales, and includes many specimens of types or of authenticated specimens from the herbaria of Ravenel, Curtis, Schweinitz, Fries, Berkeley, Broome and other older mycologists.

The series of herbarium specimens of Mexican plants collected in the States of Jalisco, Mexico, Zacatecas and Lower California by Mr. Leon Diquet and presented to the Garden by the Duke de Loubat, has just been mounted for the herbarium. Other noteworthy series of Mexican plants recently added are the J. G. Schaffner collection, secured through the purchase of the Vigener Herbarium, and especially rich in the flora of middle Mexico, particularly the State of San Luis Potosi, and the C. L. Smith collection consisting of specimens from the region of the Isthmus of Tehuantepec and contiguous states in southern Mexico.

Mr. Albert de Lautreppe, who was commissioned last year to obtain material for the Garden during his visit to Peru on a mining errand, has recently returned, bringing with him a notable collection of small cacti, which have mostly been incorporated into the public series in conservatory house No. 5, a considerable number of other living plants, and over two hundred packets of seeds which have been sown in the propagating houses. He also secured some herbarium specimens, principally of lichens and mosses.

The total amount of precipitation in the Garden during February amounted to 5.2 inches. Maximum temperatures of 35° on the 2d, 37° on the 7th and 15th, 36° on the 20th, 45° on the 23d, and 59° on the 27th, and minima of 9° on the 4th, 5.5° on the 6th, 13° on the 15th, 11° on the 19th and 21st, and 10° on the 22d were observed. The coldest weather was during the week beginning the 3d, the temperature continuing under 32°, excepting for an hour or two during the middle of the day on the 7th and 9th; another cold spell occurred in the following week, although the temperature was relatively a little higher. The severe storm of the 21st and 22d did considerable damage to the trees, especially to the white pines.

ACCESSIONS.

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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.

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. Vol. I, Nos. 1–5, 449 pp., 3 maps, and 12 plates, 1896–1900. $3.00. No. 6, 232 pp., 20 plates. **Free to all members of the Garden; to others, 50 cents.**

Memoirs of the New York Botanical Garden, Vol. 1. 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. Price to members of the Garden, $1.00. To others, $2.00. [Not offered in exchange.]

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

No. 1. Symbiosis and Saprophytism, by Dr. D. T. MacDougal.

No. 2. New Species from western United States, by Dr. Per Axel Rydberg.

No. 3. The dichotomous *Panicums*: some new Species, by Geo. V. Nash.

No. 4. *Delphinium Carolinianum* and related Species, by Dr. Per Axel Rydberg.

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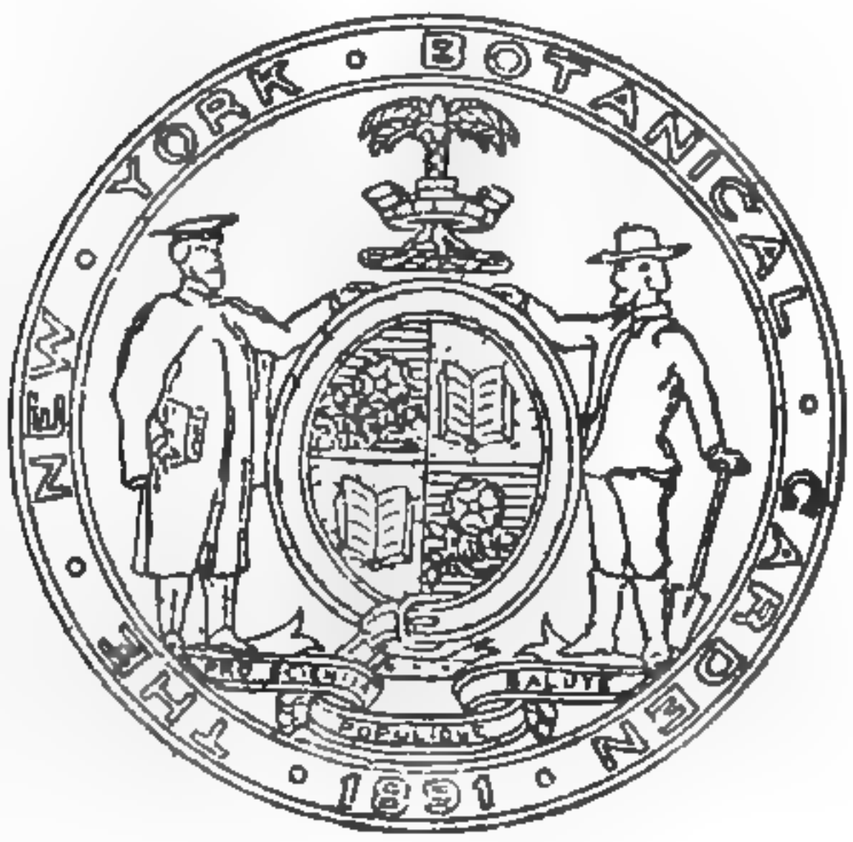
Director of the Laboratories



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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 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 train leaves Bronx Park at 5.42 P. M. Excursion fare 25 cents.

Opportunity will be given for inspection of the Museums, Laboratories, Library and Herbarium, the large Conservatories, the Herbaceous Collection, the Hemlock Forest, the Fruticetum and parts of the Arboretum site.

The spring course of lectures will be delivered in the Lecture Hall on the Museum Building of the Garden, Bronx Park, on Saturday afternoons, at 4.30 o'clock, as follows:

April 19th, "The Maples and other Early-flowering Trees," by Cornelius Van Brunt; April 26th, "Plant Life of the Sea," by Dr. Marshall A. Howe; May 3d, "Botanical Features of Porto Rico," by Professor L. M. Underwood; May 10th, "Some Examples of Botany in its Relation to Geology," by Dr. Arthur Hollick; May 17th, "Wild Flowers, the Necessity for their Preservation," by Mr. Cornelius Van Brunt; May 24th, "The Cottons," by Dr. H. H. Rusby; May 31st, "Cactuses and Cactus-like Plants," by Dr. N. L. Britton; June 7th; "Favorite Flowers of Nations and Poets," by Professor E. S. Burgess; June 14th, "The Vegetation of American Deserts," by Dr. D. T. MacDougal.

The lectures will be illustrated by lantern slides and otherwise. They will close in time for auditors to take the 5.42 train from

the Bronx Park railway station, arriving at Grand Central Station at 6.08.

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

NEW MISSIONARY WORK.*

Again we are called upon to rally to the defense, this time of our native plants. One becomes a little weary of this constant warfare, but nothing is more certain than that we are not put into this world to avoid action, since it is absolutely impossible for us to avoid responsibility, those who refuse to hear about a wrong being as accountable for the continuance of said wrong as those who, hearing, refuse to act; and they in turn are no less to blame than those who act, but act ineffectively or injudiciously.

Since we have no reason to discredit the statement that our native plants do require protection, it becomes our duty to inform ourselves as to the dangers which threaten them, to ascertain the best means of combating these dangers, and to consider how we, individually, can aid in the warfare.

The circular of the New York Botanical Garden calls for "Essays on the Preservation of Wild Plants, including shrubs, herbs, and trees." We are tempted to consign schemes for the preservation of trees to the Forestry Association †; there is surely no danger of the extermination of tree-species by the gathering of tree blossoms? Possibly not, but species-extermination is not the only evil that threatens our flora—we wish also to guard against a decrease in the number of individual plants of useful, interesting or beautiful species. In 1891 Dr. Farlow ‡ called attention to the destruction of shade trees on country roadsides and the streets of villages, towns and cities through the gross indifference of the town and city fathers and the public generally, who allow tele-

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* Awarded the second prize of thirty dollars, competition of 1902, from the Caroline and Olivia Phelps Stokes Fund for the Preservation of Native Plants.

† The American Forestry Association, Washington, D. C.

‡ W. G. Farlow. Diseases of Trees Likely to Follow Mechanical Injuries. Read before the Massachusetts Horticultural Society, March 7, 1891.

graph and telephone men to mutilate the branches, the horses of the milkman or grocer to gnaw the bark, and ignorant officials to prune the trees, or even, on the slightest pretext to cut them down. He says: "It is all very well to talk about the protection of forests and the formation of National Parks in distant states. But we have our own forests which are the trees in our streets and public grounds, and before turning our eyes in other directions, we had better see what is needed at home. . . . Not a few of our New England towns owe their prosperity as summer resorts to the arching elms and rounded maples whose loss no money could replace . . . an effort should be made to secure legislation which shall make compulsory the placing of guards around trees in exposed places. Furthermore, the care of trees in public grounds should be entrusted only to persons specially trained for the purpose."

Botanical friends who spend summers in the country complain of the ruthless way in which, in mending or widening the roads, the most beautiful wild growth is destroyed through being ploughed up, mowed down, or smothered with stones or gravel, and suggest that the missionary movement should especially aim at reaching selectmen, roadmasters, or those who act, in more ways than one, as highwaymen.

The chief danger that menaces our native plants is from those who cut or dig them in quantity to sell in the cities. We rely upon the Forestry Association and the Plant Protection Society to tell us whether the evergreen trees, pines, spruces and firs are in danger from the wholesale attacks they suffer in December. It pains some of us to see the cart-loads of Christmas trees brought into the city annually, to be enjoyed but for one night, and then to be cast aside. We read * of children in an English village going out to the plantation to dig up their Christmas tree, planting it carefully in a tub before they bring it into the house; after it has appeared in full glory at their evening party, they trundle it in a wheelbarrow, "all its ornaments bobbing wildly" down to a neighbor's, where it delights the eyes of a party of poor children. After this, it is taken back to its original home

* C. M. Yonge. Both Sides of the Shield. Macmillan.

and planted out, to grow in peace until the next Christmas. This delightful method is hardly feasible for our large cities, but possibly it can be imitated in the country.

"Trees, shrubs and herbs" the appeal reads; shrubs are perennial and picking their flowers does not kill them, but we usually have to break off the flowers with a length of branch and leaves, and this has the effect of pruning. Now though judicious pruning benefits a plant, overpruning weakens it and injudicious pruning, or pruning done at the wrong season is also bad for it. It is holly and mountain laurel that our Boston Society * calls upon us especially to protect as they are both slow-growing shrubs, and the poor laurel has to undergo two attacks annually, one for the flowers in summer and one for the evergreen leaves at Christmas time. We rely upon the same Society to inform us if we should refrain from purchasing pussy-willow, flowering dogwood, azaleas, and black-alder—the scarlet berries of the latter are very beautiful in early winter, though it lacks the leaves of its cousin the holly. The ground pine is said to be in danger from being torn up wholesale for Christmas green, and we have already been called upon in the Boston *Transcript* to refrain from purchasing the Mayflower offered for sale in quantity in the streets in early spring.

The leaflet I have just quoted is no. 1 of our Plant Protection Society and is written by Robert T. Jackson. The herbs which he deems in need of protection are sabbatia and fringed gentian, but he considers the following species so abundant as not to be in danger: marsh marigold, iris, aster, golden rod, violet, except the crowfoot (which is that? *Viola pedata?*) and houstonia. I take exception to including the houstonia in this list, because one has to dig it up in clumps, root and all—it is nearly impossible to pick it flower by flower.

The maiden-hair fern, Mr. Jackson tells us, has been nearly eradicated in this vicinity—think what a loss this is to us all—I did not even know that it formerly grew here. But I have

* For information in regard to the Society for the Protection of Native Plants, or its leaflets, application may be made to Miss Maria E. Carter, Curator of Herbarium, Boston Society of Natural History, Berkeley Street, Boston, Mass.

noticed that the evergreen native ferns are much used by Boston florists as a cheap green to add to bunches of carnations and other leafless flowers to save their hothouse smilax and diosma.

A friend in Orchard Park, N. Y., writes me that two species of evergreen ferns have been practically exterminated about Buffalo by the greenhouse men. "Where twelve years ago were luxuriant beds and rich masses of these ferns, now only a few puny specimens are to be seen. The same thing has happened to the beautiful maiden-hair fern, though it never was as abundant as other ferns." She also writes from Connecticut, "from the country about Waterbury in fact, from New Haven Co., within twenty years, the once riotously abundant *Kalmia latifolia* and plentiful *Epigaea repens* have been skinned. The latter has almost disappeared and the former grows in scrubby little plants with yellowish leaves in place of the rich dark foliage that I remember. The rose-colored wild azalea or swamp honey-suckle has become rare and the great bird's-foot violet is very rare now in this locality, although I remember its growing in sheets of blue on the sandy hillside, thirty years ago. The same story is true of the ferns here—they are sent to the New York market. We think the Goths and Huns barbarians to destroy the art treasures of Rome; but we are more barbarous toward our beautiful native trees and plants."

The agents invoked by the Plant Protection Society to prevent this wholesale destruction are:

Legislation—such as protects the Hartford trailing fern;

Moral suasion—articles in papers and magazines, explaining the dangers which threaten our native flora, and calling upon people not to buy certain species.

Education—which goes more deeply into the subject, and endeavors to teach both children and adults, by lectures, lessons, and talks, the beauty and worth of our native flora, the duty of preserving it, and the best way to enjoy it. Can we not persuade those who go out to gather flowers that a few blossoms showing the graceful outline and contrasting leaves are really more pleasing to the eye than a great crowded bunch? Surely after all these decades of Japanese art, we ought to have a generation

growing up that has learned to appreciate the beauty of a single spray, be it rose, bamboo or pine, and the eye thus trained will soon learn that those able to go to see the flowers in their natural surroundings will care but little for a bunch in a vase. For the pleasure of those unable to ramble in wood or meadow let us bring home a few of the beauties—moss, grass, sedge, fungus, fern, and flower, and arrange them as far as possible to imitate their natural surroundings—yet what columbine in a vase begins to compare with the graceful beauty of a columbine nodding on a rocky ledge?

I once read * a pleasant account of a place a friend visited in the country where the profusion of blossoming wild plants pressing up close to the house and garden filled her with amazement —thick beds of violets and wild pink in the spring—ranks on ranks of cardinal flower and gentians in the fall, and other flowers in their season between. "How do you manage to have so many?" my friend exclaimed. "It is the children," replied the mother. "I have taught them to love the flowers as they grow —to protect and care for them, and not think they must be always plucking them; it requires some resolution not to gather a flower but if they cannot practice self-command now, how are they to learn it when they grow up?"

Children thus brought up will be welcome visitors everywhere; they will not gather the single spike of fringed orchis that we have been enjoying for a week on the hill-path, nor the clump of black-eyed Susans that nodded to us every time we stepped out onto the piazza, nor the starry campion that sowed itself in the oval; and still less will they maraud over the place, plucking every one of the field lilies that are so handsome standing erect and stately, with the sun streaming through the red petals, against a background of grass and bushes, and look so commonplace in a great crowded bunch. When we first established ourselves at Cape Ann we heard that these lilies had been nearly exterminated by people digging up the bulbs for sale, and we resolved that not only should our bulbs be protected but the

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* S. Minns. Rights Due to Wild Flowers. "The Little Unity," Aug. 1, 1882. (The same in "The Cheerful Letter," July, 1898.)

flowers should be allowed to go to seed and propagate the plant in that way, and a lively time we had of it in lily season; we saw that there is some excuse for people who surround their places with stone walls and iron gates; grounds bordered by imaginary lines connecting boundary-stones deeply hidden in the bushes stand little chance of being considered private, and those who live all the year in the country do not realize that city people find one of the chief delights and refreshments of their summer outing to lie in the wild nature surrounding their cottage at the shore or in the country, and that they care far more for their bunch berries and ferns, their sandpipers and woodchucks than for garden roses and heliotrope. I have heard an old sea captain speak in the most scornful way of a gentleman who had erected a sign "Please Do Not Pick the Wild Flowers" in the midst of the beautiful wild growth which covered his little place. Not to let every passer-by break off the creamy viburnum blossoms which overhung the road, pluck the red lilies or tear up the pink bindweed seemed to this good old sea captain the acme of selfishness, although the owner of the place had shown a very unselfish interest in his neighbors and had done much for the good of the village.

Let us then establish letters, talks, classes and societies to interest everyone in the life of plants; let us teach them to care for the plants as individuals, to be interested in watching them *in situ*, to study the growth of the shoots, the twining and climbing of vines, the way the flowers are fertilized, which insects visit which flowers, which the plants guard against, and all curious facts about seed-dispersion, and it will soon cease to be an aim merely to gather as large a bunch of flowers as possible, and then perhaps to tire of it and throw it down, wilting, in the dusty highway.

A useful tract to influence young children is "Grandmother's Spring," by Mrs. J. H. Ewing. I fear it is now out of print, but pressure should be brought to bear upon the publishers * for a new edition; it is a small thin picture-book, with chromo-litho-

* London: Society for Promoting Christian Knowledge; New York: E. & J. B. Young & Co.

graphs on every page, the text being squeezed into the sky or other small areas of vacant space. I quote as briefly as possible the moral, which is what the old grandmother says to the children when they are going a-maying :

" Little kings and queens of the May,
Listen to me ;
If you want to be
Every one of you very good,
In that beautiful, beautiful, beautiful wood,
Whatever you pluck,
Leave some for good luck ;
Picked from the stalk or pulled up by the root,
From overhead or from underfoot,
Water-wonders of pond or brook,
Wherever you look,
Or whatever you find,
Leave something behind :
Some for the Naiads,
Some for the Dryads,
And a bit for the Nixies,
And the Pixies.

" Harken, my child :
There is nothing more destructive and wild,
No wild bull with his horns,
No wild briar with clutching thorns,
No pig that routs in your garden bed,
No robber with ruthless tread,
More reckless and rude,
And wasteful of all things lovely and good
Than a child with the face of a boy and the ways of a bear,
Who doesn't care,
Or some ignorant little minx,
Who never thinks :
Now I never knew so stupid an elf
That he could not think and care for himself.
Oh ! little sisters and little brothers,
Think of others and care for others.
And of all that your little fingers find,
Leave something behind."

In another picture book of the same series,* a similar moral ends the story of " The Old Willow Man,"—

" Oh, children ! who gather the spoils of wood and wold,
From selfish greed and wilful waste your little hands withhold.
Though fair things be common, this moral bear in mind,
Pick thankfully and modestly and leave a bit behind."

---

* " Boy and Squirrel."

The Audubon Societies for the Preservation of Birds send out travelling lecturers, accompanied by a lantern and slides; I hardly think our work can be done in the same way, but might we not accomplish by means of a travelling lecturer who would go about to different towns giving talks, which, having the interest of the personal element, might be heeded where circulars, placards and pamphlets would fail to influence? If he could also interest his hearers in making a list of the plants of their township or county they might be stimulated to protect their plant-species, and forbid their being shipped to distant cities.

CORA H. CLARKE.

91 MT. VERNON STREET,
BOSTON, MASS.

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2 specimens of Florida plants. (By exchange with Mr. A. H. Curtiss.)

93 specimens of Wyoming fungi, collected by Professor A. Nelson.

1 specimen of *Hicoria* from Pennsylvania. (Given by Mr. Benj. H. Smith.)

39 specimens of fungi from California. (By exchange with Mr. C. F. Baker.)

167 specimens of mosses from Mt. Washington, Mass., and vicinity. (Given by Mrs. N. L. Britton.)

51 specimens of lichens, fungi and hepatics from Santa Marta, South America. (Given by Mr. C. F. Baker.)

1 specimen of a red-flowered *Erythronium Americanum.* (Given by Mr. J. Crawford.)

311 specimens illustrating the local flora. (Given by Mr. S. H. Burnham.)

17 specimens of North American grasses. (Given by Mr. G. V. Nash.)

1 specimen of *Eleocharis diandra* from Massachusetts. (By exchange with the herbarium of Harvard University.)

192 specimens of North American fungi. (By exchange with Dr. J. J. Davis.)

6 museum specimens from Bahama, collected by Mr. S. H. Hamilton.

1 specimen of *Hypochaeris radicata* from Staten Island. (Given by Mr. W. T. Davis)

1 specimen of *Opuntia arborescens.* (By exchange with Mr. J. M. Macoun.)

84 specimens of marine algae, collected by the Harriman Alaska Expedition.

136 specimens of North American grasses. (By exchange with Professor L. H. Pammel.)

43 specimens of fungi from West Virginia. (Given by Dr. W. A. Murrill.)

PLANTS.

32 Sarracenias. (By exchange with H. P. Kelsey, Boston, Mass.)

11 filmy ferns from New Zealand. (Given by Mr. L. Cockayne, Tarata, New Brighton, New Zealand.)

37 cactus plants for the Conservatories. (Collected by Mr. A. de Lautreppe.)

144 plants, miscellaneous collection for the Conservatories. (By exchange with the Department of Parks, Borough of the Bronx.)

SEEDS.

29 packets of Georgia seed. (Given by R. M. Harper.)

1 packet *Warea* seed from Florida. (Given by Professor P. H. Rolfs, Miami, Fla.)

8 packets Nassau seed. (Collected by S. H. Hamilton.)

3 packets from Nogales, Mexico. (Collected by Dr. MacDougal.)

1 packet seed of *Physalis* sp. (Given by Professor T. D. A. Cockerell, East Las Vegas, N. Mex.)

44 packets *Crataegus* seed. (Purchased from W. W. Eggleston, Rutland, Vt.)

226 packets of seed from Peru and Panama. (Collected by Mr. A. de Lautreppe.)

WEATHER REPORT FOR MARCH, 1902.

The total amount of precipitation in the Garden during March, 1902, amounted to 5.63 inches. Maximum temperatures of 47° on the 7th, 67.5° on the 12th, 66° on the 13th, 66.5° on the 23d and 63.5° on the 30th, and minima of 14° on the 7th, 25° on the 15th, 21° on the 19th and 25.5° on the 26th were observed.

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OF

The New York Botanical Garden

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.

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. Vol. I, Nos. 1–5, 449 pp., 3 maps, and 12 plates, 1896–1900. $3.00. No. 6, 232 pp., 20 plates. Free to all members of the Garden; to others, 50 cents.

Memoirs of the New York Botanical Garden, Vol. 1. 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. Price to members of the Garden, $1.00. To others, $2.00. [Not offered in exchange.]

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

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OF

The New York Botanical Garden

EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

CONTENTS

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JOURNAL

OF

The New York Botanical Garden

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A NEW METHOD OF TREATING CEREAL GRAINS AND STARCHY PRODUCTS.

The cereal grains including wheat, rice, barley, oats, maize and rye form a most important part of the food of the human race. The chief value of the cereals lies in the starch which they contain, which may amount to as much as 50 to 80 per cent. of the weight of the dried kernels.

Starch occurs in plants in the form of globose, ovoid, and oblong bodies of rounded outline, the exact shape assumed in any plant being more or less characteristic of the species. Almost any growing green plant will be found to contain starch grains in all stages of formation from the most minute to the maximum size. Those of the potato often attain a diameter of a hundredth of an inch, being visible to the naked eye. An examination of the granules with a magnification of a few hundred diameters shows that they are constructed of concentric layers or coats of alternating denser and watery layers, the centrum around which the layers are arranged being of the latter character. The granule contains from 15 to 22 per cent. of water when in an a air-dry condition. Investigation of these interesting bodies with reference to their formation shows that they are really built up like crystals, being in fact sphaero-crystals.

Starch granules when intact are acted upon but slowly by chemicals, especially the digestive enzymes. Consequently starchy substances are made more suitable for food by cooking or some method of treatment by which the granules are broken up. When starch granules are warmed in water they begin to swell at a temperature of 55° to 60° C., and burst at 75° to 80° C.,

being converted into a uniformly translucent mass known as starch paste in which the minute particles are suspended in the water, but are not dissolved.

It is well known that starch grains do not swell or break up to any great extent when heated in an air-dry condition at the temperatures employed in bread-making by ordinary methods. Although bread is one of the oldest and most widely used food preparations yet it is by no means to be considered as an economical use of starch since the granules in the center of a loaf are practically unchanged and therefore digestible only with great difficulty. The desired changes do ensue to some extent in the crust, but in prevailing methods of preparation the proportion of the whole amount of starch present made available for rapid digest tion is very small.

As a result of almost continuous work during the past year I have been so fortunate as to develop a method by which, with the application of heat to starch grains and to air-dry starch in many forms, the granules or particles are expanded to many times their original dimensions, being fractured into innumerable fragments during the process. As a result of this treatment a grain of rice is expanded to eight or more times its original volume, while still retaining its original form. Other cereals exhibit similar behavior. The process is applicable to nearly all starchy seeds and starchy substances, greatly increasing their nutritive availability. The products obtained are pleasant to the taste, and the process may be varied to produce a great variety of flavors with any given cereal. Furthermore the material prepared in this manner is absolutely sterilized and may be preserved or stored for long periods. I am led to hope from the approval the products have met from food and chemical experts that the process may prove of great economic and commercial value.

The experiments by which this method was developed were begun at Clemson College, South Carolina, in the spring of 1901, but no results of any direct bearing upon the process mentioned were obtained at that time. Upon my removal to Columbia University in August, 1901, time was afforded me to resume the investigations, and in the Laboratories of the New York Botanical

Garden every facility was given me for the prosecution of the work. I am indebted to the latter institution for the use of a chemical laboratory which was placed at my disposal and for a plentiful supply of material of all kinds as well as for encouragement and helpful suggestions from the members of the staff.

In view of the fact that I have received letters making claims in connection with the results attained above, and also that many unauthorized newspaper notices have been published in which the facts are incorrectly reported I take occasion to say that I have never heard a lecture on "pop corn" or any other subject which suggested the investigation noted above and that the principles used in the process were discovered directly in my own experiments, being entirely different from the "popping" of corn or other grains. The above note is the first statement I have made for publication upon this subject, and I do not hold myself responsible in any degree for the various sensational and misleading newspaper reports that have appeared purporting to describe the methods used.

ALEXANDER P. ANDERSON.

COLUMBIA UNIVERSITY, May 2, 1902.

REPORT OF DR. D. T. MACDOUGAL, FIRST ASSISTANT, ON AN EXPEDITION TO ARIZONA AND SONORA.

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

Dear Sir: I have the honor to present the following report of my operations in Arizona and Sonora in February and March, 1902.

Pursuant to your instructions I left New York January 31st, going via New Orleans to Tucson. Professor J. W. Toumey, now of the Yale School of Forestry, had formed a collection of cactuses, agaves and yuccas on the grounds of the University of Arizona at this place during his term of service at that institution, and a few days' study of this plantation yielded information which gave valuable guidance in securing cacti and other xerophytic plants for the newly completed ranges of the conservatories. I am indebted to President Adams of the University, and Director

R. H. Forbes of the Experiment Station, for many courtesies and for the privilege of taking specimens from this collection that could not be obtained elsewhere.

Professor J. J. Thornber, Botanist to the Experiment Station, gave every assistance in the examination of this material, and on surveying tours of the surrounding country. Arrangements were completed with the University by which a set of plants collected by myself in the northern part of Arizona in 1898 were presented to the herbarium in exchange for material to be forwarded to the Garden from time to time.

It being my purpose to make an examination of the flora of this arid region from several points in order to select the best place for securing and shipping specimens before any actual collection was made, I proceeded to Nogales, Arizona, and to Guay-

FIG. 10. Island in Bay of Guaymas bearing numbers of a large *Cereus* (see Fig. 11) and fringed with mangroves.

mas in southern Sonora. The last named place is a town of about eight thousand inhabitants situated upon the bay of the same name, which is an arm of the Gulf of California.

The surrounding country is extremely dry and as the place is only 28 degrees north latitude the climate is extremely warm even during the winter months, and the vegetation is highly xerophytic.

Minor mountain ridges extend to within a short distance of the actual shore line, and the "Saguaro" or tree cactus (*Cereus*

giganteus) which is more abundant northward extends this far southward and supposedly beyond on the higher mesas and slopes. In the valleys and lower levels its place is taken by

FIG. 11. *Cereus* sp. (Pithaya) on island in Bay of Guaymas (see Fig. 10).

another *Cereus* which forms a short thick main trunk from which a number of high branches arise. This large form extends down to sea-level, and is abundant on the islands in the Bay of Guaymas, and I was so fortunate as to secure photographs of this interesting plant growing within a few feet of clumps of mangrove. It is certainly an unusual occurrence to find such large xerophytics so near a typical strand form.

Numbers of species of opuntias, asclepiads, and thorny shrubs were found around Guaymas. Adequate transportation facilities for freight by land being difficult to secure, collections were made almost entirely from row-boats, by the use of which a great length of shore line was visited and numbers of succulent plants, including "Bisnagas" (*Echinocacti*) from the islands in the harbor were secured. A visit was made to the irrigated ranch of Señor Bustamente, northwest from Guaymas, where

large plantations of oranges and maguey were inspected, specimens of the latter being secured.

A systematic effort was made to secure information which would be useful in the exploration of Baja California, which is all but entirely unknown from the botanical point of view. This peninsula is nearly 900 miles long and contains a few settlements and mining towns in the southern half, around which a few collectors have worked at various times. An expedition by T. S. Brandegee and by other members of the California Academy of Science traversed the western part a few years ago. The northern portion is reputed extremely dry, uninhabited and to be traversed by a mountain ridge a few thousand feet in height.

This entire region embracing two coast lines and a strip of land four hundred miles long offers a most tempting field for exploration, and a properly equipped expedition would secure material of the greatest scientific interest and value. So far as the information at hand may be relied upon, the best, and most practical method would embrace the chartering of a fifty-ton schooner at Guaymas with a crew of four, and the organization of a scientific party of three or four persons of some field experience in rough work. This party might then proceed along the eastern coast, putting in at convenient anchorages from which excursions afoot might be made into the interior. It might be possible to include one or two burros in the cargo of the vessel for use as pack animals on such trips but the chief difficulty encountered is the scarcity or entire lack of water, and of all kinds of forage and food. Propositions were secured from two firms for the outfitting of a vessel, adequate to carry out the above plan, and it is suggested that this important exploration should be made at the earliest moment at which funds become available.

From Guaymas, I returned northward to Torres, a small town on the Sonora railway, 102 kilometers north from Guaymas. At this point I was so fortunate as to secure the active interest of Mr. T. Oldendorff, agent for the Sonora railway. In addition to giving me much practical information concerning the plants native in that region, Mr. Oldendorff placed me in care of Antonio, his Indian hunter, who acted as guide

on a trip through the country to the westward toward the Gulf of California. The trip was made on horseback, our bedding and food being carried behind our saddles and camp was made in the open country. This gave me the opportunity of crossing a great mesa west of Torres transversed by a streamway, which at that time of the year was entirely dry. At widely distant points, a few huts of Papago Indians were encountered, the inhabitants of which secured their water supply by digging to a depth of several feet in the streamway bed. This great sandy plain was partly covered with a forest of small acacia trees,

FIG. 12. "Cholla" or arborescent opuntia near Torres, Sonora.

shrubby opuntias, and a *Parkinsonia.* The last named tree has finely subdivided switch-like branches and is known as "Paloverde," which formed the sole food for our horses during the entire trip. A very curious plant, known as "Huarequi," consisting of a large woody tubercle which rests on the surface of the ground under acacia trees, was seen for the first time. During the rainy season a rapidly growing vine is sent up which bears a profusion of white flowers, then the plant goes into inac-

tivity for the remainder of the year. Numbers of large specimens of *Cereus ingens* (?) were seen.

The shrubby opuntias ("Chollas") in many places covered the entire open space among the small trees, offering extremely difficult and dangerous passage for horses. The segments of the branches bear spines from one to three inches in length, and are very easily detachable. The slightest contact will drive the spines into the flesh, and the branch breaking off from the plant, becomes extremely difficult to remove.

During one day of this trip we crossed the trails of small parties of Yaqui Indians, and were compelled to keep the saddle

FIG. 13. Outfit and crew for collecting large cacti in front of a clump of "organ" cactus, or *Cereus Thurberi*.

almost all the time and to ride far into the night to lessen the chance of an encounter with them. Our scant water supply was supplemented by using the juices of the fleshy fruits of some of the opuntias. Along the lower foothills at the edge of the mesas, great numbers of small trees with white bark were seen, which bore the name of "Palo blanco" being a tree morning-glory (*Ipomœa arborescens*). Although entirely destitute of leaves at this time of the year, a few characteristic white flowers were seen. The tips of the branches of this tree furnish an agreeable forage to deer, which we saw in great numbers.

With the information thus acquired the collection and shipment of material was begun in which the service of four laborers and a six-mule team were required. A fine *Cereus* sp. obtained near Torres is shown in Fig. 6, and a plant of the "organ" cactus

FIG. 14. A Yaqui Indian digging *Cereus* sp. near Torres, Sonora. This specimen is now in house No. 6 of the conservatories.

(*Cereus Thurberi*) is shown in Fig. 13, from which specimens were obtained.

Returning to Nogales two days were spent in shipping the specimens of living material which had been selected during the previous visit to the place. Several species of yuccas and agaves were secured and a number of mammalarias, opuntias, as well as many shrubs native to this semi-arid region.

Operations were begun at Tucson on February 24th and during the following eight days I had the continued assistance of Professor J. J. Thornber, whose knowledge of the native flora was of the greatest service in the selection of representative material of the various species secured, which included the native Cacti,

FIG. 15. *Cereus giganteus* (Saguaro) near Tucson, Arizona (see Fig. 17). An adult tree about a century old.

perennial herbs, and shrubs of the region. A systematic examination was made of the plantation of Cacti on the University grounds and some forms which had not been secured were obtained from this collection.

Perhaps the most difficult part of my task on this expedition was the collection and shipment of specimens of the tree cactus or "Saguaro" (*Cereus giganteus*). This interesting plant consists of a main trunk of a diameter of one to two feet which reaches a height of thirty-five to sixty feet. Ordinarily a few branches arise from the trunk at a distance of five to ten feet from the base, which are at first horizontal, but which finally curve upward like the branches of a candelabrum. The formation of the branches does not take place until the main trunk has reached a height of twelve

FIG. 16. *Cereus giganteus* about twenty-five years old, 13½ feet high, near Tucson, Arizona. This specimen is now in conservatory house No. 6.

to twenty feet. The trunk has an internal woody cylinder about six to ten inches in diameter enclosing a pith saturated with a bitter juice, and the outer portion of the trunk embracing the

greater part of its bulk is composed of a soft watery tissue. The surface is made up of a number of ridges bearing numerous clusters of spines. These trunks grow at the rate of about six inches per year, hence the larger examples must be more than a century old. It was impossible of course to ship branching specimens, and attention was devoted to those under fourteen feet in length, six of which were secured. The largest of these, slightly less than the above measurement, weighed about a thousand pounds. The services of six men were required to dig out the

FIG. 17. A portion of a forest of *Cereus giganteus* (Saguaro) near Tucson, Arizona.

roots of such a plant and to lower it to the ground without breaking the spines or bruising the epidermis. Measurements having been previously taken, long coffin-like boxes were constructed and in these each specimen was lowered, being secured against damage by a packing of the tips of the branches of creosote bush (*Covillea*), which is abundant in the same region. By this method it was possible to transport heavy specimens to New York without serious damage. Somewhat sensational reports having been circulated in the daily press that this fine tree is in

danger of extinction I take occasion to say that its destruction in the comparatively small area of the region capable of irrigation is of comparatively little importance when it considered that it is found over many hundreds of square miles and on steep and almost inaccessible mountain slopes. Its safety is further insured by the fact that it has no commercial importance and finds but little use by the Indians, who take the woody framework of dead trees for building huts.

After leaving Tucson two days were spent at Austin, Texas. Several Cacti were added to the material already secured as well as many shrubs and bulbs. I am indebted to Professor W. L. Bray for his guidance and assistance in making these collections, which his knowledge of the local flora greatly facilitated.

Respectfully submitted,

D. T. MacDougal.

HOW SHALL OUR WILD FLOWERS BE PRESERVED?*

The problem of the preservation of our wild flowers is most acute in the vicinity of our towns and cities, for it is here that flowers suffer most from indiscriminate gathering.

In rural localities there are at least three situations or conditions that demand attention. The gathering of some particularly attractive wild flower for city markets; the search for some rare and local plant and its excessive collection because of its very rarity; and the clearing of forest areas or the draining and clearing of swamps for economic reasons so changing the conditions that very many of the native plants are unable to exist.

The almost complete extinction of the trailing arbutus in many localities where it was formerly abundant furnishes too good an illustration of the damage done by the collecting of attractive wild flowers for the city markets.

The danger of rarities from over-enthusiastic admirers is well illustrated by the case of the climbing fern (*Lygodium*) which

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*Awarded the third prize of twenty dollars, competition of 1902, from the Caroline and Olivia Phelps Stokes Fund for the Preservation of Native Plants.

would have been nearly or quite an extinct species by this time if measures had not been taken to preserve it.

In these two cases the conditions are so similar to those that have obtained in the case of game birds and other inoffensive wild animals that it seems certain that similar remedies will produce similar desirable results. In other words, our societies for the preservation of native wild flowers should exert their energies to secure the enactment of stringent laws for the protection of such plants as stand in need of it in their localities. The sale of flowers like the trailing arbutus should be stopped and the collection of plants like the climbing fern should be absolutely prohibited, except by the accredited agents of scientific institutions.

It will take time to educate public sentiment until it will secure adequate enforcement of such laws, just as it has taken time to educate public sentiment up to the point of enforcing the laws for the protection of game and song birds, but the sooner the agitation is begun, the sooner will the desired results be obtained. For public opinion follows, not leads in such matters. The need for action is the more urgent from the fact that it will soon be too late to save some of our most beautiful plants from extinction in settled localities, the very place where they will do the most good.

The cutting of forest and the reclaiming of swamp and moor areas presents an entirely different problem, which must be met in a different way. Where the land is sufficiently valuable to pay for the reclaiming of it for agricultural or building purposes, little can be done, except by the incorporation of such areas into public parks where they are situated near enough to cities to warrant it. Even then the landscape gardener will very likely improve (?) the native plants out of existence. Forest Park in Brooklyn and Van Cortlandt and Bronx Parks in the Borough of the Bronx, New York City, have been conspicuous examples of beauty of nature unadorned by art.

To the writer a trip to Van Cortlandt Park is productive of a pleasure that the glories of Central Park can never even approximate. One of the greatest attractions at the Botanical Gardens in Bronx Park is due to the intelligent preservation and care of

the native plants in many of the most beautiful spots. Flower lovers in New York and other large cities owe it to themselves and to the ideals they represent to see to it that measures are taken to preserve untouched such spots as the woodland and swamp in Van Cortlandt and Forest Parks.

The forestry agitation and the forest reservations will, of course, tend to preserve woodland plants of all kinds and flower lovers should reinforce the forestry associations at all possible points.

The pulp mill is without question the most dangerous enemy of our forests. The ordinary lumberman will leave enough young trees standing to practically reforest the lumbered areas in twenty years, but the pulp-wood cutter leaves nothing but desolation.

The Green Mountains in southern Vermont have been the scene of lumbering operations for years, but the forest areas rapidly renovate themselves so that little damage is done to the native flora; the land still retains its moisture and is not subject to any considerable degree to forest fires. Contrast this with the state of affairs in the southern Adirondack region where the insatiate pulp mill has taken everything worthy the name of tree, and where destructive forest fires burn up, not only the surface vegetation, but the very soil itself, as it is in many places so rich in vegetable matter as to be combustible to a considerable extent. The man who shall invent a cheap and satisfactory substitute for wood pulp for paper will do more for forests and flowers than all the legislatures in the country could accomplish in a century.

The problem of preserving wild plant life in the vicinity of large cities and towns stands distinctly by itself. Except in a few cases, as outlined above, it is not a problem to be reached by law but by enlightened public opinion. The police regulations may in a measure protect the park areas but in the larger and wilder parks police protection to be adequate would be burdensome beyond endurance, both to the taxpayer and the lover of nature. I, for one, can never enjoy nature while under the surveillance of a blue-coat. He is a rank and jarring discord in what otherwise might be a soul-stirring visual symphony.

A great proportion of evil is wrought through ignorance and

thoughtlessness which can be reached through the usual channels of popular education, the lecture, the newspaper, and the school.

There is a right way and a wrong way to pick flowers. Many kinds if properly gathered can be picked continuously throughout the period of bloom without materially injuring the plants. Others must be picked sparingly, and some not at all.

If rules something like the following were iterated and reiterated in the public prints with fairly complete lists of the local plants in each of the classes mentioned (for the composition of these lists would vary greatly in different localities), I believe it might do much to save our native wild flowers from needless and thoughtless destruction. And we of the city might still enjoy our bouquet of wild flowers with a clear conscience.

Flowers of any kind should not be gathered near walks or drives. They give the most pleasure to the most people in their natural situation and they are most exposed to injury from thoughtless people and vandals.

As little as possible of leaf or leaf-bearing shoot should be gathered with the flowers, and underground stems or roots should never be disturbed. The violation of this rule is responsible for much of the damage done the trailing arbutus.

Rare or unusual flowers found near a city should not be gathered except for strictly scientific purposes. This of course does not apply to plants which are plainly weeds or introduced plants.

In the case of annuals, flowers enough to furnish plenty of seeds for next year must be allowed to remain on the plants.

Flowers with long stalks like water lilies and violets, which can be picked without injuring other portions of the plant, can usually be gathered freely with little danger of injury to the plants as a whole. It is well known to floriculturists that flower production is much less exhausting to the plant than the production of seeds and that to get the greatest yield of flowers the blooms must be picked as they open. This principle will apply to wild flowers as well as to those under cultivation.

Experience, moreover, bears out this belief, for violets are gathered as freely as any of our wild flowers, yet they seem to thrive and increase even in the places where they are likely to be

gathered most. This may be due in part to the cleistogamous flowers which never appear above ground. But neither does the water lily seem to be suffering, although marketed freely. As before stated, local lists of similar flowers could be easily made up by any competent local botanist.

Flowers can be gathered in moderation from flowering shrubs and trees without material injury to the plants if little of the wood and leaf-bearing shoot be removed and care be taken to select flowers from different portions of the plant. For instance, it is a decided advantage to apple trees to have some of the flowers removed in seasons of very full bloom. But it is far from an advantage to have whole branches torn off bodily and all the lower flowers entirely removed, as is so often done with the apple trees and with the dogwoods in the vicinity of New York City. There are flowering dogwoods enough in its vicinity to give pretty nearly all comers a moderate cluster if properly gathered, but at the present rate and methods of collecting there will soon be none for any one. The locusts, sweet pepperbush and the various species of viburnum belong in a similar class.

Many of our most interesting wild flowers, especially those of early spring, arise from a thickened underground portion, rich in stored nutriment, and while in many cases the flowers cannot be collected without taking the leaves also, the underground portion (rootstock, tuber, bulb, corm, etc.) will easily supply the loss if not too frequent or severe. Such flowers, for example, as the spring beauty, jack-in-the-pulpit, bellworts and anemones, can be gathered in moderation in the more secluded portions of the city environs. In these cases special care should be taken to avoid injury to the underground portion, although in many cases nature herself has looked out for this by burying this portion of the plant deeply in the soil. If any one doubts this, let him try to dig a few corms of the adder-tongue lily (*Erythronium*).

Then there is a class of flowers ordinarily classed as weeds, yet beautiful withal, and so sturdy and difficult of destruction that they can nearly always be collected without compunction. Such are daisies, buttercups, wild carrot, dandelions and others.

There are other flowers in every locality that should not be

gathered at all, but it is doubtful whether a list of such would not induce certain irresponsible persons to hunt them down. If good full lists based upon the same principles as those given above were easily accessible to every one, I believe it would aid greatly in the matter of popular education and would act as a restraint on the more public-spirited portion of the community.

As before stated, the usual channels for popular instruction must be our main reliance. Newspaper agitation is slowly but surely making it bad form. It has always been poor taste to wear the plumage of our wild birds, and the same agency properly utilized will make any right-minded person ashamed to collect great handfuls of our wild flowers only to throw them away as soon as they wither a little in the hand. Fewer flowers will be picked and those few will be carefully cherished so as to please for days instead of minutes.

The place of places for public instruction is the schoolroom, although newspapers, books and lectures have done much for animals and will do much more for plants. Every teacher of botany and every teacher of nature study should be sure to imbue his pupils with an idea of the sanctity of plant life. Here is a field which some flower-lover of the artistic and literary ability should enter at once. For a well-told story is the strongest method of rooting ideas so deeply in childish minds that they will bear fruit in action. Black Beauty, overdrawn and unreal as it is, by its vivid portrayal of the suffering (real or imaginary) of the horse, read in thousands of schools, has done incalculable good in making children more thoughtful of the comfort of their animal pets and companions and more considerate in their treatment of them.

Something similar is needed properly to impress children with the fact that flowers need their care and consideration, and may suffer deformity and death if misused, although actual pain may not be possible to them.

I would respectfully suggest that the next prize from The Olivia and Caroline Phelps Stokes Fund be offered for stories of this sort, suitable for reading in the primary and grammar grades.

I may have used the term "Societies for the preservation of

native wild flowers," unadvisedly for few local societies have as yet been formed. Every botanical club and society should at once organize itself into such a society and furnish a large membership for the central organization already formed.

Let each such club begin at once to study local needs and the best means of meeting them. The plants in need of protection should be noted and means taken for their protection, lectures should be given and literature distributed. There are enough such clubs already in existence to carry out the needed measures with success, and it is to these that this article is addressed as an appeal.

A. J. GROUT.

BOYS' HIGH SCHOOL, BROOKLYN, N. Y.

PROGRAMME FOR THE THIRD ANNUAL MEETING OF THE HORTICULTURAL SOCIETY OF NEW YORK AT THE NEW YORK BOTANICAL GARDEN, WEDNESDAY, MAY 14, 1902.

Members and their friends leaving Grand Central Station, Harlem Division, by the 1.35 P. M. train for Bronx Park (Botanical Garden) Station, will be met at Bronx Park Station by Mr. James Wood, President of the Society, and escorted to the Conservatories.

Members and their friends leaving Grand Central Station by the 2.35 P. M. train will be met at Bronx Park Station by Dr. D. T. MacDougal, First Assistant, New York Botanical Garden, and escorted to the Conservatories.

Leaving the Conservatories at 3.35 the party will walk through the grounds to the Museum Building; the Formal Meeting will commence in the Lecture Hall of the Museum Building at 4.15 o'clock, and will be followed by an exhibition by Dr. N. L. Britton, of lantern slides illustrating "Features of the New Zealand Flora," contributed to the Garden by Mr. L. Cockayne.

Members and friends leaving Grand Central Station by the 3.35 P. M. train will arrive at Bronx Park Station in time for the meeting.

The council of the society will meet in the Administration Office, Museum Building at 3.15 oclock.

The Museum, Library, Herbarium and Laboratories in the Museum Building will be open for inspection until 6.30 o'clock.

Trains leave Bronx Park Station for Grand Central Station at 5.28, 5.42, 6.13 and 6.57. The excursion fare is 25 cents.

An exhibition will be held in connection with the meeting, in the hall of the Museum Building immediately adjoining the Lecture Hall; this exhibition will be open from one o'clock until half past six on Wednesday, May 14, and from 10 o'clock until 5 on Thursday, May 15.

All members of the New York Botanical Garden and their friends are hereby cordially invited to attend this meeting of the Horticultural Society.

Invitations are also hereby cordially extended to the members of the New York Florist's Club, the Farmer's Club and Horticultural section of the American Institute, the American Rose Society, and the Torrey Botanical Club.

Schedule of Prizes.

For exhibition Wednesday and Thursday, May 14th and 15th. The following prizes for exhibits open to all competitors are offered by the New York Botanical Garden, to be awarded by the Council of the Horticultural Society.

Cut Flowers, Etc.

Class.		Prize: 1st.	2d.
1	Collection of flowering shrubs and trees	$15	$10
2	Collection of bulbous plants	15	10
3	Collection of wild flowers, named	25	10
4	Collection of Alpine, Rockery species (plants or flowers or both)	10	5

Plants.

5	Group of Crotons (*Codiaeum*)	25	15
6	Group of Palms and other foliage plants	50	25
7	Group of foliage and flowering plants	50	25
8	Collection of Orchids, each plant a distinct species or variety (no duplicates)	30	15
9	Collection of Cattleyas	15	10
10	Six Calceolarias	10	5

NOVELTY.

11 For the Best Horticultural Novelty in plant, fruit, flower, or vegetable (that is anything distinct and not previously in general cultivation in America).. ....$50

THE HORTICULTURAL SOCIETY OF NEW YORK

Offers the following prizes (open to all).

Class.		Prize: 1st.	2d.
12	Collection of Ferns.....	$25	$15
13	Collection of succulent plants.....	25	15
14	Collection of Begonias.....	10	5
15	Collection of fresh vegetables.....	10	5

The council may also award certificates to meritorious exhibits.

The word collection in this schedule does not signify the greatest number only; quality, rarity, effectiveness and display will also be counted.

Mr. George Skene will be in charge of the arrangement on the part of the New York Botanical Garden.

Plants and flowers for exhibition should be sent by express prepaid, addressed Horticultural Society Museum Building, New York Botanical Garden, Bronx Park, New York City.

LEONARD BARRON, *Secretary.*

136 LIBERTY ST., N. Y. CITY.

NOTES, NEWS AND COMMENT.

Miss J. T. Emerson, of New York, who has been pursuing some investigations upon diseases of the rose and of the potato, has accepted a position as special assistant to Dr. J. C. Arthur, of Purdue University, in his cultural studies of the rusts.

Mr. C. L. Pollard, of the U. S. National Museum, Washington, D. C., spent the last two weeks in April at the Garden in the study of a collection of plants recently made by himself and Dr. Palmer in Cuba.

Mr. F S. Earle, assistant curator, is at present making a collection of the flora about Barstow and in the Davis mountains in western Texas and will proceed later to eastern New Mexico; the Sacramento, White and Capitan mountains will also be visited.

Mr. George V. Nash, head gardener, is making an extensive tour in Europe for the purpose of visiting the herbaria at London, Paris and Berlin to complete some special studies on grasses and the Podostemaceae, and also to make arrangements for exchanges with various botanical gardens.

A number of living specimens of *Monotropsis odorata* collected by Dr. D. S. Johnson near Baltimore have been kindly sent by him to the Garden and will furnish valuable material for studies on mycorhiza.

The following lectures in the spring course are yet to be delivered: May 17th, "Wild Flowers, the Necessity for their Preservation," by Mr. Cornelius Van Brunt; May 24th, "The Cottons," by Dr. H. H. Rusby; May 31st, "Cactuses and Cactus-like Plants," by Dr. N. L. Britton; June 7th, "Favorite Flowers of Nations and Poets," by Professor E. S. Burgess; June 14th, "The Vegetation of American Deserts," by Dr. D. T. MacDougal.

The total amount of precipitation in the Garden for April amounted to 3.73 inches. Maximum temperatures of 58° on the 6th, 64.5° on the 11th, 66° on the 21st, and 87° on the 22d were observed; also minima of 27.5° on the 6th, 34° on the 12th, 27.5° on the 15th, and 30° on the 25th.

Mr. Oakes Ames, of North Easton, Mass., who recently visited the Garden for the purpose of studying the herbarium and living collections of orchids, has kindly presented a considerable number of living water-lilies and other aquatics for the preliminary stocking of conservatory house No. 9; other aquatics have been received from the Buffalo Botanical Garden.

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PUBLICATIONS

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The New York Botanical Garden

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.

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. Vol. I, Nos. 1–5, 449 pp., 3 maps, and 12 plates, 1896–1900. $3.00. No. 6, 232 pp., 20 plates. Free to all members of the Garden; to others, 50 cents.

Memoirs of the New York Botanical Garden, Vol. 1. 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. Price to members of the Garden, $1.00. To others, $2.00. [Not offered in exchange.]

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

No. 1. Symbiosis and Saprophytism, by Dr. D. T. MacDougal.

No. 2. New Species from western United States, by Dr. Per Axel Rydberg.

No. 3. The dichotomous *Panicums*: some new Species, by Geo. V. Nash.

No. 4. *Delphinium Carolinianum* and related Species, by Dr. Per Axel Rydberg.

No. 5. Studies on the Rocky Mountain Flora—I, by Dr. Per Axel Rydberg.

No. 6. Notes and Descriptions of North American Plants I and II, by Dr. J. K. Small.

No. 7. Vegetative Reproduction and Multiplication in *Erythronium*, by Frederick H. Blodgett.

No. 8. Two new Species of *Grimmia* from Montana, by R. S. Williams.

No. 9. Studies on the Rocky Mountain Flora—II, by Dr. Per Axel Rydberg.

No. 10. Studies on the Rocky Mountain Flora—III, by Dr. Per Axel Rydberg.

No. 11. Life-history of *Schizæa pusilla*, by Elizabeth G. Britton and Alexandrina Taylor.

No. 12. Studies on the Rocky Mountain Flora—IV, by Dr. Per Axel Rydberg.

No. 13. Farther Studies on the Potentilleae, by Dr. Per Axel Rydberg.

No. 14. Studies on the Rocky Mountain Flora—V, by Dr. Per Axel Rydberg.

No. 15. Studies on the Rocky Mountain Flora—VI, by Dr. Per Axel Rydberg.

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No. 19. The American Species of *Limnorchis* and *Piperia*, North of Mexico, by Dr. Per Axel Rydberg.

No. 20. The Morphology and Physiology of the Seedlings of *Arisaema triphyllum* and *A. Dracontium*, by R. J. Rennert.

No. 21. Two new Western Mosses, by R. S. Williams.

No. 22. Studies on the Rocky Mountain Flora—VII, by Dr. Per Axel Rydberg.

All subscriptions and remittances should be sent to

NEW YORK BOTANICAL GARDEN

BRONX PARK, NEW YORK CITY

Vol. III JUNE, 1902 No. 30

JOURNAL

OF

The New York Botanical Garden

EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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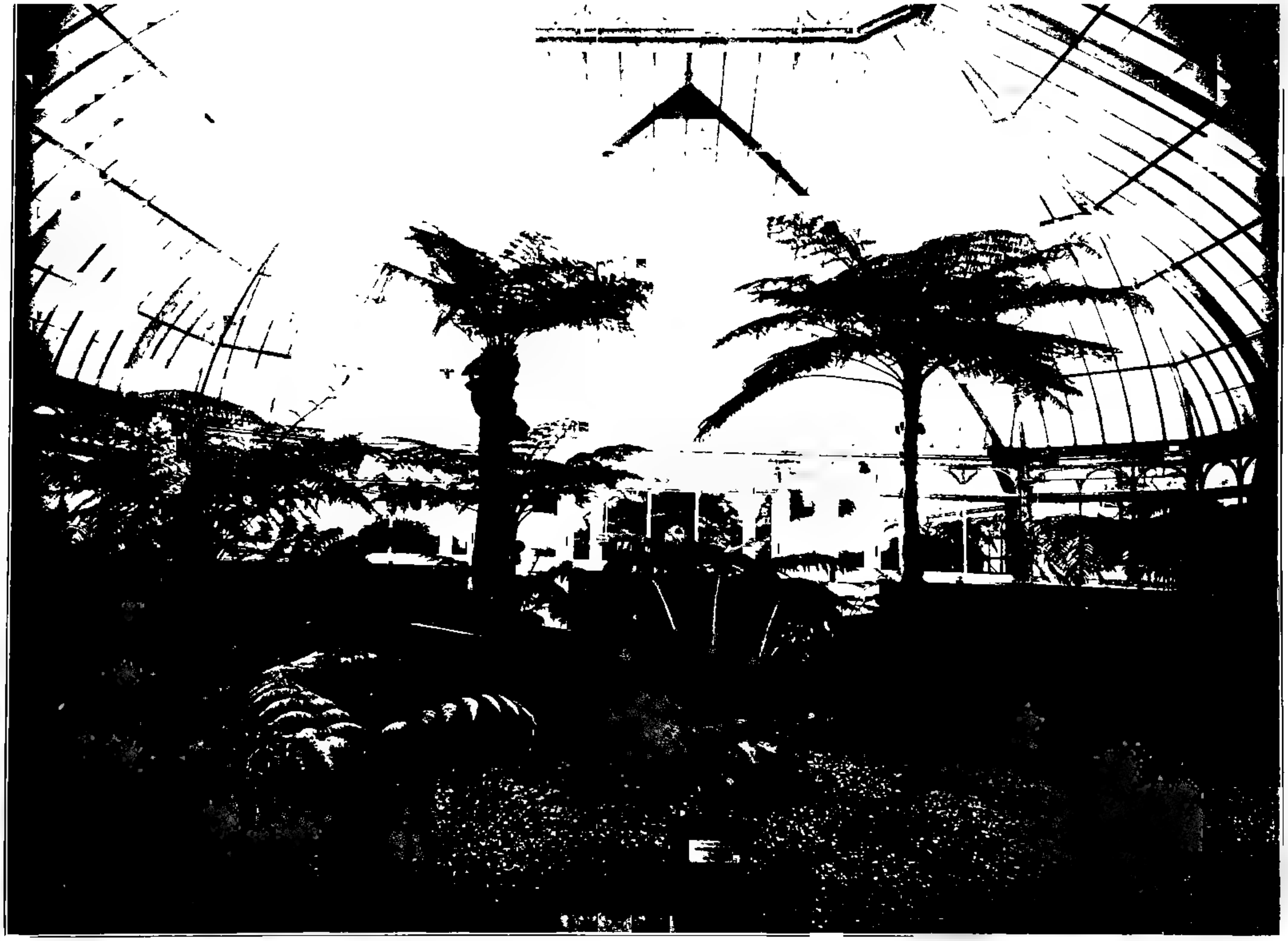

JOURNAL

OF

The New York Botanical Garden

VOL. III. June, 1902. No. 30.

THE COLLECTION OF TREE-FERNS.

In the arrangement of the public conservatory collections made possible by the completion of the additional houses, the tree-ferns thus far obtained have been brought together in the south-eastern corner house of the range, where they may now be studied to advantage. Our collection of these interesting and beautiful plants is as yet meagre, and it is hoped that additional specimens may be secured during the present year. The illustration accompanying this note shows the general present appearance of the interior of this house. The largest specimen is an Australian tree-fern, *Alsophila australis*, which was presented to the Garden by Mr. John Crosby Brown, and is a fine example of this species; two smaller trees of the same kind are also there, the one presented by Mr. Samuel Thorne and the other by Columbia University. There are three small, but fine specimens of another Australian tree-fern, *Dicksonia antarctica*, one obtained by exchange with the Buffalo Botanical Garden and two presented by Mrs. F. L. Ames. A very fine specimen of Schiede's tree-fern, *Cibotium Schiedei*, from Mexico, was given by Mrs. F. L. Ames, and two smaller plants of the lamb-fern, *Cibotium Barometz*, from southern China, were obtained by exchange from the conservatories at Fairmount Park, Philadelphia. Two small specimens of *Cyathea arborea*, native of Jamaica, obtained by exchange with the conservatory in Central Park, and one specimen of *Cyathea pubescens* from the Botanical Gardens of Jamaica, two plants of *Hemitelia grandifolia*, obtained by the writer on the forest slopes of Mt. Misery on the Island of St. Kitts, and several other tree ferns obtained from the same island

represent the tree ferns of the West Indies. All the foregoing belong to the tree-fern family proper, the Cyatheaceae. It is hoped to materially increase the representation of West Indian species by an expedition to Porto Rico during the present summer.

Arboreous species of small dimensions occur occasionally in other families of the ferns than the tree-fern family; our native Royal fern and Clayton's fern which grow plentifully in marshy and wet soil in northeastern North America, sometimes form a trunk several inches in height; the Royal fern family, Osmundaceae, is represented in the tree-fern house by a live specimen of *Todea barbara*, native of Africa and Australia, obtained by exchange with the Fairmount Park conservatories.

A few of the true fern family, Polypodiaceae, also form small erect trunks; these are represented in the collection by several fine specimens of *Blechnum Cordovense* from Brazil, presented by Mrs. F. L. Ames; some of the spleenworts (genus *Asplenium*) likewise form low erect trunks and we possess two individuals of a species from Costa Rica.

It is desired to increase the tree-fern collection as rapidly as possible, and we will be glad to receive any plants which can be spared from other collections.

N. L. Britton.

HORTICULTURAL SOCIETY OF NEW YORK.

The second annual spring show of the Horticultural Society of New York was held on May 14th, and 15th in the New York Botanical Garden. The programme, as announced in the May Journal, was carried out and there was a good attendance of visitors.

There was a charming exhibit of decorative plants, flowering shrubs, native wild flowers and orchids. But the chief interest centered in Class 11, where were the contestants for the $50 prize offered by the New York Botanical Garden for the best horticultural novelty. There were six entries and a thoroughly good competition. The judges specially delegated by the Council were J. Roehrs, F. M. Hexamer, J. Wood, P. J. Berckmans and J. W. Withers, who awarded the honors to Mr. F. R. Pier-

son's charmingly pretty sport from the Boston fern and illustrated in these pages under the name of *Nephrolepis exaltata Piersoni.* (See Fig. 18.) The decision was accepted with general satisfaction.

Other exhibits in the class were *Nephrolepis* Anna Foster, from Mr. Foster, of Massachusetts, a plant of more drooping ap-

FIG. 18. *Nephrolepis exaltata Piersoni.*

pearance, quite distinct and not so ample in its foliage. Then, also from Massachusetts, the Farquhar Rose from Messrs. Farquhar, of Boston. This is a pretty cluster rose of a lively pure rose color and was raised by Jackson Dawson from Crimson Rambler × *Wichuriana* and is fairly intermediate. It recalled several of the more modern hybrid Rambler roses. We believe this will be sent out in the fall (certificate).

Mr. C. J. Roebling (gardener, H. T. Clinkaberry), Trenton, N. J., sent a new hybrid *Zygopetalum* (*rostratum* × *Gauthieri*)

and named *Z. Roeblingianum.* It is about the prettiest of all the *Zygopetalums* we have seen and has large flowers (certificate).

A new dwarf ivy from the Caucasian Mountains was shown by Mr. J. H. Troy. It is a plant attaining a height of only a few inches and makes a very acceptable subject for a pan. Its color is a dull brown-green (certificate).

Tritoma crocata was shown by Mr. J. L. Childs, Floral Park, N. Y. The growth of interest in this class is a very satisfactory sign.

The wild flower class was well filled and a remarkable display was made. The Bedford Agassiz Association was easily first, as last year, and Miss S. E. Close was second.

In the orchid class there was no competition, owing to the severe handling that the exhibit of Lager & Hurrell had undergone by the express company. Messrs. Siebrecht & Son had better fortune; their plants were in fine condition and received the first prize.

This firm was a large exhibitor and won firsts for groups of crotons, of palms and other foliage plants, ferns, begonias, and for foliage and flowering plants, etc., very materially adding to the general effect of the show.

F. Weinberg, Woodside, N. Y., had a large and interesting lot of cacti, including a hybrid *Opuntia*, and won the first honor in the class for those plants; he also took first for rockery and Alpine plants, and second on begonias.

In the display of flowering trees and shrubs Mr. W. H. S. Wood, Greenwich, Conn. (gardener for A. L. Martin), won an easy first with a remarkably representative collection, Messrs. Siebrecht being second.

A fine display of cut orchids also came from Mr. Roebling who had some *vandas* and other Philippine orchids and several rare *Cypripediums.*

At the annual meeting of the Society twenty members were elected. The report of the Secretary showed that the Society was in a most gratifying financial condition having accumulated about $1,000 in invested funds. The total membership now amounts to 201.

Arrangements were made for the exhibition to be held in the Museum Building of the New York Botanical Garden on June 11th and 12th, the detailed programme of which appears in a separate notice.

The directors announced that the Plant Breeding Conference would be held on September 30 and October 1 and 2, and submitted a synopsis of papers to be presented.

L. BARRON, *Secretary.*

136 LIBERTY STREET.

PROGRAMME FOR THE JUNE MEETING OF THE HORTICULTURAL SOCIETY OF NEW YORK.

NEW YORK BOTANICAL GARDEN, WEDNESDAY, JUNE 11, 1902.

Members and their friends leaving Grand Central Station, Harlem Division, by the 1.35 P. M. train for Bronx Park (Botanical Garden) Station will be met at Bronx Park Station by Mr. James Wood, President of the Society, and escorted to the Herbaceous Ground and Hemlock Grove.

Members and their friends leaving Grand Central Station by the 2.35 P. M. train will be met at Bronx Park Station by Dr. N. L. Britton, Director-in-Chief, New York Botanical Garden.

The Formal Meeting will commence in the Lecture Hall of the Museum Building at 4.15 P. M., and will be followed by an address on "Horticultural Prospects," by the President of the Society.

Members and their friends leaving Grand Central Station by the 3.35 P. M. train will arrive at Bronx Park Station in time for the Formal Meeting.

The Council of the Society will meet in the Administration Office, Museum Building, at 3.15 P. M.

The Museum, Library, Herbarium, and Laboratories in the Museum Puilding will be open for inspection until 6.30 P. M.

Trains leave Bronx Park Station for Grand Central Station at 5.28, 5.42, 6.13, and 6.57 P. M. The excursion fare is 25 cents.

An exhibition will be held in connection with the meeting, in

the Hall of the Museum Building immediately adjoining the Lecture Hall; this exhibition will be open from 1 P. M. until 6:30 P. M. Wednesday, June 11, and from 10 A. M. until 5 P. M. on Thursday, June 12.

All members of the New York Botanical Garden and their friends are hereby cordially invited to attend this meeting of the Horticultural Society.

Invitations are also cordially extended to the members of the New York Florists' Club, the Farmers' Club and Horticultural Section of the American Institute, the American Rose Society and the Torrey Botanical Club.

Schedule of Prizes.

The following prizes for exhibits open to all competitors are offered by the New York Botanical Garden to be awarded by the Council of the Horticultural Society.

Roses—Cut Blooms.

Class.		Prize: 1st.	2d.
1	Hybrid Perpetuals, Collection	$15	$10
2	" " Display of any one variety.	10	
3	Hybrid Teas, Collection	12	8
4	" " Display of any one variety	8	
5	Teas, Collection	12	8
6	" Display of any one variety	8	

Peonies—Cut Blooms.

7	Chinese group, Collection	15	5
8	Officinalis group, Collection	10	5
9	Single flowering species and varieties	10	5
10	Best 12 Peonies	10	

Flowering Shrubs and Wild Flowers.

11	Collection of flowering shrubs	15	10
12	" " wild flowers	10	5

Vegetables.

23	Collection of 12 garden vegetables	10	6
24	" " 6 " "	8	4
25	Garden Peas, three varieties, three plates	3	1
26	" " single plate, one variety	2	2

STRAWBERRIES.

13	Collection	ten varieties	$10	$5
14	"	five "	5	3
15	"	three "	3	2
16	Single plate,	Marshall	2	1
17	"	" Sharpless	2	1
18	"	" Nick Ohmer	2	1
19	"	" Brandywine	2	1
20	"	" Any other variety	2	1
21	"	" Gandy	2	1
22	Best new variety, not distributed		2	

The Council may also award certificates to meritorious exhibits.

The word collection in this schedule does not signify the greatest number only; quality, rarity, effectiveness, and display will also be counted.

The exhibition will be open from 1 P. M. until 6 : 30 P. M., on Wednesday, June 11th, and from 10 A. M. until 5 P. M., Thursday, June 12th. Exhibits to be staged by 1 : 30 P. M. on Wednesday.

Mr. George A. Skene will be in charge of the arrangements on the part of the New York Botanical Garden.

Plants and flowers for exhibition should be sent by express, prepaid, addressed, Horticultural Society, Museum Building, New York Botanical Garden, Bronx Park, New York City.

RULES AND REGULATIONS GOVERNING EXHIBITIONS.

1. Prizes will be awarded by the Exhibition Committee subject to the approval of the Council; and will be paid in money or in silver plate of equal value, at the option of the exhibitor.

2. No exhibit can compete for more than one prize, and no two prizes will be awarded to any one person in the same class.

3. Entries in competitive exhibits not made according to the schedule will be disqualified, and the full sum offered as a prize will not be confirmed by the Council unless the exhibit is considered sufficiently meritorious. And no prize will be awarded to any exhibit which in the opinion of Council has no positive merit.

4. All articles for competition must be in position on Wednesday, May 14, by 1 P. M.

5. Competition is open to all, and all articles to be exhibited must be entered in writing in the owner's name, by noon on Tuesday, May 13, and if for competition, must conform to the conditions of the premium list.

6. Exhibitors and competitors may attach cards to their exhibits, as soon as staged; these cards will be furnished by the Secretary.

7. The Exhibition Committee shall have power to exclude from the exhibition all inferior exhibits, or to remove any or part of any exhibit; but no exhibit shall be removed by an exhibitor until the close of the exhibition.

8. Cut flowers will be shown in vases furnished by the management.

9. All flower pots used in the exhibition must be clean.

10. Each person who becomes an exhibitor thereby agrees to conform strictly to such rules and regulations as the Council may make or authorize.

Exhibition Committee: H. A. Siebrecht, Chairman, F. M. Hexamer, W. Turner, J. W. Withers.

Ex-Officio Members: James Wood, N. L. Britton, L. Barron.

LEONARD BARRON, *Secretary.*

136 LIBERTY STREET, N. Y. CITY.

AN ATTEMPT TO INTRODUCE A SEAWEED INTO THE LOCAL FLORA.

Influenced primarily by a desire to furnish Mr. W. A. Cannon with material for experiments in hybridization, the writer, acting for the New York Botanical Garden, has recently secured from a friend in Pictou, Nova Scotia, a number of living fertile plants of *Fucus serratus.* These were collected with much care, not only the disk-like holdfast being preserved but in many cases also a considerable portion of the rock to which it was attached. The plants were carefully packed with bog-mosses in a wooden box, and although four days intervened between the shipment at

Pictou and the delivery at the Garden, the material arrived in good condition. The antheridia had exuded copiously, forming yellowish waxy masses about the mouths of the cavities in which they were borne, and when they were transferred to sea-water great numbers of vigorous spermatozoids were set free. The egg-bearing individuals, though less numerous, were in equally good condition. On May 16th some of the plants were set out at four stations in Pelham Bay and on Hunters Island, these places being on Long Island Sound and within the present limits of New York City. At the date of writing (June 3d) the plants are living and appear moderately healthy. Even if these plants soon die the possibilities of their being responsible for the appearance of the species in some more or less remote part of the adjacent coast seem sufficient to justify a printed record of the present attempt.

Fucus serratus L. is a strikingly distinct species of "rockweed" with an interesting geographical distribution. De-Toni in his Sylloge Algarum (3: 208. 1895) states that it is found on the shores of Europe from Norway and Scotland to Spain, in the Baltic Sea and the Arctic Ocean, and that it has been reported also from the Cape of Good Hope; its occurrence in America is alluded to in a parenthesis followed by an interrogation mark. Harvey in the Supplement of his classical Nereis Boreali-Americana, published in 1858, includes a short description of the species followed by "Newburyport, Mass., *Captain Pike*, 1852." He adds: "I have received a small fragment of this common European plant, stated to have been found in the above locality on the American coast. It is hardly probable that it is either confined to one locality or even rare, wherever it occurs; yet none of my other American correspondents have sent it; nor do I know the circumstances under which Captain Pike obtained it. I hope this notice may lead some one on the coast to investigate the subject; for European botanists are yet uncertain whether *F. serratus* be really a *bona fide* native of the American coast or merely a stray waif, accidentally cast ashore." In 1881, Professor Farlow, in his Marine Algae of New England, attributed the species to "Newburyport, Mass., *Captain Pike*," apparently

on the strength of this record in Harvey's Nereis, adding, however, "Pictou, N. S." whence Rev. J. Fowler had sent specimens to Professor Eaton, in 1869. Later, it was collected again at Pictou by Professor John Macoun, the Government Botanist of Canada, and others, and Professor Macoun informs the writer that he has collected the species also at the Straits of Canso, about 80 miles eastward from Pictou. Further search for the species, however, at Newburyport and at other points in New England does not seem to have resulted in finding it and the species is omitted in Mr. Collins' recently published list of the Marine Algae of New England (Rhodora, **2** : 41. F. 1900). But for several miles at least about Pictou, Nova Scotia, as it was the fortune of the writer to determine in the summer of 1901, *Fucus serratus* is the most common of the rockweeds and it has all the appearance of being a resident of long standing rather than a recent or casual introduction. The outcome of the effort to establish the species about New York will be awaited with interest.

MARSHALL A. HOWE.

NOTES, NEWS AND COMMENT.

A very successful meeting of the Woman's Municipal League was held in the lecture room of the Museum on the evening of April 25th. The program was devoted to a consideration of the welfare and care of the parks and brief lectures were given on the following subjects: "Early History of the Parks," Hon. W. W. Niles; "The Parks and Parkways of the Borough of the Bronx," Commissioner John E. Eustis; "The Work of Bacteria of the Soil," Dr. D. T. MacDougal; "The Protection of Birds in the Parks," Mr. William Dutcher; "The New York Botanical Garden" (illustrated by lantern slides), Dr. N. L. Britton.

The growing interest in the efforts now being made to protect native wild plants against extermination has been greatly promoted by the publication and distribution of the prize essays under the terms of the Stokes fund. A number of persons met in New York and organized an association under the name of "The Wild Flower Preservation Society of America" on April 23, 1902.

The annual dues are one dollar for membership; for fellows, twenty-five dollars; for patrons, fifty dollars, fellows and patrons being exempt from the payment of further dues. The Plant World was designated as the official organ of the society and is sent free to members of all classes. The by-laws and additional details concerning the society will be published in the Plant World for May.

This is the most important step taken in the promotion of public sentiment in the matter, and the journal in question will serve as a very efficient means of publicity and general distribution of literature which will advance the aims of the society.

The officers for 1902 are as follows: President, Frederick V. Coville, Washington, D. C.; vice-president, D. T. MacDougal, New York City; secretary, Charles Louis Pollard, 1854 Fifth street, Washington, D. C.; treasurer, Mrs. Carolyn W. Harris, 125 St. Marks avenue, Brooklyn, New York; managers, Mrs. E. G. Britton, New York City; Miss Alice Eastwood, San Francisco; L. H. Bailey, Ithaca; E. L. Morris, Washington; C. F. Millspaugh, Chicago, Ill.; C. D. Beadle, Biltmore, N. C.; Joseph Crawford, Philadelphia, Pa.; Charles E. Bessey, Lincoln, Nebr.; Walter Deane, Cambridge, Mass.; William Trelease, St. Louis, Mo., and F. H. Knowlton, Washington, D. C.

Three of the larger specimens of the giant cactus (*Cereus giganteus*) recently brought from Arizona are now in bloom in house No. 6 of the conservatories.

The total precipitation in the Garden during May, 1902, amounted to 1.85 inches.

Maximum temperatures of 67° on the 2d, 75.5° on the 7th, 80° on the 17th, 89.5° on the 22d, and 86° on the 23d were observed. Also minima of 41.5° on the 4th, 36.5° on the 10th, 40° on the 15th, 43° on the 21st, 44° on the 28th, and 40° on the 29th. It is to be noted that the month has been entirely free from frost and freezing temperatures.

The meteorological apparatus was removed to the nursery on May 2d. A soil thermograph constructed after a design by Professor William Hallock, of Columbia University, has also been installed and a continuous record is now being taken of the tem-

perature of the soil at a distance of 30 cm. (1 foot) below the surface.

The constantly increasing demands upon the Garden for information upon the chemical composition of plant products, and the investigations undertaken by the Garden in which chemical methods and analyses are required has made necessary the beginning of the equipment of the chemical laboratories.

This development will be carried out under the advice of Dr. Wm. J. Gies, who has recently been appointed Consulting Chemist to the Garden. Dr. Gies at present holds the position of adjunct professor of physiological chemistry in Columbia University, and his extensive experience in investigation and in the work of directing research students in problems related to those constantly arising in the Garden fit him peculiarly well to discharge his newly assumed duties. Dr. Gies has already coöperated with the institution in several important things, having directed Professor Kirkwood's studies of the chemical changes in germinating cocoanuts, now in press, and with Professor Kirkwood furnished the text for the section of Dr. MacDougal's text-book of plant physiology, dealing with the composition of plants.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

2,743 specimens from Louisiana, Mississippi and Alabama. (Collected by Prof. F. E. Lloyd.)

31 herbarium specimens from the Bahamas. (Collected by Mr. S. H. Hamilton.)

22 specimens of North American fungi. (By exchange with Mr. C. F. Baker.)

5 specimens of *Crataegus* from Rochester, N. Y. (Given by Mr. J. Dunbar.)

37 specimens from Lake George, N. Y. (Given by Mr. S. H. Burnham.)

213 herbarium specimens of "Plantae Utowanae." (By exchange with the Field Columbian Museum.)

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

487 herbarium specimens from Missouri and the south-central states. (Collected by Mr. B. F. Bush.)

329 specimens from the northern Rocky Mountain region. (By exchange with Prof. L. H. Pammel.)

2 specimens of *Osmunda*. (Given by Mr. Robert White.)

3 herbarium specimens from New Jersey. (Given by Miss Bertha S. Miller.)

121 specimens of *Charæ* and Hepaticae. (By exchange with the Royal Botanical Garden, Berlin, Germany.

1 specimen of *Ruscus Hypophyllum* from Italy. (Given by Mrs. Theodore K. Gibbs.)

346 specimens "West. Amer. Fungi." (Distributed by Dr. D. Griffiths.)

1,480 specimens of marine algae from America, Europe and Australia.

237 specimens of fungi, mainly from the vicinity of Bar Harbor, Maine. (Given by Miss V. S. White.)

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

1,808 specimens from Scandinavia and Spitzbergen. (By exchange with the University of Lund, Sweden.)

1 museum specimen of "Mavi" from Porto Rico. (Given by Prof. L. M. Underwood.)

516 specimens from Montana, Idaho and Washington. (By exchange with Professor Umbach.)

3 North American ferns. (Given by Miss Margaret Slosson.)

102 specimens of New Zealand ferns. (Given by Col. E. W. Bass.)

2 specimens of parasitic fungi from South Carolina. (Given by Dr. A. P. Anderson.)

2 photographs of the "Witches Broom." (Given by Prof. J. H. Montgomery.)

3 museum specimens from South Carolina. (Given by Dr. N. L. Britton.)

1 museum specimen of "Mexican rubber plant." (Given by Mr. P. T. Austin.)

33 herbarium species from near Charleston, South Carolina. (Given by Dr. N. L. Britton.)

51 specimens of parasitic fungi from the Gulf States. (Collected by Prof. S. M. Tracy.)

2 herbarium specimens of Californian Crassulaceae. (By exchange with Prof. E. L. Greene.)

8 specimens from San Diego County, California. (Given by Dr. J. S. Merriam.)

24 specimens of fossil plants from Chappaquidich Island, Massachusetts. (Collected by Dr. A. Hollick.)

33 herbarium specimens from Virginia. (By exchange with the U. S. National Museum.)

103 specimens from Vermont and Michigan. (Collected by Mr. W. W. Eggleston.)

2,442 specimens of marine algae from North America, Australia, Hawaii and Mauritius.

51 specimens of mosses from Washington and Idaho. (Collected by Messrs. W. H. Lawrence and H. F. Blanchard.)

5 specimens from Essex County, New York. (Given by Prof. J. F. Kemp.)

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

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

225 herbarium specimens from the Labrador coast. (Collected by Mr. J. D. Stormberger.)

2 specimens of *Sedum* from Oregon. (By exchange with Mr. Thos. Howell.)

1 specimen of *Cleomella oöcarpa* from Nevada. (Given by Dr. J. H. Barnhart.)

117 herbarium specimens from New Zealand. (By exchange with Prof. L. Cockayne.)

167 specimens from the Yukon Territory. (Given by Mr. M. W. Gorman.)

17 specimens from southern California. (Collected by Mr. S. W. Austin.)

2 pods of *Theobroma*. (Given by Mr. A. Wakeman.)

23 museum specimens from Arizona and Mexico. (Collected by Dr. D. T. MacDougal.)

9 museum specimens from Bermuda. (Given by Mrs. H. L. Britton.)

2 snow shoes (Given by Mr. Wm. Gaynor.)

194 herbarium specimens from Florida and the contiguous States. (Collected by Mr. A. H. Curtiss.)

LIBRARY ACCESSIONS FROM MARCH 25TH TO MAY 24TH.

ACLOQUE, A. *Les Champignons*. Paris, 1902.

AGARDH, J. G. *Species Genera et Ordines Algarum*. Vol. 3. Parts 3 and 4. Lund, 1898–1901.

American Gardens. Edited by Guy Lowell. Boston, 1902.

ASKENASY, E. *Algen*. (Forschungsreise S. M. S. "Gazelle.") Berlin, 1888.

BASTIAN, H. CHARLTON. *The Beginnings of Life*. New York, 1872.

BERTHOLD, G. *Die Cryptonemiaceen des Golfes von Neapel*. Leipzig, 1884.

BOTANISCHE HEFTE. *Forschungen aus dem botanischen Garten zu Marburg*. Marburg, 1885–88. 2 vols.

BRÉBISSON, A. DE. *Flore de Normandie*. Ed. 3. Caen, 1859.

BUXBAUM, J. C. *Plantarum minus cognitarum*. Centuria 1–5. St. Petersburg, 1828–4. 2 vols.

CAMPBELL, D. H. *University Text-Book of Botany*. New York, 1902. (Given by the Torrey Botanical Club.)

CANDOLLE, AUG. PYR. DE. *Mémoire sur la Famille des Crassulacées*. Paris, 1828.

CASAVIELLA, JUAN RUIZ. *Catalogo Metodico de las Plantas observadas como Espontaneas en Navarra*, 1880.

Centralblatt für Bakteriologie und Parasitenkunde. Zweite Abtheilung. Jena, 1895–1901. 7 vols.

CRAMER, C. *Über Caloglossa Leprieurii*. Zurich, 1891.

DODOENS, REMBERT. *Cruydt-Boeck*. Antwerp, 1644.

DUMORTIER, B. C. *Analyse des Familles des Plantes, avec l' Indication des principaux Genres qui s'y rattachent*. Tourney, 1829. (Given by Dr. John Hendley Barnhart.)

DUPERREY, L. I. *Voyage autour du Monde, executé par Ordre du Roi sur la Corvette de sa Majesté, La Coquille, pendant les Années 1822–5*. Botanique. Paris, 1826–29. 3 vols.

DURAND, TH. AND JACKSON, B. DAYDON. *Index Kewensis Plantarum phanerogamarum*. Supplementum Primum. Brussels, 1902.

EARLE, ALICE MORSE. *Old Time Gardens*. New York, 1901. (Given by Miss V. S. White.)

ENGINEER DEPARTMENT, U. S. ARMY. *Report of the Exploring Expedition from Santa Fé, N. M., to the Junction of the Grand and Green Rivers of the Great Colorado of the West in 1859*, under the command of Capt. J. N. Macomb. Geological Report by Professor J. S. Newberry. Washington, 1876.

FALKENBERG, PAUL. *Die Rhodomelaceen*. Berlin, 1901.

Forhandlinger ved de Skandinaviske Naturforskeres andet Möde. Kjobenhavn, 1841.

GOETZE, WALTHER and ENGLER, A. *Vegetationsansichten aus Deutschöstafrika.* Leipzig, 1902.

GREEN, J. REYNOLDS. *Manual of Botany.* Ed. 2, v. 2. London, 1902.

HALSTED, MARIA E. *Collection of Pith Flowers made by Miss Maria E. Halsted. 1853–60.* (Given by Miss L. P. Halsted.)

HAY, WILLIAM DELISLE. *Elementary Text-Book of British Fungi.* London. 1887.

HEYER, GUSTAV. *Das Verthalt·n der Waldbäume gegen Licht und Schattent.* Erlangen, 1852.

HOOKER, J. D. *The Rhododendrons of Sikkim-Himalaya.* London, 1849. (Given by Samuel P. Avery, Esq.)

KEMP, EDWARD. *How to Lay Out a Small Garden.* London, 1850.

KOHL, F. G. *Untersuchungen über das Carotin und seine physiologische Bedeutung in der Pflanze.* Leipzig, 1902.

La Cellule, Vols. 18 and 19. 1901–2.

LEUNIS, JOHANNES. *Synopsis der Pflanzenkunde.* Hannover, 1877.

LINDENIA. *Iconographie des Orchidées.* Ghent and Brussels, 1885–1902. 16 vols.

LINK, H. F., KLOTZSCH, FR. and OTTO, F. *Icones Plantarum Rariorum Horti Regii Botanici Berolinensis.* Berlin, 1841–44. 2 vols.

LOUDON, JANE. *Gardening for Ladies and Companion to the Flower Garden.* New York, 1843. (Given by Miss L. P. Halsted.)

MARTIUS, KARL PHILIPP VON. *Versuch einer Monographie der Sennesblätter.* Leipzig, 1857.

Medical Botany: or History of Plants in the Materia Medica of the London, Edinburgh and Dublin Pharmacopoeias. London, 1821–2. 2 vols.

Mississippi Valley Horticultural Society, Transactions. Vols. 1–2, 1883–84. 2 vols.

Mittheilungen aus dem Botanischen Institute zu Graz. Jena, 1888.

MORGAN, THOMAS H. *Regeneration.* New York, 1901.

MULDREW, W. H. *Sylvan Ontario; a guide to our Native Trees and Shrubs.* Toronto, 1901.

NATURAL HISTORY SOCIETY OF NEW BRUNSWICK. *Bulletin.* 1–15. St. John's, 1882–97. 3 vols.

NORTH CAROLINA STATE BOARD OF AGRICULTURE. *North Carolina and its Resources.* Winston, 1896. (Given by Miss Violette S. White.)

Porto Rico, Report on the Census, 1899. Washington, 1900. (Given by Dr. L. M. Underwood.)

RÈ, FILIPPO. *Saggio Teorico-Pratico sulle Malattie delle Piante.* Ed. 1. Venezia, 1817. Ed. 2. Milan, 1817. 2 vols.

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ROUY, G. *Illustrationes Plantarum Europae Rariorum.* Fasc. 1–15. Paris, 1895–1901. 16 vols.

SALISCH, HEINRICH VON. *Forstästhetick.* Ed. 2. Berlin, 1902.

Scrap-book of Figures of Plants. (Given by Samuel P. Avery, Esq.)

SHENSTONE, W. A. *The Methods of Glass Blowing.* London, 1897.

SMITH, JAMES EDWARD. *Tracts relating to Natural History.* London, 1798.

STERNBERG, GEORGE M. *Text-Book of Bacteriology.* Ed. 2. New York, 1901.

STRASBURGER, EDUARD. *Lehrbuch der Botanik für Hochschulen.* Ed. 5. Jena, 1902.

STRONG, A. B. *The American Flora.* New York, 1847–50. 4 vols.

TIPPENHAUER, L. GENTIL. *Die Insel Haiti.* Leipzig, 1893.

VRIES, HUGO DE. *Intracellulare Pangenesis.* Jena, 1889.

WARMING, EUGENIUS. *Lehrbuch der Ökologischen Pflanzengeographie.* Ed. by Paul Graebner. Berlin, 1902.

WATSON, FORBES. *Flowers and Gardens.* London, 1901.

PLANTS.

24 plants of Crassulaceae. (Collected by C. R. Orcutt, San Diego, Cal.)

1 *Tillandsia* from Florida. (Given by Chas. Vetterman.)

22 plants of *Cotyledon* sp. (Given by Miss Mary T. Bryce.)

SEEDS.

44 packets *Crataegus* seeds. (Purchased from W. W. Eggleston, Rutland, Vt.)

2 packets Georgia seed. (Given by R. M. Harper.)

15 packets seed from Mexico and Texas. (Collected by Dr. MacDougal.)

41 packets seed. (Given by J. J. Thornber.)

136 packets seed for conservatories. (By exchange with the Botanic Garden, Cambridge, England.)

1 packet seed of *Cassia beareana* from East Africa. (Given by E. M. Holmes, 17 Bloomsbury Sq., London, W. C., England.)

1 packet seed of *Tecoma stans.* (Given by Mrs. Connolly, Miami, Fla.)

4 packets Arizona seed. (Given by C. H. Baker, Grasmere, Fla.)

1 packet Florida seed. (Given by C. H. Baker, Grasmere, Fla.)

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PUBLICATIONS

OF

The New York Botanical Garden

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.

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. Vol. I, Nos. 1–5, 449 pp., 3 maps, and 12 plates, 1896–1900. $3.00. No. 6, 232 pp., 20 plates. Free to all members of the Garden; to others, 50 cents.

Memoirs of the New York Botanical Garden, Vol. 1. 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. Price to members of the Garden, $1.00. To others, $2.00. [Not offered in exchange.]

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

No. 1. Symbiosis and Saprophytism, by Dr. D. T. MacDougal.

No. 2. New Species from western United States, by Dr. Per Axel Rydberg.

No. 3. The dichotomous *Panicums*: some new Species, by Geo. V. Nash.

No. 4. *Delphinium Carolinianum* and related Species, by Dr. Per Axel Rydberg.

No. 5. Studies on the Rocky Mountain Flora—I, by Dr. Per Axel Rydberg.

No. 6. Notes and Descriptions of North American Plants I and II, by Dr. J. K. Small.

No. 7. Vegetative Reproduction and Multiplication in *Erythronium*, by Frederick H. Blodgett.

No. 8. Two new Species of *Grimmia* from Montana, by R. S. Williams.

No. 9. Studies on the Rocky Mountain Flora—II, by Dr. Per Axel Rydberg.

No. 10. Studies on the Rocky Mountain Flora—III, by Dr. Per Axel Rydberg.

No. 11. Life-history of *Schizæa pusilla*, by Elizabeth G. Britton and Alexandrina Taylor.

No. 12. Studies on the Rocky Mountain Flora—IV, by Dr. Per Axel Rydberg.

No. 13. Further Studies on the Potentilleae, by Dr. Per Axel Rydberg.

No. 14. Studies on the Rocky Mountain Flora—V, by Dr. Per Axel Rydberg.

No. 15. Studies on the Rocky Mountain Flora—VI, by Dr. Per Axel Rydberg.

No. 16. Vanishing Wild Flowers, by Elizabeth G. Britton.

No. 17. The Tylostomaceae of North America, by V. S. White.

No. 18. Shrubs and Trees of the Southern States, by Dr. J. K. Small.

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EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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THE TEMPERATURE OF THE SOIL.

A committee on the "Relation of Plants to Climate" was appointed at the New York meeting of the American Association for the Advancement of Science, in June, 1900, and this committee immediately undertook the consideration of current methods of measuring temperatures with regard to their influence upon vegetation. The actual investigations planned by the committee were carried out by the author, and a paper was presented at the Denver meeting of the Association in August, 1901, describing a method of estimation of the total temperature exposure of a plant. This method implied the use of thermographic curves, and the total heat exposures (temperature above zero centigrade, freezing point) and cold exposures (temperature below zero centigrade) were calculated in hour-degree units. Thus it was found that the flowers of the silver maple (*Acer saccharinum*) in the New York Botanical Garden were mature and ready for fertilization on March 26, 1901, after 1,100 hours exposure to air temperatures above the freezing point with a total heat exposure of 3,466.6 hour-centigrade-degree heat units. *Draba verna* (vernal whitlow grass) reached the same stage in 974 hours with 1,644 hour-centigrade-degree units of heat exposure.

The above method of measuring the temperatures to which plants were exposed was applicable only to the thermometry of the air. The basal portion of the axis of a plant, often the larger part of its body, is imbedded in the soil, however, and no adequate study of the subject could be made until some graphic method was devised for obtaining continuous temperature records of the soil. The committee was given a second grant by the Associa-

tion, and by the aid of additional funds given by the New York Botanical Garden an effort was made to devise an instrument that would make such a record. The investigation was intrusted to the author, and he was so fortunate as to enlist the interest and secure the coöperation of Dr. Wm. Hallock, professor of physics in Columbia University, who undertook to devise a thermograph that would make a continuous record of the temperature of the soil at any depth desired. A paper by Prof. W. H. Bristol, "A new Recording Thermometer for closed Spaces" read before the Association at the Brooklyn meeting in 1894, furnished the

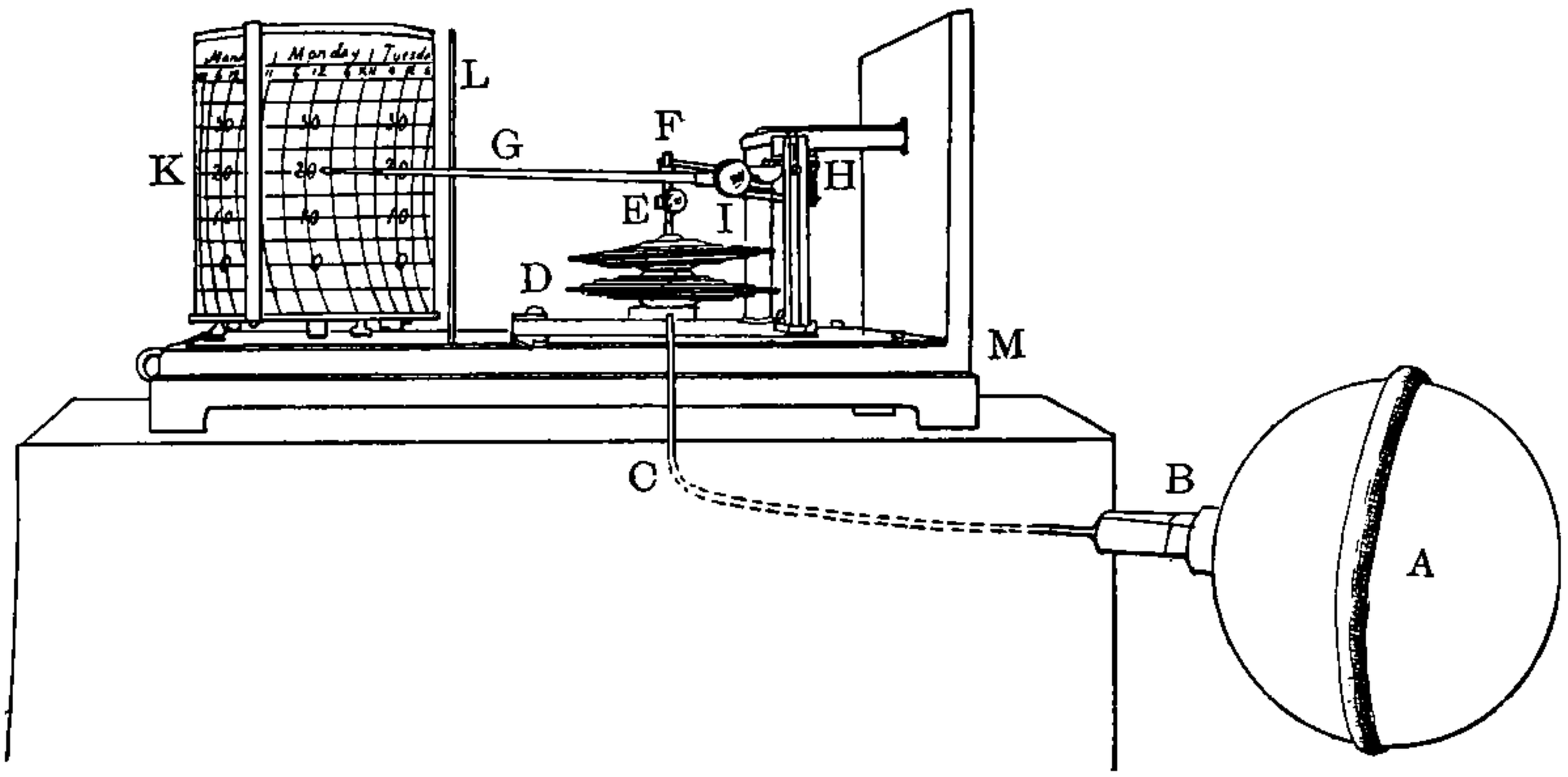

FIG. 19. Hallock thermograph. *A*, bulb containing kerosene. *B*, heavy tube, soldered to polar opening in bulb. *C*, capillary tube connecting bulb, and expanding chamber. *D*, double expanding chamber. E, upright post with adjustment clamp at *E*, on expansion chamber and fastened to short lever arm at *F*. *G*, lever extending from axis, and bearing pen, which traces temperature record on the cylinder. *H*, adjustment to raise or lower pen in making corrections, and calibrations. *K* cylinder driven by internal clockwork which makes one revolution per week. The cylinder carries paper ruled horizontally to degrees centigrade. The rate of movement carries the paper past the pen at such rate that two hours is taken to pass over the interval between two curved lines. *L*, upright rod on hinged base to remove pen from contact with paper. *M*, base of cast iron.

principle upon which the new instrument, which will be designated as the Hallock thermograph, was constructed.

The essential features of the Hallock thermograph are as follows: The thermal element of the instrument consists of a copper bulb or globe 11 cm. in diameter with a strengthening equato-

rial ridge, filled with commercial kerosene. A short section of copper tubing with a heavy wall is soldered to an opening in one pole of the globe, and the free end of the heavy tube receives a small copper tube with an external diameter of about 4 mm., a bore of one millimeter, and of any desired length. The tube is also filled with petroleum. The free end of the small tube is connected with a chamber consisting of a pair of corrugated brass disks 8 cm. in diameter with the edges soldered together. The chamber is seated on a metal block fastened to the base of a recording apparatus and the tube connects with the chamber through an opening in the metal block. An opening is made in the upper side of the first chamber and a second chamber of the same kind is soldered to it, the interior of the two chambers being thus connected (see Fig. 19, *D*). The pair of corrugated chambers are filled with petroleum as convenient during the course of construction, and care is taken to exclude all air from the bulb, tube and chambers. As the temperature in the bulb is made to rise it expands, and as both it and the small tube have fairly rigid walls, the total expansion of the liquid is made to press outwardly the walls of the chambers with corrugated walls, which expand and contract after the manner of a bellows. An upright post is fixed to the upper wall of the pair of chambers, and it may be lengthened or shortened in making the necessary adjustments. This post connects with a short arm 4 cm. in length at *F*, running to an axis held in bearings between two upright standards. A second arm 17 cm. long carrying a pen is attached to this axis extends to an upright recording cylinder revolved by clockwork. The cylinder carries double ruled paper and occupies a week in a single revolution. The instrument is now adjusted so that the pen bears against the point on the paper indicative of the same temperature as that of the bulb as determined by a mercurial thermometer, and it is ready for use. At the end of a week the paper, bearing a continuous tracing of the temperature for that time, is removed and another put in its place.

The peculiar usefulness of this apparatus lies in the fact that the bulb may be buried in the soil at some distance from the re-

corder, and a continued record made of the temperatures to which the roots of plants are subjected. The amount of liquid in the capillary tube and corrugated chambers is so small in comparison with that in the bulb, that the variations in volume of this portion of the confined liquid make no practical differences in the readings. Thus no matter how warm the air might become, or even if the sun shone directly on the capillary tube the instrument would show the temperature of the bulb to within a very small fraction of a degree, the error being so small as to be negligible in all ordinary experiments. This is further illustrated by the fact that the flame of a bunsen burner may be applied to this tube without apparent effect on the temperature shown by the indicator.

But one of the Hallock thermographs has been constructed, and it has been installed as described below in a location in the

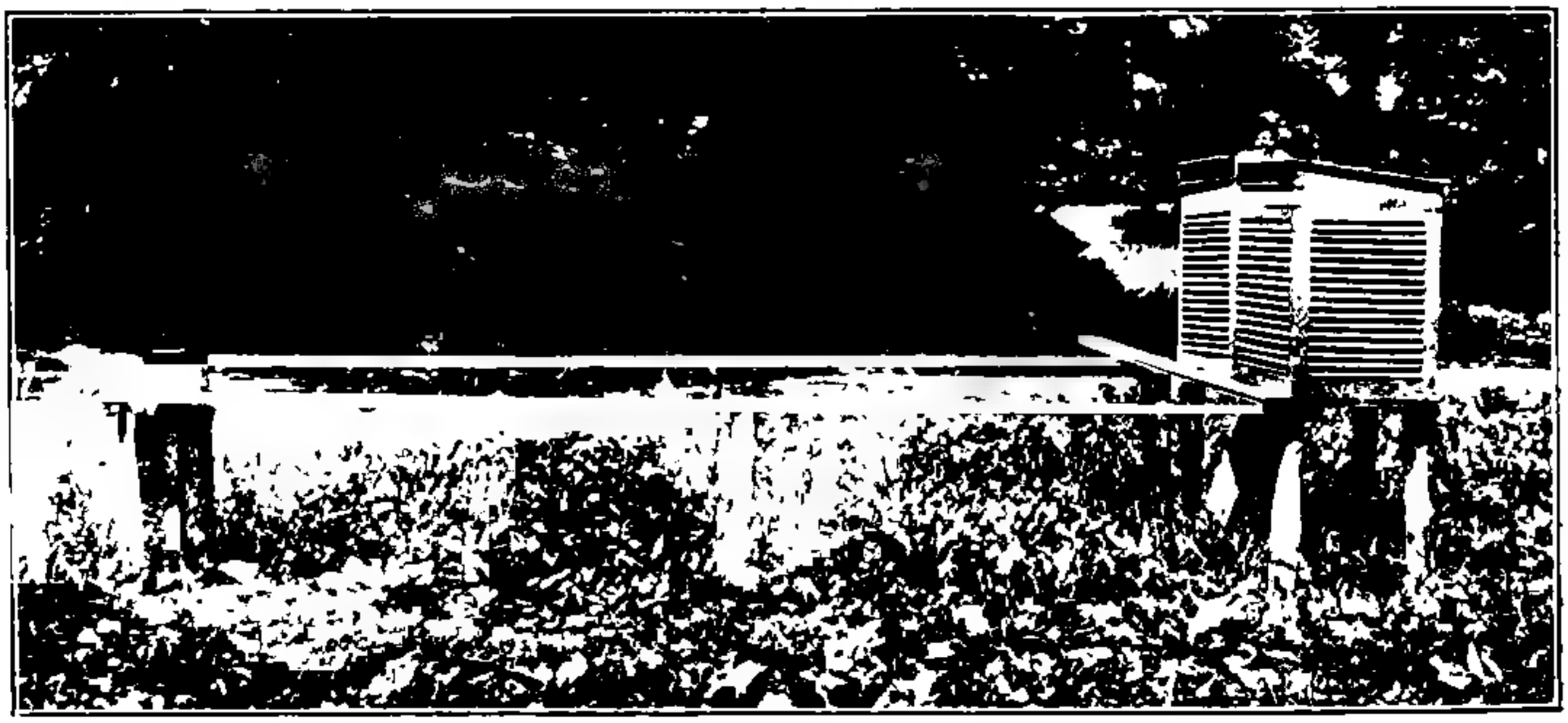

FIG. 20. Meteorological station in Garden. Rain-gauge in corner of enclosure. The bulb of the Hallock thermograph is buried in the middle of the enclosure at a depth of 30 cm. The instrument shelter at the right contains the recording and registering apparatus.

nurseries of the Garden, to which place all of the meteorological apparatus has been removed. The recording portion of the instrument, together with an air thermograph, has been placed in an instrument shelter of the United States Weather Bureau pattern. (See Fig. 20.) The capillary tube has been extended down through the floor of the shelter to the surface of the ground, being protected

from mechanical injury by being led through a groove in a board. A narrow trench two meters long and about 20 cm. in depth was then dug, and the excavation was continued for a distance of half a meter more in a small tunnel. The tube was now laid in the trench and the bulb pushed to the farther end of the tunnel. This allowed the bulb to lie in contact with the undisturbed earth around the roots of the grasses and other plants growing there, and at a distance of 30 cm. (1 ft.) from the surface of the soil. The trench and tunnel were carefully packed with earth. The above arrangement places the bulb at a distance of 3.5 meters from the recording apparatus and gives a record of the temperature of the soil in a fairly natural condition with respect to its porosity and permeability to air and water. The soil was clayey with a mixture of a small proportion of loam.

Previously to the installation the two thermographs were placed in a closed room with a standardized mercurial thermometer (No. 2792 G. S. Reichsanstalt, Berlin) and were found to read approximately alike, allowing for a certain slowness of response in the thermographs (see tracings under date of April 28, *A* and *B*, to *M*, Fig. 21). Both were put in place at the nursery on May 2, 1902.

The results obtained at this date are shown in Fig. 21, in which tracings of the thermographic records of the temperature of the air, and of the soil at the stated depth are given. The temperature of the soil is seen to exhibit two variations. In one series the lowest temperature is reached between 8 A. M. and noon and the highest between 8 P. M. and midnight. A second series of fluctuations follows the general variations in air temperatures as exemplified in "warm waves" and "cold waves." During the period of six weeks over which these records extend the heaviest rainfall of .65 inch appeared to exert no direct effect upon the temperature of the soil at the given depth, although the effect might have been masked by the general cooler temperature of the air following the rain. The highest temperature of the soil recorded was 14° C. (57° Fahr.) and the lowest 7° C. (44° Fahr.). It is too early to make generalizations upon the influence of the fluctuations of soil temperatures upon the growth

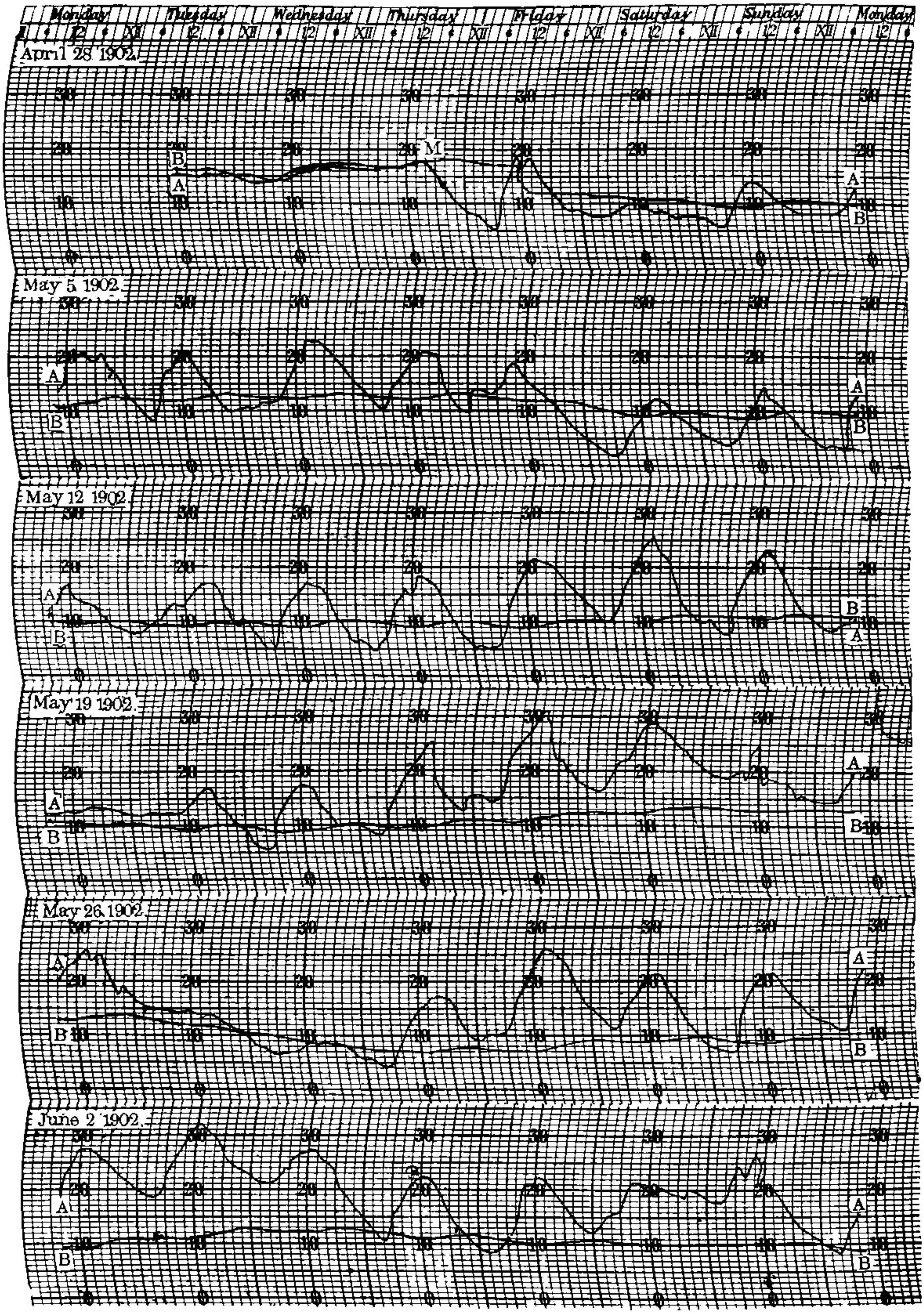

FIG. 21. Thermographic record of air, and soil at a depth of 30 cm., in nursery, from May 2 until June 9, 1902. The first part of the uppermost curve—*B* to *M*, and *A* to *M* show tracing by instruments in testing room. *A*, *A*, air temperature. *B*, *B*, soil temperature.

of plants, yet several promising avenues for investigation are opened up.

It is to be recalled that numerous and extensive data of soil temperatures at various depths have been obtained by many observers, chiefly by means of mercurial thermometers, or by electrical apparatus.* It is believed however that the above apparatus will offer many advantages in the way of securing continuous records, as well as data as to the rate and manner of variation that will be of great value in the investigations under way, and also in other questions connected with the growth and activity of plants.

D. T. MacDougal.

EFFECT OF LIGHTNING ON TREES.

Five trees in the Garden have been "struck" by lightning in three years. One of these, a fine example of swamp oak (*Quercus palustris*) which stood near the railroad station in the western part of the grounds, conducted a discharge in July, 1901, which traversed the trunk and one of the two main "forks" into which it divides. The spark or flash appeared to pass through the uppermost twigs of this main branch, variously splitting and rupturing the tissues, and tore the bark, growing layer, and sap wood, in places from the surface of the main branch and trunk in a band 8 to 12 inches in width. The lowermost branches of the fork traversed survived and sent out a few leaves in 1902, but the remainder, as well as the lowermost branches of the other fork, were unmistakably killed immediately by the shock. The

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* General Considerations on Soil Temperatures. Rep. N. Car. Exp. Sta. Pp. 92–99, 106–112, 122–128. 1886.

Whitney and Briggs. An Electrical Method of Determining the Temperature of Soils. Bull. No. 7, U. S. Dept. of Agriculture, Division of Soils. 1897.

Briggs, L. J. Electrical Instruments for Determining the Moisture, Temperature, and Soluble Salt Contents of Soils. Bull. No. 15, U. S. Dept. of Agriculture, Division of Soils 1899.

See also Reports N. Y. Exp. Station for observations extending over a number of years.

Some important phases of the subject are set forth by D. A. Seeley in an article The Temperature of the Soil and the Surface of the Ground, Monthly Weather Review, 29: No. 5, p. 501. 1901.

remainder of the crown developed only a small portion of the leaves in 1902, and has begun to give indications of approaching death, so that the removal of the tree will soon be necessary (see Fig. 22).

During the same year a large specimen of American elm (*Ulmus Americana*) near the present location of the landing stage of the elevated railway was wrecked by a discharge that killed the tree so completely that it was removed. A white oak (*Quercus alba*) on the ridge of the herbaceous plantation was also the object of a discharge that tore a wide strip of bark from the surface of the trunk for a distance of forty feet and then the spark appeared to be diffused through several branches, some which were ruptured and killed. This tree appears to offer an example of discharge from the earth, although the evidence is not at all to be relied upon as conclusive.

Another instance of lightning stroke is to be seen in a large chestnut (*Castanea dentata*) standing on the eastern slope of the main ridge in the hemlock reservation. A discharge took place through this tree in July, 1899, which tore loose the bark, growing layer and sap wood in narrow strips, from the trunk and a main branch in a spiral band a foot in width. In June, 1902, the larger branches in the crown were found to be dead, and the bark and cambium layer on both sides of the bared strip were dead over a width of a foot or two. The survival of the tree is doubtful.

An interesting example was found in a specimen of ash (*Fraxinus Americana*) east of the Bronx River, near the road leading to the Bleeker street entrance. The only evidence of the discharge in this case consisted of a narrow band of ruptured bark and sap wood, beginning a few inches above the surface of the soil, and extending upward to a height of about eight feet. No injury to the branches could be seen. No noticeable effect was exerted upon the general vigor of the tree.

From the various investigations that have been made of the subject it has been found that the electrical conditions of the clouds and earth may change quickly from negative to positive during the course of a thunderstorm, and that the differences of

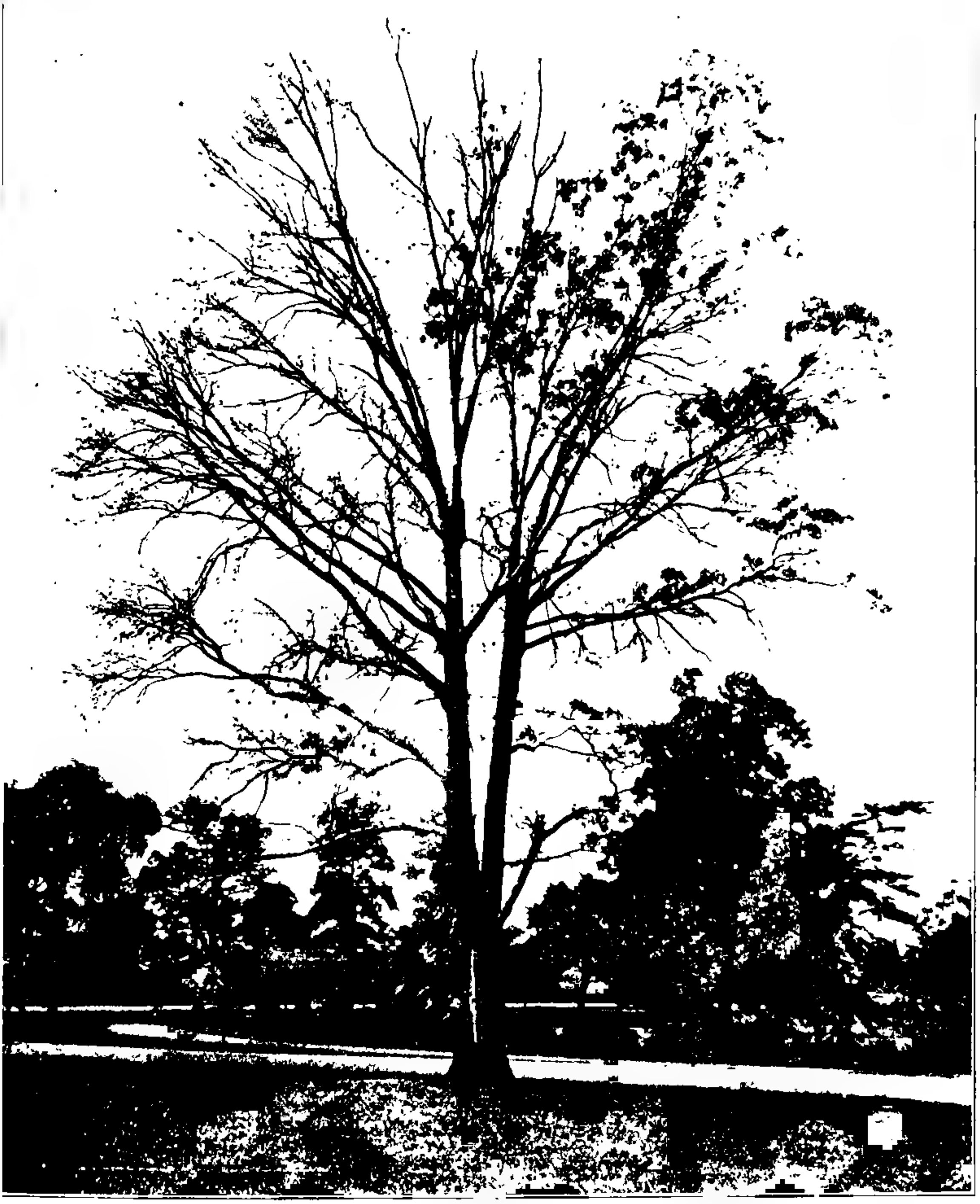

FIG. 22. Swamp oak (*Quercus palustris*) eleven months after being struck by lightning. The dead portion of the tree is devoid of leaves. The nodules seen on many branches are insect galls.

potential are often enormous. Great variation is shown in the direction and character of the discharge. An examination of a living tree as a conductor reveals the fact that the portions containing the greatest proportion of starch, glucose, or other sugars offers the least resistance to the passage of electrical currents, or discharges and that the parts containing oily material offers the greatest resistance. In consequence lightning discharges generally pass through a tree trunk in the growing layers and sap wood, and the actual amount of mechanical lesion accomplished will depend upon the size of the discharging spark, or flash. A more or less constant discharge is constantly taking place through trees but it is only when the difference in potential becomes very great that a lightning stroke results.

The increasing attention paid to origin of forest fires has led to indubitable proof that their origin is often to be traced to flashes of lightning. The following example has come under the author's observation. While in camp on Minard's Bay on the western side of Priest Lake, Idaho, in 1900 in company with Mr. Sam Davis, a forest ranger detailed for duty in that portion of the reserve, a number of severe thunderstorms occurred. One morning we were warned by a boatman from the opposite side of the lake that lightning had been seen to strike a tree up on the mountain side, back from the lake, the night before. The lesser mountain ridge was climbed in about three hours' hard work, and then favorable positions were secured from which the forested slopes around the lake could be observed. After a time our watch was rewarded by the sight of puffs of smoke from a point two miles away. On making our way to this place the base of a pine tree, and a widening circle of leaves and humus were found to be burning briskly. A flash of lightning had struck the top of the pine tree and after coming down it for thirty feet had jumped to the top of a dead spruce leaning against the pine, setting fire to a portion about six feet in length. This top of the spruce had been burned away from the trunk and the blazing fragment had then fallen to the ground against the base of the pine, which was partly rotted and dry. At the time it was discovered, this incipient forest fire had eaten its way into the heart of the pine tree, and outwardly

in a widening circle in the deep humus, which dried before it. A few hours later the fall of the blazing pine would have set a conflagration on its way that would have burned a hundred square miles of magnificent forest before we could have had the least hope of checking it.

D. T. MacDougal.

THE JUNE MEETING OF THE HORTICULTURAL SOCIETY OF NEW YORK.

The June meeting and flower show of the Horticultural Society took place on June 11 and 12, at the Botanical Garden, when a very creditable display of flowers was made. Mr. James Wood, president, delivered a masterly address on "Horticultural Prospects," in which he showed how the afore-time distinctions between agriculture and horticulture were gradually being removed as the one adopted and absorbed the methods of the other. The speaker drew attention to the fact that horticulture had until very recently progressed by experience alone but that now there was a concentration of scientific effort toward the bettering of practice and methods. At no time had the prospect been brighter. In other branches of investigation great results had accrued from the occasional efforts of investigators, but now in each state of the union were skilled men devoting their time incessantly to the cause of horticulture, and there could be but one result of all this.

A feature of the exhibition was in the offer of the American Rose Society's silver medal for the best collection of garden roses. The award went to T. Bell, gardener to F. R. Newbold, Poughkeepsie, who had 24 vases of finely grown flowers. Mrs. J. B. Trevor (H. Nichols, gardener), Yonkers, N. Y., was the winner for H. P. Roses in the collection and also for the best one variety, having Mad. G. Luizet in this case. The strawberries from this exhibitor were not only the finest in the show, but were of exceptional quality, especially Marshall and Nick Ohmer. W. Scott, gardener for Joseph Eastman, Tarrytown, was first for a collection of five varieties, and also had prizes for single dishes.

He also showed good vegetables, but was beaten by G. C. Rand, Lawrence, N. Y. (gardener, G. McNichol). Peas were well shown in the varieties Daniel O'Rourke and First-of-All, respectively from W. Scott and H. Nichol.

Paeonies of the Chinese section were largely shown, the Cottage Gardens, Queens, N. Y., being the chief contributor and sending a very great number. T. A. Havemeyer, Hempstead, N. Y., was second in the class for a collection showing a carefully named lot. Flowering shrubs were sent by W. H. S. Wood and G. C. Rand, to whom the honors were given in the order named.

Special prizes and certificates of merit for culture and quality were granted to Charles Uffler, gardener to George W. McFadden, Rosemont, Pa., for bunch of asparagus, variety d'Argenteuil, wonderfully large stalks and the finest ever shown in New York; to A. Hans, gardener to Lowell N. Palmer, Stamford, Conn., for display of 33 varieties of rhododendrons, exceptionally fine; to L. A. Martin, gardener to W. H. S. Wood, Greenwich, Conn., for seven vases of 100 blooms each of sweet peas, each of a variety, also for collection of herbaceous perennials. The sweet peas were from fall-sown seed and were superb. Salopian, Peach Blossom, Countess of Radnor and Boreatton were some of the varieties.

A new rambler rose named Bridal Wreath came from W. A. Manda, South Orange, N. J. It is a seedling of *R. Wichuraiana* and some H. P. variety; has double white flowers, produced in regal profusion and in habit leans strongly to the seed parent. It also has glossy foliage. A certificate of merit was granted to the novelty.

LEONARD BARRON,
Secretary.

136 LIBERTY ST.

REPORT OF MR. F. S. EARLE, ASSISTANT CURATOR, ON A COLLECTING TRIP TO WESTERN TEXAS AND NEW MEXICO.

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

Dear Sir: In accordance with your instructions I started from Barstow, Texas, on April 20th, for a wagon trip through the Davis Mts. in western Texas. On this part of the journey I was accompanied by Prof. S. M. Tracy. Barstow is on the Texas Pacific Railway near where that road crosses the Pecos River. It is in a low sandy plain constituting the second bottom of the river. The original growth is mesquite scrub (*Prosopis*), with a dense sod of "salt grass" (*Sporobolus*) on the heavier moister portions. To the eastward this plain is bounded by low gravelly ridges covered with "creosote bush" (*Covillea*). This region proved to be a poor collecting ground, only about seventy numbers being taken during a careful examination of several square miles of territory. Barstow is an agricultural center of some importance, water for irrigation being taken from the Pecos River. Cotton is the principal crop and this is I believe the only point in the United States where this crop is grown on a large scale under irrigation. California grapes (*vinifera* varieties), peaches and cantaloupes are other important crops.

Leaving Barstow our course was in a general southwesterly direction for about a hundred miles to Fort Davis, entering the mountains by way of the Limpia Cañon. From this point we turned northward, following a rugged trail through the heart of the mountains for sixty miles to Kent, on the Texas Pacific R. R. and thence back easterly along the line of the railroad to Barstow, the trip occupying fifteen days.

The region is a very interesting one botanically, and later in the season after the beginning of the summer rains it would have yielded a great variety of plants. Owing to the heavy overstocking with cattle, and to the columnar character of the rocks with many vertical crevices which seemed to intensify the usual condition of spring drought characteristic of western Texas and New

Mexico, the collecting was a little disappointing; still nearly four hundred numbers were taken, many of them of flowering shrubs that would have been missed later in the season. The region will well repay farther and much more extended study. At one point near Kent some low limestone ridges were encountered and the effect on the vegetation was at once apparent in the presence of such lime-loving plants as *Fouquiera splendens* with its flame-tipped thorny branches, species of *Hedeoma* and *Teucrium laciniatum*, all plants characteristic of the limestone hills in New Mexico, but which had not been seen in the Davis Mountains proper. Besides herbarium specimens a few living plants, mostly cacti, were secured but the quantity was not great, owing to the difficulty of transportation.

I left Barstow on May 7th, going to El Paso where a day was spent in collecting cacti for shipment to the garden and in taking herbarium material. Notwithstanding the long-continued drought the rocky foothills near town furnished an interesting variety of plants and more time could have been spent here to advantage. From El Paso I went by rail to Cloud Croft, New Mexico, at the top of the Sacramento Mountains at an elevation of 9,000 feet, reaching there about noon of May 9th. Cloud Croft is in the aspen-spruce belt and later in the season would furnish abundant collecting. At this elevation the season was but little advanced and though some interesting things were found the number of plants in bloom did not justify a prolonged stay. The morning of the 10th, I started down the mountain on foot passing, successively through the spruce, pine and juniper belts and into the mesquite formation near the foot of the mountain, securing an interesting series of plants illustrating the spring blooming at these different elevations.

The itinery of the journey as planned included a trip of the neighboring White Mountains which are some four thousand feet higher than the Sacramentos, but the scarcity of bloom at the higher altitudes on the Sacramentos indicated that the results so early in the season would not justify the time and expense necessary for organizing an expedition to reach this higher level and this feature was reluctantly abandoned. On the trip

home brief stops were made at Carrizoza, Capitan, Lincoln and Roswell in New Mexico and at Cobden, Illinois, some plants being secured from each of these localities.

F. S. EARLE.

THE PLANT PICTURE COLLECTION.

For many years the late Mr. A. P. Lyon was engaged in bringing together in a special series and as an adjunct to his library, plates or pictures of plants. This collection, at the time of Mr. Lyon's death, contained fully 260,000 prints, many of which were accompanied by the letter-press.

The Board of Managers of the Garden at a recent meeting, authorized the purchase of this collection, and the transfer of the boxes containing the entire series of plates from Mr. Lyon's late residence to the Museum Building at the Garden has been accomplished.

The collection is made up of both black and white, and colored plates from many of the illustrated botanical works of the United States, Great Britain and Continental Europe. Such works as the Botanical Magazine, the Flower Garden, Flowers and Ferns of the United States, the Botanical Garden, Icones Filicum, Botanical Cabinet, Sertum Botanicum, Botanical Register, Histoire des Plantes and various government reports have been drawn upon to build it up.

As a matter of course a series brought together in this way is exceedingly heterogeneous, representing as it does the greatest variety of methods of reproduction and skill in delineation, varying from those of little value to those of relatively great value, especially to certain departments of this institution. A superior class of plates predominates, however, and the Garden has been fortunate in being able to add this plant picture collection in its entirety to its exhibition resources.

At present the collection is arranged on the system of classification adopted by Bentham and Hooker in their Genera Plantarum, and thus any plate is readibly accessible. However we shall change its arrangement to the classification adopted by

Engler and Prantl in their Natürlichen Pflanzenfamilien on which all the collections of the Garden are arranged, and then withdraw such plates as will strengthen exhibits in the public Museums, and others will be used in connection with the collections and herbarium. J. K. SMALL.

NOTES, NEWS, AND COMMENT.

Professor W. W. Rowlee, of Cornell University, spent a few days during June at the Garden making a critical examination of some material recently secured by him from the Isle of Pines.

Professor J. E. Kirkwood, of Syracuse University, is in residence at the Garden for the purpose of completing his studies upon the embryology of the Cucurbitaceae begun some time since.

Miss W. Robinson, instructor in biology at Vassar College, occupies a table in the Laboratories during June and July for the purpose of making some studies of the ferns of North America and prosecuting some physiological researches.

The Alabama Polytechnic Institute has recently conferred the degree of M.A. on Professor F. S. Earle, assistant curator in the New York Botanical Garden, in recognition of his extensive researches in the fungi and in plant pathology.

Professor A. W. Evans, of Yale University, and Mr. Percy Wilson, of the New York Botanical Garden, have gone to Porto Rico to make some further investigations and collections of the flora of that island for the New York Botanical Garden. Special attention will be given to the small area of primitive forest yet remaining on the island.

The total amount of precipitation in the Garden during June, 1902, amounted to 5.65 inches. Maximum temperatures of 92.5° on the 3d, 86° on the 12th, 87.5° on the 16th were observed, and minima of 46.5° on the 16th, 50° on the 12th, 49° on the 23d, and 46° on the 24th were observed.

The temperature of the soil, taken by the newly designed Hallock thermograph at a depth of a foot, ranged from 45° to 55° F.

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OF

The New York Botanical Garden

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.

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. Vol. I, Nos. 1–5, 449 pp., 3 maps, and 12 plates, 1896–1900. $3.00. No. 6, 232 pp., 20 plates. Free to all members of the Garden; to others, 50 cents.

Memoirs of the New York Botanical Garden, Vol. 1. 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. Price to members of the Garden, $1.00. To others, $2.00. [Not offered in exchange.]

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No. 21. Two new Western Mosses, by R. S. Williams.

No. 22. Studies on the Rocky Mountain Flora—VII, by Dr. Per Axel Rydberg.

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The New York Botanical Garden

EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

CONTENTS

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JOURNAL

OF

The New York Botanical Garden

VOL. III. August, 1902. No. 32.

REPORT OF THE HEAD GARDENER ON HIS VISIT TO EUROPEAN BOTANICAL GARDENS.

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

SIR:—I submit herewith a report upon my recent trip to Europe, made for the purpose of studying the larger botanic gardens there, for arranging exchanges with them, and also for pursuing scientific investigations on certain families of plants.

Pursuant to your instructions, I left on April 12, arriving in London the following Saturday. I immediately proceeded to the Royal Gardens at Kew, and with the permission of the Director, Sir William T. Thiselton-Dyer, at once began the selection of duplicates from the extensive collections. Mr. Watson, the curator, was most cordial in his reception, and gave me every facility for a detailed inspection of the collections, generously setting aside such duplicates as could be spared. These were removed by Messrs. Veitch & Sons to their establishment, and packed and shipped to New York by them. About 800 species have been received up to the present time. Bulbous plants, shrubs and trees, which it was impossible to ship at once, will be forwarded later at the proper time. In addition to those above referred to, cuttings of about 150 other species, mostly succulents, were brought with me, and from this source something over 600 additional plants have been derived. The courtesy of those in charge at the Royal Gardens, Kew, I shall long have cause to remember. About two weeks were spent here in examining and studying the collections, and in selecting specimens.

Early in May a visit of three or four days was made to the Botanic Garden in Edinburgh. This is not as extensive in area as that at Kew, but contains a most interesting collection, and many desirable plants, which were not obtainable at Kew, were here secured. Your letter of introduction was presented to the Director, Dr. I. Bayley Balfour, who explained the general scheme of planting and grouping. With his permission, I made a rather lengthy list of desiderata. Of these, about 225 plants have already been received, and more are to follow during the summer and fall. A rich collection of alpine and rock-loving plants is a feature of the institution, and these, especially the saxifrages, seemed to revel in a climate and environment well adapted to them. A collection of cycads planted out in the palm house especially attracted my attention on account of their vigorous growth and the beauty of their foliage. Mr. Harrow, the curator, furnished every facility for the prosecution of my work.

Cambridge was next visited, and at the Botanic Garden connected with the University and directed by Mr. Lynch, a most interesting collection of both hardy and tender plants has been accumulated. Many plants which could not be secured elsewhere were obtained here through the generosity of Mr. Lynch. The garden is limited in area, but the number of species brought together in so small a space is amazing. Mr. Lynch has a fondness for succulents, and has accumulated a valuable collection. Such of these as were in duplicate were gladly offered to us, and of such others as we desired, cuttings were made wherever possible. Something over two hundred species have already been received from this source, and more will follow later, including a collection of irises, of which a most complete representation has been brought together there.

On May 13, I started for the continent, making my first stop at Brussels. M. de Wildeman was absent in Paris, and so I presented your letter, addressed to him, to Dr. Durand, the director, who was willing to arrange an exchange with us. A list of desiderata was prepared, a large proportion of which have been received. A valuable collection of aroids has been brought

together here, embracing many species represented by well-grown plants. M. Cl. Marchandise was appointed by the director to conduct me through the institution and to indicate such plants as could be spared.

On the 15th Antwerp was visited, but the garden here is very small, and contains little of interest, so but a short stay was made.

The following day I arrived at The Hague, Holland, from which point Leyden, some ten miles distant, was visited. Here is located a small botanic garden, but its size is no indication of its importance. It is well worth a visit, especially to those interested in the bromeliads, of which a fine collection has been here brought together by Mr. Witte, the curator, whose willingness to let us have rare and interesting plants was much appreciated. The plants selected here are to be shipped during the present summer. Dr. J. M. Janse, the director, readily consented to the arrangement of an exchange.

From Leyden I proceeded to Utrecht. The director of the botanic garden here, Dr. Went, to whom I presented your letter, was willing to enter into an exchange, and gave instructions that such duplicates as could be spared should be sent to us. About fifty species were selected, and these have already been received.

Hanover, Germany, was next visited on the 18th. The collection here was somewhat of a disappointment, as I had heard so much in regard to it. The director, Herr H. Wendland, that ardent lover and student of palms, has been unable for some time to give his personal attention to the collection. It was impossible to see him, and no one else seemed to show a disposition or desire to enter into an exchange, so little was accomplished in that line.

On the 20th I arrived at Berlin. I presented your letter of introduction to Dr. Engler, who personally explained to me the general scheme of the new garden. From the standpoint of plant geography, I have seen nothing to equal it. I spent several hours in inspecting the large collections of hardy plants here brought together, and in studying the grouping and general scheme, with which I was much impressed. I also examined the exceedingly rich collections of tender plants, under the

guidance of Herr Behnick. I examined the very rich collection of cacti, and a large number of South African plants, many of which I saw nowhere else. The collection of aroids is rich in unusual and rare forms. With the permission of Dr. Engler, I made out a list of desiderata, which, according to the rules of that institution, must be officially submitted to him by yourself.

I also called upon Dr. Urban and handed to him the package of West Indian herbarium specimens upon which you desired his opinion. He took an active interest in the matter and gave them his immediate personal attention, expressing the wish that the two institutions might coöperate in the work on the West Indian flora, and offered his services to that end.

On the 24th I visited Halle, and called upon Dr. Mez, submitting to him for determination several species of Lauraceae and Bromeliaceae. He gladly made these determinations. I found him just beginning the study of the grass genera *Panicum* and *Paspalum* for Engler's Pflanzenreich. Most of the large collections in Europe had been sent him for study, so I was enabled, through his kindness and help, to see types of a number of American species in these two difficult genera. He is quite anxious to secure herbarium specimens of grasses, and I arranged with him an exchange of these for specimens of Bromeliaceae, Lauraceae and Myrsinaceae, an extensive monograph by him of the latter family having just been published. I was surprised to find an interesting collection of succulents at the university garden, especially rich in the genus *Mesembryanthemum*. I made a list of such plants as we desired and as could be spared. These will be forwarded during the summer.

My next visit was to Frankfurt-am-Main, on the 25th. The Palmengarten located here is, strictly speaking, not a botanic garden, but is more a pleasure park. It belongs to private parties, and an admission fee is charged, which contributes partly to its support. Showy horticultural plants prevail, little of strictly botanical interest finding place.

From Frankfurt a day's run brought me to Paris on the 27th. At the Jardin des Plantes Prof. J. Constantin is in charge of the living collections. An exchange was arranged with him, and a

list of our desiderata furnished. These, some ninety species and over one hundred plants, were packed and shipped by him, and were received some time ago. Considerable work was also accomplished while here in my studies on the family Podostemaccae. The material upon which Tulasne based his work is deposited here, and I was able to secure, through the courtesy of Professors Bureau and Bonnet, specimens of the types of two species.

I returned to London on the 30th, devoting the remainder of my stay to work on the Podostemaceae, mainly at the herbarium of the Royal Gardens, Kew. I found much interesting material there, which appreciably forwarded my work on this family. On June 7th I sailed for New York, arriving here on the 14th.

As a result of my trip about 1,500 species new to our collections have already been received, and a considerable number are yet to come. Friendly and personal relations have been established with the curators of other gardens, which I trust will lead to our mutual advantage in the future. Courteous and generous treatment was accorded me at all the botanical gardens visited, and I found a desire to coöperate with us everywhere evident.

Yours respectfully,

GEORGE V. NASH,

Head Gardener.

AN UNUSUAL SPECIMEN OF A WEST INDIAN ORCHID.

There is at present in full bloom in the conservatories, in house No. 15, which is just east of the large central dome devoted to palms, a remarkably fine specimen of *Oncidium Baueri* Lindl., a native of the West Indies, and said also to occur in northern South America. This plant was secured by one of our collectors in Porto Rico, and its present condition is due to two or three years of greenhouse culture. It is suspended from the roof at the west end of the house referred to above, its numerous flowers, yellow-barred with brown, hanging in graceful panicles. There

are five of these clusters, the shortest with a length of 4 feet 3 inches, while the longest measures 12 feet 6 inches; the total length of the five panicles is 35 feet 8 inches. This same plant bore but a single cluster last year which was between four and five feet long.

In the *Botanical Register* for 1833, at plate 1651, is given a colored illustration of this species, under the name of *O. altissimum*, a quite different plant, as Lindley, the author of the present species, eventually admits. Lindley, in the descriptive matter accompanying the above plate, says: "We have actually had a specimen from Mr. Harrison, of Liverpool, the flower stem of which exceeds 10 feet in length." We have not been able to find a record of a larger panicle than this. The author of the article on *Oncidium* in Bailey's Cyclopaedia of American Horticulture gives the length of flower stem as 8–9 feet. Our specimen considerably exceeds all of these.

FIG. 23. *Oncidium Baueri* Lind.

This species is closely related to the *Oncidium altissimum* Sw., from which it differs in several particulars, which will be discussed later, and appears worthy of specific rank, although its early struggles to acquire title to this position were somewhat confusing. In 1830, in Lindley's Genera and Species of Orchidaceous Plants, page 200, the name of *O. Bauer* was first published as a synonym under the variety β of *O. altissimum*, a reference also occurring at the same place to the Illustrations of Genera and Species of Orchidaceous Plants, plate 7, to which

work at present we have not access. From a memorandum following the dedicatory page of the Genera and Species above referred to, it is evident that the Illustrations appeared subsequent to that work, although probably during the same year, as Pritzel gives the date of the Illustrations as 1830–1838, and the low plate number would indicate the earlier year. In the Botanical Register for 1833, plate 1651, the position first taken in the Genera and Species is still maintained, but in text descriptive of plate 1851 of the same work, in the volume for 1836, he states that he has now seen the true *O. altissimum* and the plant under discussion here growing side by side, and that it is impossible now to keep them together, asserting their individual rights to specific rank, and describing the differences which led him to this opinion, which was still held in 1855 at the time of his publication on the genus *Oncidium* in his Folia Orchidacea. The differences which were pointed out by Lindley as distinguishing *O. Baueri* are the ones which at the present time serve to distinguish the two species, and they are: the larger oblong pseudo-bulbs, the panicle which is branched throughout, the paler color of the flowers, and the truncate wings of the column. We have not *O. altissimum* in our collections, but it is said to have pseudo-bulbs which are nearly round, an inflorescence which is branched only at the base, the flowers brighter in color, and the wings of the column rounded and somewhat crenulated. An illustration of this species occurs at plate 1851 of the Botanical Register, already referred to.

The genus to which this large and free-flowering species, *O. Baueri*, belongs, is confined to America, and its members, like those of many other genera of the orchid family, are epiphytic, that is, make their home on trees, but derive no nourishment from their living tissues, and hence are not parasitic. The genus is a large one, embracing about 300 species, and is confined to America, ranging from Bolivia and Brazil to Mexico and the West Indies.

GEORGE V. NASH.

THE ENDOWMENT FUND.

Referring to the statement of the Finance Committee of the Board of Managers relative to the need of additional endowment, published in the February Journal and to the supplementary statement published in the March Journal, the status of the Endowment Fund may now be reported as follows:

Reported in March Journal	$314,102.93
Received from executors of the estate of the late Charles P. Daly (David Lydig Fund)	8,438.91
From Mrs. Frank Ferguson and Mrs. W. G. Nichols, in memory of their father, the late H. O. Armour	1,000.00
23 Life Membership fees	2,300.00
Students' fees added to Students' Research Fund	139.00
Total	$325,980.84

It will be recalled, from the February statement that it is desired to increase the Endowment Fund to at least $500,000. Any information desired will be furnished by the Director-in-Chief.

ARRANGEMENT OF RESEARCH WORK.

The collections in the Garden and library and the equipment of the laboratories have received such additions during the present year that the efficiency of the institution in promoting investigation has been greatly increased. In addition to the advantage gained by increased facilities in the way of apparatus and furniture, a number of new subjects have been added to the list, an expansion which has been made possible by changes in the staff, and by the further development of work already under way. The principal changes will be found to consist in the formal arrangement of work in plant geography, a subject which has received much attention from various members of the staff; in the increase of the scope of investigations offered in economic botany, made possible by the appointment of Dr. Gies as consulting chemist; in the rearrangement of the work in plant pathology

in such manner that several subdivisions of the subject will be open to investigators by the coöperation of various members of the staff; in the addition of special facilities in teratology, and in provision for experimental work in acclimatization and influence of climate on plants. The position formerly held by Dr. Anderson in Columbia University is now filled by Dr. Tracy Hazen, who will participate in directing investigations on the morphology and taxonomy of the algae.

The principal subdivisions of research subjects are as follows:

Morphology of Algae. — Study of the structure, development and life-history of the Algae. Field and laboratory. Dr. Howe; Dr. Richards; Dr. Hazen.

Morphology of Fungi. — Study of the structure, polymorphism and development of the Fungi, including culture methods. Field and laboratory. Professor Underwood; Mr. Earle.

Morphology of Bryophyta. — Study of the structure, development and life-history of Musci and Hepaticae. Field and laboratory. Professor Underwood; Mrs. Britton; Dr. Howe.

Morphology of Pteridophyta. — Study of the structure, development and life-history of Ferns and Fern-allies. Field, garden, conservatories and laboratory. Professor Underwood; Mrs. Britton.

Morphology of Spermatophyta. — Study of the structure, development and life-history of the Flowering Plants. Field, garden, conservatories and laboratory. Dr. Rydberg; Dr. Curtis; Professor Lloyd.

Experimental Morphology. — Problems in phylogenetic and adaptive reactions in form and structure. Professor Lloyd; Dr. MacDougal; Dr. Curtis.

Taxonomy of Algae. — Study of the diagnostic characters and relationships of the principal families and genera. Field, herbarium and laboratory. Dr. Howe; Dr. Hazen.

Taxonomy of Fungi. — Study of the diagnostic characters and relationships of the principal families and genera. Field, herbarium and laboratory. Professor Underwood; Mr. Earle.

Taxonomy of Bryophyta. — Study of the diagnostic characters and relationships of the principal families and genera. Field,

herbarium and laboratory. Professor Underwood ; Mrs. Britton ; Dr. Howe.

Taxonomy of Pteridophyta. — Study of the diagnostic characters and relationships of the principal 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. Dr. Britton ; Dr. Small ; Dr. Rydberg.

Taxonomy of Gramineae. — Study of the diagnostic characters and relationships of the principal genera of grasses. Field, herbarium, garden and laboratory. Mr. Nash.

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

Developmental Taxonomy. — Fossil ancestors of some family of plants. Comparative study of form and structure. Laboratory and museum. Dr. Britton ; Dr. Hollick.

Embryology of Spermatophyta. — Comparative embryology of special groups. Special embryological problems. 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 from the entire range of the vegetable world. Field, herbarium, laboratory, conservatories and garden. Directed, according to the group chosen, by Professor Underwood ; Dr. Howe ; Dr. Britton ; Dr. Small ; Dr. Rydberg ; Mr. Nash ; Professor Burgess ; Mr. Earle ; Mrs. Britton.

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

Cretaceous Flora of Eastern North America. — Collection and determination of specimens of some station, with attention to stratigraphic relations. Field and laboratory. Dr. 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. Doctor Britton; Doctor MacDougal; Professor Lloyd; Dr. Curtis.

Physiology of Nutrition. — Treated from a chemical standpoint. Laboratory. Dr. Richards.

Physiological Anatomy. — Problems in the relationships of tissues and functions. Laboratory. Dr. Curtis.

General Physiology. — Problems in absorption, excretion, nutrition and transformations of energy, growth, regeneration, correlations, the general irritable organization of the plant, and mechanism of movement. Laboratory. Dr. MacDougal; Dr. Curtis; Dr. Richards.

Economic Botany. — Investigation of plant products useful to man; origin, occurrence and formation in the plant. Method of preparation for practical use. Dr. Rusby; Dr. Gies.

Bacteriological Pathology. — Changes induced in the tissues of plants infected with bacteria. Chemical relations of host and parasite. Mr. Earle; Dr. Richards; Dr. Gies.

Mycological Pathology. — Morphology and physiology of fungi causing pathological conditions alterations in tissues of host plant, and changes in external form. Nutritive and general chemical relations of host and parasite. Mr. Earle; Dr. Richards.

Functional Pathology.—Problems in analysis of diseases due to disturbances in nutritive, chemical and physical processes, excessive, or defective formation and retention of enzymes, acids and other secretions. Functional abnormalities. Dr. Richards; Dr. Gies.

Pathological Conditions Due to Atmospheric Factors. — Influence of external chemical solutions, gases and vapors upon aërial organs. Effect of mechanical particles in the atmosphere. Dr. MacDougal; Dr. Richards; Dr. Gies.

Pathological Conditions Caused by Soil. — Influence of separate chemical constituents. Effect of varying proportions of water, concentration of soil salts, and of mechanical factors. Dr. MacDougal; Dr. Curtis; Dr. Gies; Dr. Richards; Mr. Earle.

Teratology. — Origin, structure and formation of abnormal organs. Effect of mechanical injuries and parasitic animals, Morphology of galls, and other malformations. Dr. MacDougal; Dr. Curtis; Professor Lloyd.

Acclimatization. — Analysis of factors of a species constituting hardiness and capacity for endurance of wide ranges of climate. Studies in the influence of climatic elements upon plants. Mr. Nash; Dr. MacDougal.

The laboratories are open during the entire year and persons desirous of availing themselves of the facilities afforded should address the Director-in-Chief.

D: T. MacDougal,
Director of the Laboratories.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

18 specimens "Ohio Fungi" fascicle III. (Distributed by Professor W. A. Kellerman.)

103 lichens from Minnesota. (By exchange with Mr. J. R. Gardner.)

12 herbarium specimens of *Crataegus*. (Given by Mr. J. Crawford.)

1 specimen of *Erythronium Smithii* (Given by Mr. C. G. Lloyd.)

21 herbarium specimens from New Mexico. (By exchange with Professor T. D. A. Cockerell.)

2 specimens of *Cypripedium* from Maine. (Given by Mr. Walter Deane.)

8 specimens of fungi and mosses from Cuba. (Collected by Mr. S. H. Hamilton.)

136 specimens "West American Fungi." (Distributed by Dr. David Griffiths.)

57 type specimens of recently described species of fungi. (Received from Mr. J. B. Ellis.)

4,000 specimens from China. (Collected by Dr. A. Henry.)

15 herbarium specimens from Maryland. (Given by Dr. N. L. Britton.)

2 type specimens of *Heuchera* from California. (Given by Mr. L. R. Abrams.)

16 specimens of fungi from California. (By exchange with Mr. C. F. Baker.)

1 specimen of *Astragalus* from Colorado. (Given by Dr. J. H. Barnhart.)

4 specimens of fungi from Wyoming. (By exchange with Professor Aven Nelson.)

15 lichens from California. (Given by Mr. C. F. Baker.)

34 photographs of plants. (Given by Mr. T. H. Kearney.)

587 herbarium specimens from various localities. (By exchange with the Royal Botanical Garden, Berlin, Germany.)

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

4 photographs of the Melbourne Botanical Garden. (Given by Col. E. W. Bass.)

14 specimens of *Salix* from Pennsylvania. (By exchange with Mr. A. A. Heller.)

75 specimens from Colorado. (By exchange with Mr. C. F. Baker.)

18 specimens of *Potentilla* from California and Utah. (By exchange with Mr. T. S. Brandegee.)

35 specimens of Wyoming plants. (Collected by Mr. Elias Nelson.)

2,124 miscellaneous specimens. (By exchange with the Botanical Garden, Upsala, Sweden.)

414 specimens from Cuba. (Collected by Messrs. E. Palmer, W. Palmer and C. L. Pollard.)

261 herbarium specimens from Margarita Island, South America. (Collected by Messrs. O. O. Miller and J. R. Johnston.)

265,000 illustrations of plants. (Collected by Mr. A. P. Lyon.)

200 mosses from Patagonia and Chile. (Distributed by Dr. V. F. Brotherus.)

PLANTS.

8 filmy ferns for the Conservatories. (Given by Mr. L. Cockayne, New Zealand.)

7 *Sedums* for the Conservatories. (Given by Mr. L. R. Abrams.)

13 plants for the Conservatories. (By exchange with Buffalo Botanic Garden.)

434 plants for outdoor collections. (By exchange with Department of Parks, Borough of the Bronx.)

127 plants for the Conservatories. (By exchange with the Department of Parks, Borough of the Bronx.)

48 plants for the Conservatories. (Given by Miss Mary T. Bryce.)

95 plants for the Conservatories. (By exchange with Mr. F. Weinberg.)

839 plants for the Conservatories. (By exchange with Royal Botanic Gardens, Kew, England.)

2 plants for the Conservatories. (Given by Mr. J. S. Merriam.)

173 plants for the Conservatories. (By exchange with the Botanic Garden, Cambridge, England.)

30 hardy plants. (Collected in Pike Co., Penn., by Mr. Percy Wilson.)

75 plants for the Conservatories, from the Bahamas. (Given by Mrs. H. L. Britton.)

5 plants for the Conservatories. (By exchange with the U. S. National Museum, Washington, D. C.)

62 plants for the Conservatories. (Collected by Professor F. S. Earle in Texas)

3 plants for the hardy collections. (Given by Mr. Otto Hacker.)

3 succulents for the Conservatories. (Given by Mr. H. P. Chandler.)

47 plants from Cuba. (Purchased from Mr. S. H. Hamilton.)

47 plants for the Conservatories. (Obtained by Dr. N. L. Britton at Charleston, N. C.)

2 succulents for the Conservatories. (Given by Mr. F. S. Curtis.)

8 orchids for the Conservatories. (Given by Dr. C. C. Curtis.)

1 *Cotyledon* from Santa Catalina Island, Cal. (Given by Dr. Hasse.)

1 *Cotyledon* from Santa Catalina Island, collected by Blanche Trask. (By exchange with the U. S. National Museum, Washington, D. C.)

9 plants for the Conservatories. (By exchange with Fairmount Park, Philadelphia, Penn.)

1 cactus for the Conservatories. (Given by Mr. James Wood.)

6 aquatics for the Conservatories. (By exchange with New York Zoölogical Society.)

5 Begonias. (By exchange with Mr. K. H. Ludwig.)

200 hardy shrubs. (Purchased from Thos. Meehan & Sons.)

3 plants of *Viola pedata*. (Given by Mr. David S. George.)

34 aquatics for the Conservatories. (Given by Mr. Oakes Ames.)

1 plant for the Conservatories. (Given by Mr. Bestelmeyer)

3 plants for Herbaceous Grounds. (Given by Professor E. L. Greene.)

1 plant of *Passiflora lutea*. (Obtained by Dr. N. L. Britton at Pittsburgh, Penn.)

56 plants for the Conservatories. (By exchange with the Botanic Garden, Utrecht, Holland.

1 plant for the Conservatories. (Given by Messrs. Schultze & Sons.)

1 plant for the Conservatories. (Given by Mr. Gaynor.)

7 plants of *Iris*. (By exchange with Mr. Frank Brunton.)

4 plants for the Conservatories. (Given by Mr. H. M. Hall.)

1 plant for the Conservatories. (Given by Mr. E. Smith.)

7 plants for the Conservatories. (Given by the University of Nebraska.)

1 plant for the Conservatories. (Given by Mr. J. P. Tracy.)

3 plants for the Conservatories. (Given by Mr. J. S. Holbrook.)

5 plants of *Arisaema quinata*. (Given by Mr. W. N. Clute.)

2 violets. (Given by Miss Angell.)

7 plants of *Lewisia rediviva*. (Given by Professor M. J. Elrod.)

7 plants for the Conservatories. (By exchange with Vassar College.)

226 plants for the Conservatories. (By exchange with the Botanic Garden, Edinburgh, Scotland.)

1 plant of *Lodoicea Seychellarum*. (By exchange with Phipps' Conservatories Pittsburgh, Pa.)

SEEDS.

1 packet seed of *Iris* sp. from Pikes Peak. (Collected by Professor L. M. Underwood.)

2 packets of seed. (By exchange with Professor T. D. A. Cockerell.)

18 packets of New Zealand seed. (Given by Mr. L. Cockayne, New Zealand.)

7 packets of Bahama seed. (Given by Mrs. H. L. Britton.)

4 packets of Mexican and Texan seed. (Collected by Dr. D. T. MacDougal.)

159 packets of seed. (By exchange with the Botanic Garden, Buenos Aires.)

1 packet seed. (Given by Mr. C. M. B. Harrison.)

2 packets of seed. (Given by Mr. Geo. E. Osterhout.)

3 packets palm seed. (By exchange with the Royal Botanic Gardens, Kew, England.)

4 packets of Texas seed. (Collected by Professor F. S. Earle.)

7 packets of seed for the Conservatories. (By exchange with the Botanic Garden, Cambridge, England.)

15 packets Porto Rico seed. (Collected by Mr. Percy Wilson.)

1 packet seed. (Given by Dr. J. N. Rose.)

14 packets seed. (Given by Mr. Willard W. Eggleston.)

1 packet seed of *Datura* sp. (Given by Mrs. J. B. Brown.)

1 packet seed. (Given by Mr. L. T. Withers.)

12 packets seed. (Given by Miss C. C. Haynes.)

1 packet Georgia seed. (Given by Mr. R. L. Harper.)

1 packet seed. (Given by Mr. E. M. Holmes.)

5 packets of seed. (Given Mr. by C. H. Baker.)

1 packet seed. (Given by Miss Sadie Taylor.)
78 packets seed. (By exchange with the Botanic Garden, Zurich.)
1 packet seed. (Given by Mr. L. R. Abrams.)
1 packet seed. (Given by Mr. J. S. Holbrook.)
48 packets Cuban seed. (Purchased from Mr. S. H. Hamilton.)

LIBRARY ACCESSIONS FROM MAY 25th TO JULY 11th.

ACOSTA, CHRISTOBAL. *Trattato della historia natura et virtu delle droghe medicinali et altri semplici rarissimi che vengono portati dalle Indie Orientali in Europa.* Venetia, 1585.

American Journal of Microscopy and Popular Science. Vols. 1–6. New York 1876–81. 3 vols. (Given by the Rev. Dr. Haslett McKim.)

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WEATHER REPORT.

The total amount of precipitation in the Garden during July, 1902, amounted to 4.12 inches. Maximum temperatures of the air were observed as follows: 90° on the 5th, 93.5° on the 9th, 91° on the 15th, 83° on the 22d and 90.5° on the 28th. Minima of 51.5° on the 2d, 52.5° on the 11th, 50° on the 17th and 56° on the 26th were recorded.

The temperature of the soil at a depth of 30 cm. (1 foot) ranged from 47.5 to 55.5° F.

Two examples of lightning stroke on trees were observed in the Garden. A large tulip tree (*Liriodendron tulipifera*) on the northern bank of the lake north of the museum was struck, the only outward signs of the stroke being the stripping of the bark in a narrow irregular band from the trunk. The discharge was of such intensity, however, that the tree began to cast its leaves within two days and was dead within a week. The second tree was a small hemlock (*Tsuga Canadensis*) about fifty-five feet in height near the Lorillard dam. This tree stood in the center of a triangle formed by a larger hemlock, a white oak (*Quercus alba*) and a red oak (*Quercus rubra*), the branches of which completely overshadowed the smaller hemlock affected. The "stroke" appeared to be due to an earth discharge, as the outer layers of the trunk near the base which was about fifteen inches in diameter were slightly split, while the amount of rending increased upwardly, culminating at a height of about forty feet, where the entire trunk was shattered, long fragments being hurled many yards. Enough of the riven portion remained in place, however, to support a section of the top about twelve feet in length, which appeared entirely untouched.

COÖPERATION WITH THE PUBLIC SCHOOLS.

In compliance with a request from the Board of Education special facilities have been afforded to the pupils in the vacation schools for the inspection of the collections of living plants in

the Conservatories and Plantations, and the exhibits of material in the museums.

The Garden has been visited by one or two parties of pupils in charge of teachers, daily on the afternoons of school days during July and the earlier part of August. Competent guides have been placed in charge of the separate groups of visitors, and their attention has been directed to the more interesting and important features of the Garden.

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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.

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. Vol. I, Nos. 1–5, 449 pp., 3 maps, and 12 plates, 1896–1900. $3.00. No. 6, 232 pp., 20 plates. Free to all members of the Garden; to others, 50 cents.

Memoirs of the New York Botanical Garden, Vol. 1. 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. Price to members of the Garden, $1.00. To others, $2.00. [Not offered in exchange.]

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

No. 1. Symbiosis and Saprophytism, by Dr. D. T. MacDougal.

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No. 3. The dichotomous *Panicums*: some new Species, by Geo. V. Nash.

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JOURNAL

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The New York Botanical Garden

EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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VOL. III. September, 1902. No. 33.

THE MICROSCOPICAL EXHIBIT.

In the JOURNAL for September and November, 1900, accounts were given of the exhibition microscopes of special design provided for the Museum of the Garden through the generosity of William E. Dodge, and of the objects selected for display under them. The experience gained in the two years since these microscopes were installed has sufficed both to demonstrate the great popularity of this feature of the museum exhibit and to suggest a few improvements in the details of construction of the microscope and its mountings. In order to allow sufficient play to the sides of the enclosing glass case in the contraction and expansion incident to changes of temperature in the room and thus to avoid cracking the glass, cement is no longer used at any of the joints. Instead, the edges of the glass plates forming the vertical sides of the case are simply brought into close contact, and the vertical plates are held in position by a metal collar at the top. Furthermore, the height of the glass case has been increased, it being now carried above the body-tube, thus enclosing the fine adjustment screw and clamping ring. In order to avoid the possibility of forcing the whole microscope body downward by heavy pressure from above, to the detriment of the exhibition object, an accurately fitting block of brass is now slipped in between the transverse arm and the movable support below. With these improvements in detail, the lenses remain in focus and the chance of accident to the exhibition object is practically removed.

An outline figure of the microscope, showing the special features alluded to above, is given herewith.

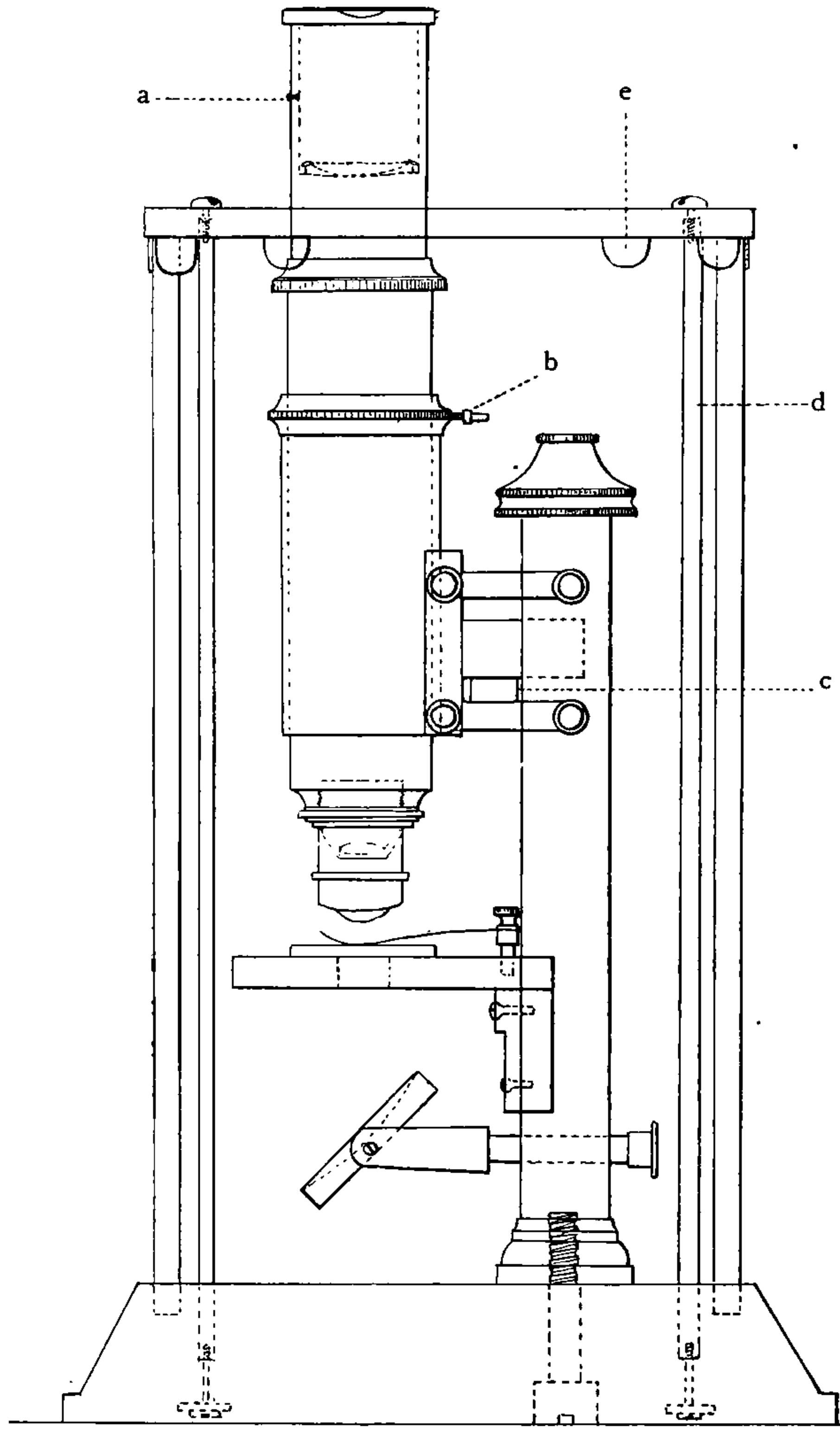

FIG. 24. An outline sketch of an exhibition microscope and glass case. *a*, set-screw for fastening the ocular; *b*, clamping ring for fastening draw-tube; *c*, block of brass inserted between arm and the lower support; *d*, upright metal rod; *e*, flange of metal collar.

The objects for exhibition under the twenty-four microscopes now installed have been selected from among the lower plants. Changes in the objects have been made from time to time, with the aim of increasing the attractiveness and the instructive qualities of the display. The objects on exhibition at the present time, with the explanatory labels, are as follows :

1. PLASMODIUM OF A SLIME MOULD (*Physarum cinereum*).

The slime moulds (Myxomycetes) are among the most simple of organisms. They form coatings on bark, leaves and dead wood in shaded or damp places. They have two stages of existence, (1) the vegetative stage or plasmodium, composed of naked protoplasm ; (2) the spore-bearing stage, in which small structures filled with propagating bodies (spores) are formed from the protoplasm. In the vegetative state, here represented, the organism is strikingly similar in its essential attributes to some of the lower animals.

2. SPORE-BEARING STAGE OF A SLIME MOULD (*Dictydium umbilicatum*).

This slime mould, like many of its relatives, grows upon decaying wood. The stalks and the netted framework of the spore-case walls remain, but the spores have mostly fallen. A few of the spores, however, appearing like minute, dark dots under the present magnification, can be detected, adhering to the network.

3. A DIATOM (*Isthmia nervosa*).

The diatoms are minute one-celled plants. The living matter of each is enclosed and protected by a hard, though thin and transparent, siliceous wall. This consists of two separable parts, one of which fits inside the other like a bandbox and its cover. In this specimen the organic matter has been removed by the use of acids, leaving only the siliceous walls, which are marked with pits, ridges and furrows. Some kinds of diatoms have the power of free animal-like locomotion.

4. A GREEN FRESH-WATER ALGA (*Draparnaldia*).

A fresh-water relative of the seaweeds. It occurs in clear pools and in slow-flowing streams. This specimen shows the vegeta-

tive structure of the plant, the short and broad cells of the main branches and the much smaller ones of the branchlets.

5. A Green Seaweed (*Anadyomene stellata*).

A representative of a family of seaweeds which is chiefly confined to the warmer parts of the earth. In some of the smaller compartments are formed a great number of microscopic motile spores or propagating cells, which finally escape through an opening in the wall. After swimming about for a time, these motile spores come to rest and develop new plants.

6. A Brown Seaweed (*Ectocarpus siliculosus*).

The plant consists of delicate branching threads, each part in the ordinary vegetative condition being made up of a single row of cells. The structures resembling an ear of corn produce minute motile reproductive cells, which unite in pairs before giving rise to new plants. The species of *Ectocarpus* often grow attached to the larger seaweeds.

7. A Red Fresh-water Alga (*Batrachospermum*).

One of the larger forms of the algae inhabiting fresh water. The main branches are peculiarly constructed; at first they consist of a single series of large cells, this structure becoming subsequently surrounded by numerous smaller cells, and its appearance being in consequence much changed. The gelatinous masses formed by this plant are slightly suggestive of frog-spawn, whence the Latin name, *Batrachospermum*.

8. A Red Seaweed or "Sea-Moss" (*Ptilota elegans*).

This species is found on the under side of shelving rocks between the tide-marks and is sometimes washed ashore from deep water. The color, now faded, is, when living, dark red or nearly black. This plant exemplifies well the pinnate type of branching.

9. A Seaweed or "Sea-Moss" (*Polysiphonia*).

The branching filaments which make up the plant body are here regularly jointed. Each joint consists of a bundle of more or less elongated cells surrounding in a single layer, in this

species, a similar though smaller, axial cell. The comparatively large ovoid structures contain spores which result somewhat indirectly from an act of fertilization. Other individuals of the same species produce spores of another kind, wholly non-sexual in origin.

10. A Red Seaweed (*Ceramium*).

One of the seaweeds or algae common on the Atlantic coast. This specimen illustrates well the two-forked mode of branching which is much more common among the lower plants than among the higher.

11. Spores (Propagating Bodies) of the Rose Rust (*Phragmidium subcorticium*).

These are the bodies which form the dark powdery spots often seen on the under surface of the leaves of rose bushes. In an earlier stage the same parasitic fungus produces orange-yellow spores much smaller in size and simpler in structure; a few of these, appearing very small, round, and colorless, may be seen intermingled with the more numerous dark spores. The smaller thin-walled spores serve to propagate the fungus during the summer, while the large thick-walled spores are adapted for enduring the winter.

12. A Saprophytic Fungus (*Sporormia herculea*).

A fungus of the order Pyrenomycetes, growing on animal refuse. The spore-sacs, which are crushed in this specimen, each contain eight spores. The spores consist of from eleven to sixteen cells in a chain and are ejected with such force from the sac when it bursts that they are thrown some distance.

13. A Saprophytic Fungus (*Ascobolus*).

One of the saprophytic fungi growing on animal refuse. This plant, in the reproductive stage, consists of a cup-shaped body bearing on its upper surface numerous pale, elongated sacs, each of which contains eight brown, oblong, one-celled spores or propagating bodies.

14. A Saprophytic Fungus (*Sarcobolus*).

One of the saprophytic fungi growing on animal refuse. This species has the elongated spores joined together in the form of oblong bodies after breaking out from the spore-cases.

15. Section of a Lichen (*Solorina crocea*).

A vertical section through the spore-bearing portion of an earth lichen of alpine regions. The upper layer consists of a dense mass of short pale filaments in which are scattered elongated sacs, each containing eight two-celled oblong brown spores. Below this is a layer of green cells, the algae of the plant; for every lichen is a composite structure consisting of a fungus and an alga, closely associated and forming what for the most purposes may be considered a single individual.

16. A Scale-Moss or Leafy Liverwort (*Frullania Nisquallensis*).

The ventral or lower surface, which differs considerably from the upper, is here shown. The two rows of lateral leaves and the single row of smaller, notched, strictly ventral leaves may be noted. An interesting feature is the row of hood-like sacs on either side of the stem, which serve as reservoirs for water. By the aid of this device, the Frullanias are able to thrive upon the bark of trees, and upon exposed rocks in drier situations than are in favor with most members of the family.

17. Spore-case of a Leafy Liverwort (*Frullania Bolanderi*).

The spore-case of this family opens by splitting lengthwise into four valves, often then resembling a little four-parted flower. The spirally twisted brown bands, here attached to the valves, are the elaters. The elaters wriggle about as a result of changing conditions of moisture and these mechanical movements help to scatter the spores, which in the present case have all been dispersed.

18. Cross Section of a Moss Leaf (*Polytrichum commune*).

The leaf of the hair-cap moss is furnished with longitudinal plates of chloropyll-bearing cells standing perpendicular to the

upper surface. When the leaf is cut across and the cut end is examined, these plates or lamellae appear as columns several cells high topped by a cell of special form.

19. Spore-case and Peristome of a Moss (*Funaria hygrometrica*).

The mouth of the capsule or spore-case of most mosses is fringed with a series of teeth called the peristome. Under the influence of changing conditions of moisture the peristome executes movements which tend to open or close the orifice of the capsule and thus aid and regulate the scattering of the spores.

20. Lid and Ring of a Moss Capsule (*Funaria hygrometrica*).

The lid covers the orifice of the spore-case or capsule of the mosses. It falls off at maturity and permits the spores to escape. A ring of cells of peculiar form is usually developed around the margin of the capsule mouth, just below the lid, and when mature the swelling of these cells forces off the lid. The ring then usually separates from the adjacent tissues as a spiral band, or in fragments.

21. Peristome of a Moss (*Mnium cuspidatum*).

The capsule or spore-case of most mosses has at its orifice a structure called a peristome. This is usually consists of pointed appendages or teeth, which are hygroscopic, that is, they change in position with changes in the humidity of the air, and thus aid and regulate the dispersal of the spores or propagating bodies.

22. Cross Section of the Leaf-Stalk of a Fern (*Polypodium vulgare*).

The external portion of the stalk is composed of very thick-walled cells, becoming thinner toward the center of the stem, where two bundles of vessels and fibers may be seen, surrounded by a brown sheath.

23. Spore-Cases of the Polypody (*Polypodium vulgare*).

The spore-cases of the ferns open along a line bounded by two cells of special form, known as the lip-cells. On the opposite

side of the spore-case is an elastic spring, made up of cells with thick radial walls. At maturity this spring, on drying, straightens out and bends backward, carrying with it most of the spores; it then suddenly flies back to its former position, scattering the spores with considerable force.

24. PROPAGATING BODIES (SPORES) OF A HORSETAIL (*Equisetum sylvaticum*).

Each propagating body or spore is furnished with two narrow appendages, called elaters; when dry, these appendages are straight, but when moist they coil spirally about the spore. The movements of the appendages under changing conditions of moisture help to scatter the spores.

MARSHALL A. HOWE.

OLD MICROSCOPES PRESENTED BY MR. C. F. COX.

Mr. C. F. Cox, of the Board of Managers, has recently presented to the Garden eight microscopes to be added to the historical collection given by him in 1900 (see JOURNAL for May, 1900). The details of chief interest concerning the recent additions are given below.

The entire series, now consisting of twenty carefully selected instruments, includes several extremely rare stands and contains the principal types in the development of the microscope since 1740. The collection is exhibited in a case placed in the corridor in the western wing of the laboratories.

No. 13. Jones's "Most Improved Compound Microscope," the original model from which Nos. 10 and 16 of this collection have been copied. With Martin's revolving disc of six magnifiers, four other objectives, and all the other accessories catalogued by Adams, and some extras. All in flat mahogany case. Date about 1797.

No. 14. "Drum-foot" Microscope, like one described in the Royal Microscopical Society's Journal, April, 1899, pp. 213, 214. Probably the model for Fraunhofer's stand (1816) and for the popular French and German upright-tube microscopes.

With six objectives (two imperfect) and other accessories in a flat mahogany case. Date probably between 1800 and 1810.

No. 15. John Cuff's Microscope, made by George Sterrop. A closer copy of the original model as figured and described by Baker than is No. 6 of this collection. Has fine adjustment as well as rapid movement of body. With four objectives and other accessories in mahogany, pyramidal case, with drawer in base of stand. Date about 1750.

No. 16. Jones Model — maker unknown. Substantially like the "Most Improved" (No. 13 of this collection), though somewhat larger. With nine objectives (two imperfect) and other accessories in a flat mahogany case. Date probably about 1800.

No. 17. Amici's Horizontal Microscope, with elaborate mechanical stage, five objectives and numerous accessories, in flat mahogany case. Date about 1826.

No. 18. Screw-barrel microscope of the Wilson-Adams pattern, without handle or support. Date about 1745.

No. 19. Pocket Microscope, of the screw-barrel form, probably of German make. With three objectives and other accessories in upright leather case. Date about 1750.

No. 20. "The New Universal Single Microscope" of George Adams. With six objectives and a silvered speculum, but no other accessories or case. Date about 1746.

D. T. MacDougal.

ON THE NUTRITIVE VALUE AND SOME OF THE ECONOMIC USES OF THE COCOANUT.

Few if any vegetable products furnish so many useful articles as the cocoanut. It forms the chief food of the inhabitants of most tropical coasts and islands, where the kernel is not only eaten in the ripe and unripe conditions, but is also prepared and served in various ways. It forms an accessory part of the diet, and is found in many of the confections of civilized man all over the globe. The milk is considered an agreeable cooling beverage in the tropics, although it is diuretic in its effect, and causes irritation of the mucous membrane of the bladder and

urethra when taken too freely. Immoderate use of the fruit is said to cause rheumatic and other diseases.

Experiments recently published in the Bulletin of the Torrey Botanical Club by Professor Kirkwood and the writer, (see Garden Contribution No. 26) conducted in part in this garden and with the coöperation of Dr. MacDougal, indicate that the nutritive value of the endosperm of the cocoanut resides mainly in its high content of oil and moderate amount of carbohydrate. Of the former the fresh endosperm contains 35–40 per cent.; of the latter, approximately 10 per cent. The amount of proteid is very slight, being little more than 3 per cent. The quantity of inorganic matter is 1 per cent. The water amounts to nearly 50 per cent. The chief constituent of the milk, aside from water (95 per cent.), is sugar, nearly all of the solids being thus composed, as the very sweet taste amply testifies. Various alcoholic beverages have been made from fermented cocoanut milk.

The endosperm is very agreeable to the taste, and, with the exception of the cellulose (3 per cent.), is readily digestible. Domestic animals eat it eagerly, and the cocoanut-crab feeds on it almost exclusively. The residue left over after the fat has been expressed from the "copra" is widely used in Europe as food for cattle, also as fertilizer.

The use of cocoa-fat as a substitute for butter among the poorer classes has been increasing, and it is frequently employed as a butter adulterant. The tendency of cocoa-fat to rancidity is not as great as that of animal fats, and for this reason "butters" made from it keep well, and have been recommended especially for military and naval uses. Recent researches show that "cocoa butter" is quite as agreeable to the taste, and as easily and completely digested, as ordinary butter. Its heat of combustion is 9.066 small calories per gram.

"Cocoanut cream," a dietary product much used in the tropics, is made by grating the endosperm and squeezing the fluid from the finely divided material through cloth. In a warm climate the resultant mixture contains much oil and is a very delicious accessory food. Besides the oil, the "cream" contains chiefly carbohydrate and proteid.

Soaps made from cocoa-oil combine with, or hold a nunusual amount of water, while retaining special hardness, and are characterized by great solubility in salt solution. The so-called "marine" or "salt-water soap" has the property of dissolving as well in salt water as in fresh water. The harder fats of the oil make excellent candles. Cocoanut oil and resin melted together yield a mixture capable of being used with success in filling up the seams of boats and ships, and in tropical countries for covering the corks of bottles as a protection against the depredations of the white ant.

The fibrous husk (coir) is widely used for the construction of ropes, brushes, bags, matting, etc. The hard shell is easily polished, and lends itself to the formation of various utensils and ornaments. It also has a high fuel value. The powdered shell and husk are occasionally used as adulterants of ground spices.

The milk of the nut, as has already been pointed out, is strongly diuretic. The endosperm shares with milk the property of a *taenicide*, and has been used as a vermifuge in India for many years, where it is regarded as an excellent means of expelling the flat worm. The harder fats of the oil are used as constituents for suppositories and related therapeutic products. Medicinally the oil is employed repeatedly as a substitute for lard, olive oil and cod-liver oil. It is also made the chief substance by bulk in various salves and cold cream, pomade and similar cosmetic preparations. In ointments and cerates it is especially valuable because of its ready absorption when rubbed on the surface of the body, and on account of its ability to hold an unusual amount of water or saline fluid. It shows little tendency to produce chemical changes in substances with which it may be associated.

WILLIAM J. GIES.

A PALM OF THE SEYCHELLES ISLANDS.

The Seychelles Islands, a small group belonging to Great Britain, are situated in the Indian Ocean, east of central Africa, and about five degrees south of the equator. Here is the home of a group of interesting plants, and especially noteworthy among these are a number of palms, the subject of this sketch,

FIG. 25. *Phoenic phorium Sechellarum* H. Wend.

Phœnicophorium Sechellarum H. Wend., being one of these. It occupies a commanding place in the vegetation of these tropical isles, its stately crown of leaves adding a characteristic feature to the landscape. That it is there venerated by the natives is attested by a pretty little legend current among them, and given by Kerchove in his Les Palmiers, page 125, and is to this effect: "After the creation a bird of immense size flew from the earth to the sun at so great speed that he lost one of his feathers. This feather floated around in space for many ages, and at last fell to earth on one of our islands. Finding there a fertile soil it took root and grew into a stately palm, the large entire leaves of which resemble the feathers of that immense bird so long since passed away."

It is not strange that a palm of such striking appearance as to give rise to this legend should become an object of great beauty and desire in cultivation. It was first introduced into Belgium by M. Verschaffelt in 1856, but the difficulties of its cultivation have prevented its general introduction since that time. It is to be found in several European gardens, but it is by no means common, and large specimens are very valuable. In this country it is quite rare.

We were fortunate to secure in 1900, through the generosity of Mrs. F. L. Ames, of North Easton, Mass., an excellent example of this palm. At its old home it was not possible to give it as high a temperature as it, a native of equatorial latitudes, required, for its neighbors in the same house were from many climes, and the majority had to rule. In the large palm house here, however, it has been possible to consider its special needs, and it has responded most gratefully to this more congenial environment. It has increased considerably in height, now measuring 16 feet from the tip of the uppermost leaf to the top of the soil, and has nine mature leaves with two others just appearing from the center. Upon its arrival two years ago it had but four leaves.

In January, 1901, it sent forth its first bloom. This at the time was not considered an event, for it was not until some time later that investigation showed no record of a previous flowering

of this palm in cultivation. Mr. Watson, the curator of the Royal Gardens, Kew, England, assures me that it has never blossomed at that institution, nor to his knowledge in Europe. About two months ago it again showed signs of blooming, and in a short time put forth its thick horny spathes. These form an erect sword-shaped organ which at maturity falls away from the inflorescence which spreads out into a large bright yellow panicle of flowers, the bright color being due to the large number of staminate flowers. The flowers are arranged usually in groups of three, as in many of the palms, the two lateral ones being staminate and the central one pistillate. The former soon mature and fall away, when the central or pistillate flower rapidly develops.

As a result of the first blooming quite a quantity of fertile seed was developed. The fruit is of a saffron color and of about the size of very small peas. From this source we were fortunate in securing a number of seedlings, the growth of which has been watched with much interest to see if they would develop the spines which clothe the petioles and midribs of the leaves of medium-sized plants, and which are entirely absent in the parent plant above referred to. At the appearance of the second or third leaf these appeared as weak yellowish bristles, and as the little plants have gained strength and size the spines have grown more numerous and stronger, until they now more nearly approach those appendages in more mature plants. Why the palm dispenses with the spines later on is not clear, but it may be that in its native country it is subject to the attack of browsing animals, so that in its young state it is necessary to have this armor of spines, a protection which is no longer needed when the plant attains a considerable height and its foliage is carried high in the air out of the reach of all such animals.

GEORGE V. NASH.

NOTES, NEWS AND COMMENT.

Dr. N. L. Britton, Director-in-Chief, sailed for England on Aug. 16th. He will spend a few weeks at the Royal Gardens, at Kew, in study of the sedges, and also of the stonecrops. The

critical descriptions of these groups will be brought out in the earlier numbers of the Systematic Botany of North America, the publication of which has been undertaken by the Garden. Dr. Britton will return about the middle of September.

Dr. Alex. P. Anderson has resigned his position of curator of the herbarium of Columbia University, and has taken up his duties as expert to the syndicate now engaged in developing the new method of treating starchy grains, etc., recently discovered by Dr. Anderson in the laboratories of the Garden (see page 87 of this JOURNAL for 1902). Dr. Anderson is fitting up a special laboratory for the continuance of his work at Minneapolis.

Dr. A. S. Hitchcock, of the Division of Agrostology of the U. S. Department of Agriculture, spent several days at the Garden during July in making critical examinations of type specimens of some of the grasses.

Professor Howard J. Banker, of the Southwestern State Normal of Pennsylvania, was in residence at the Garden during July, being occupied in the continuance of some work begun while a student of Columbia University in 1899–1900.

Dr. A. W. Evans, of Yale University, and Mr. Percy Wilson, Museum Aid, returned from a collecting trip to Porto Rico early in August. A large collection of herbarium, museum and living material was brought back for the Garden. The small area of primeval forest on the island was investigated, and a number of large palms were successfully transported to New York.

Contributions have been recently issued as follows: Nos. 22 and 23, Studies on the Rocky Mountain flora, by Dr. P. A. Rydberg. New species of larkspur (*Delphinium*), columbine (*Aquilegia*), *Anemone*, *Clematis*, *Atragene*, *Ranunculus*, poppy (*Papaver*), *Bicuculla*, *Stanleya*, *Roripa*, *Lesquerella*, *Physaria*, *Cardamine*, *Sophia*, *Draba*, *Geranium*, *Oxalis* and *Lupinus* are described and many interesting notes on the occurrence and characters of a number of species are given. No. 24, by Miss V. S. White, is a revision of the family of Nidulariaceae, small fungi which rarely reach a height of over half an inch, growing

on sticks, shavings, dried herbaceous plants and on various kinds of refuse and decaying matter. A number of new species are described, and the exact limits and relationships of the members of the family are discussed. The treatment of the subject is made still more effective by five full-page plates. No. 25, Notes on American Hepaticae, by Dr. M. A. Howe, contains notes on several American forms and a description of a new variety. No. 26, Chemical studies of the cocoanut with some notes on the changes during germination, by Professor J. E. Kirkwood and Dr. W. J. Gies, contains an exhaustive résumé of the various studies, inclusive of those made by the authors that have been made upon the composition of the cocoanut in connection with its commercial uses. A globulin characteristic of this plant, cocoa-edestin, was isolated and the crystals figured. The principal chemical and morphological changes in the nut during germination are given in detail. Some of the features of general interest in this paper are given in this number of the JOURNAL (see page 169).

Contributions No. 1–25 are to be included in Volume I., and a title page with table of contents has been printed to be issued to subscribers for the volume.

Professor E. L. Greene, of Washington, D. C., visited the Garden for several days during August for the purpose of making critical examinations of material in the collections.

Dr. C. H. Peck, State botanist of New York, made collections of fungi in the vicinity of the city, and spent two weeks in consultation of the herbarium during August.

The total amount of precipitation in the Garden during August, 1902, amounted to 5.75 in. Maximum temperatures of 88.5° on the 4th, 83.5° on the 11th, 82° on the 19th, and 86° on the 27th were observed. Also minima of 63° on the 3d, 50.5° on the 9th, 48° on the 13th, 52.5° on the 22d, and 57° on the 26th. The temperature of the soil at a depth of 1 foot (30 cm.) ranged from 45° to 55° F.

The most notable occurrence of the month in this connection was a rainfall of 2.06 inches within 70 minutes on the evening of the 19th.

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PUBLICATIONS

OF

The New York Botanical Garden

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.

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. Vol. I, Nos. 1–5, 449 pp., 3 maps, and 12 plates, 1896–1900. $3.00. No. 6, 232 pp., 20 plates. Free to all members of the Garden; to others, 50 cents.

Memoirs of the New York Botanical Garden, Vol. 1. 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. Price to members of the Garden, $1.00. To others, $2.00. [Not offered in exchange.]

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

No. 1. Symbiosis and Saprophytism, by Dr. D. T. MacDougal.

No. 2. New Species from western United States, by Dr. Per Axel Rydberg.

No. 3. The dichotomous *Panicums:* some new Species, by Geo. V. Nash.

No. 4. *Delphinium Carolinianum* and related Species, by Dr. Per Axel Rydberg.

No. 5. Studies on the Rocky Mountain Flora—I, by Dr. Per Axel Rydberg.

No. 6. Notes and Descriptions of North American Plants I and II, by Dr. J. K. Small.

No. 7. Vegetative Reproduction and Multiplication in *Erythronium*, by Frederick H. Blodgett.

No. 8. Two new Species of *Grimmia* from Montana, by R. S. Williams.

No. 9. Studies on the Rocky Mountain Flora—II, by Dr. Per Axel Rydberg.

No. 10. Studies on the Rocky Mountain Flora—III, by Dr. Per Axel Rydberg.

No. 11. Life-history of *Schizæa pusilla*, by Elizabeth G. Britton and Alexandrina Taylor.

No. 12. Studies on the Rocky Mountain Flora—IV, by Dr. Per Axel Rydberg.

No. 13. Further Studies on the Potentilleae, by Dr. Per Axel Rydberg.

No. 14. Studies on the Rocky Mountain Flora—V, by Dr. Per Axel Rydberg.

No. 15. Studies on the Rocky Mountain Flora—VI, by Dr. Per Axel Rydberg.

No. 16. Vanishing Wild Flowers, by Elizabeth G. Britton.

No. 17. The Tylostomaceae of North America, by V. S. White.

No. 18. Shrubs and Trees of the Southern States, by Dr. J. K. Small.

No. 19. The American Species of *Limnorchis* and *Piperia*, North of Mexico, by Dr. Per Axel Rydberg.

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EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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JOURNAL

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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 in October and November.

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 5.28 P. M. Excursion fare, 25 cents.

Opportunity will be given for inspection of the Museums, Laboratories, Library and Herbarium, the large Conservatories, the Herbaceous Collection, the Hemlock Forest, the Fruticetum and parts of the Arboretum site.

The autumn course of lectures will be delivered in the Lecture Hall of the Museum Building of the Garden, Bronx Park, on Saturday afternoons, at 4.30 o'clock, as follows:

October 4, "Jamaica, a Paradise for the Botanist," by Hon. Wm. Fawcett, Director of the Public Gardens and Plantations of Jamaica. October 11, "Health and Disease in Plants," by Professor F. S. Earle. October 18, "The Vegetation of Java," by Dr. H. M. Richards. October 25, "Some Historic Trees," by Professor L. M. Underwood. November 1, "A Meeting Place of Modern and Ancient Floras," by Dr. Arthur Hollick. November 8, "The Stonecrop Family," by Dr. N. L. Britton.

The lectures will be illustrated by lantern slides and otherwise. They will close in time for auditors to take the 5.28 train from the Bronx Park Railway Station, arriving at Grand Central Station at 5.57 P. M.

REPORT OF MR. PERCY WILSON, MUSEUM AID, ON A TRIP TO PORTO RICO.

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

Dear Sir: I submit herewith a report upon my recent trip to the Island of Porto Rico, in company with Dr. W. A. Evans, of Yale University.

On the morning of June 28, we sailed on the steamer "Caracas," reaching San Juan July 3. Several days were spent in town, where arrangements were made by Dr. Evans for headquarters at a coffee plantation belonging to Mr. Palma, of San Juan, situated on the Sierra de Luquillo, the loftiest range of the island. Leaving by rail on the 7th of July, we went to the town of Carolina, from whence we were conveyed by coach to Rio Grande, situated to the northeast. After spending the night in one of the small hotels of the town, we journeyed to Memeas, where we were supplied with pack-horses from the plantation and rode five miles up the mountains. We were much surprised on reaching the planatation to find a large house, situated close to the primeval Porto Rican forest. A little over two weeks was spent collecting on the foothills, slopes and submit of El Yunque (alt. 3,700 ft.), in which time about three thousand herbarium specimens, seeds and roots were secured. We were fortunate enough to have a range at the house which proved very useful in drying herbarium specimens.

If dependent upon the sun for drying, many of the specimens would have moulded, on account of the moist atmosphere during the rainy season. The forest contains many interesting plants, among which are *Begonia Portoricensis*, *Grammadenia Sintenisii*, *Marcgravia Sintenisii*, six species of *Lycopodium*, many ferns of the genera *Polypodium*, *Trichomanes* and *Elaphoglossum*, most of which are epiphytes, and the mountain palm (*Acrista monticola*), the young heart-leaves of which are used for food by the natives. The low vegetation of the mountain summit consists mostly of *Rajania Sintenisii*, *Weinmannia hirta* and several species of grasses and sedges, one of which, *Scleria canescens*, is much dreaded by the natives because of its rough edges of the blades, which cut

like a knife. The luxuriant growth of the ravine flora is well represented by three species of tree fern, *Alsophila echinata*, *Hemitelia grandifolia* and *Cyathea arborea*, the latter often reaching the height of thirty feet. Two species of *Renealmia*, *R. racemosa* and *R. exaltata*, form dense growths along the mountain streams. In cultivated land on the edge of the forest several American weeds have found a foothold, *Lepidium Virginicum*, *Leptilon Canadense* and *Erechtites hieracifolius*, all of which are spreading rapidly. Owing to a limited space of time, I was unable to carry on further investigations in the region beyond El Yunque, which no doubt would prove a good field. An expedition to this part of the island, in the future, would undoubtedly be worth undertaking. Dr. Evans returned to New York the last of July, so I intrusted to his care all plants, seeds, etc., collected on the mountains. They all reached the Garden in good condition. The following two weeks were spent in collecting and shipping museum material, seeds and living plants, among which was a fine specimen of the "Coroza" palm (*Acrocomia media*), which when crated weighed over 1,800 pounds, and with the aid of ten natives took over three hours to put on an ox cart, for transportation to San Juan. While in San Juan my work was greatly facilitated by Mr. Sturle, also Mr. Gardner and Mr. Barrett, of the Agricultural Station at Rio Piedras, to whom I am greatly indebted for their kindness. Sailing from Porto Rico, August 12, on the steamer "Caracas," I arrived in New York, August 17.

Respectfully submitted,

PERCY WILSON.

RESULTS OF THE USE OF THE STOKES FUND FOR THE PRESERVATION OF NATIVE PLANTS.

The purposes of this fund were described in detail in the January number of the JOURNAL, and the plan adopted for use of the interest upon it was there presented. Essays in competition for the three prizes offered were received from twenty persons and those written by Dr. F. H. Knowlton, Miss Cora A. Clarke and Dr. A. J. Grout, were published in the April, May and June

issues of the JOURNAL. These essays, advocating moderation in the gathering of wild plants, with reference to the kinds most in need of protection were reprinted from the JOURNAL in editions of 500 and were freely distributed to other journals and to newspapers with requests for republication in whole or in abstract; these requests were widely granted so that the topic has in this way been brought to the attention of many thousand people. Either the reprinted essays, or copies of the journal containing them, have also been widely distributed to teachers, with the request that children under their charge be informed of the desirability of giving heed to the subject; they have also been sent to officers and members of botanical clubs and societies in the cities and larger towns. That the movement has attracted much attention is shown by the fact that the editions of 500 reprinted copies were rapidly exhausted. The first essay printed was republished by one of the botanical journals and reprinted therefrom in an edition of 2,000 copies which have mainly been distributed.

This presentation of the subject has led to the formation of the "National Society for the Preservation of Wild Flowers," which already has a considerable membership, and has adopted the journal Plant World as its organ, this journal agreeing to give special prominence in its columns to the objects of the new society; this organization will serve a very useful means for the continuous prosecution of the campaign against wild plant destruction, it being planned to organize local chapers of it at as many points as possible.

Important emphasis has been laid upon the need for the preservation of tracts of woodland and thicket in their natural condition as public or private reservations and a number of lectures and addresses bearing on the subject have been delivered at different places by persons interested in the movement.

N. L. BRITTON.

ACCESSIONS.

LIBRARY ACCESSIONS FROM JULY 12 TO SEPTEMBER 10.

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4 plants. (Collected by Dr. MacDougal.)

10 plants of *Iris foliosa.* (Given by Mr. K. K. McKenzie.)

9 plants for the herbaceous grounds. (Given by Messrs. Henderson & Co.)

3 plants for the conservatories. (Given by Mr. Jos. W. Alsop.)

2 plants. (Given by Mr. George Husten.)

55 plants for the conservatories. (By exchange with the Botanic Garden, Cambridge, England.)

3 plants from Roan Mt., N. C. (Given by Mr. W. A. Cannon.)

1 *Cereus* sp. from Sandwich Islands. (Given by Miss Emma J. Peck.)

I plant of *Dracaena fragrans.* (Given by Mrs. I. Echter.)

155 plants for the conservatories. (By exchange with the Botanic Garden, Leiden, Holland.)

19 plants for the conservatories. (Given by Mr. J. L. Childs.)

1 plant of *Aloe variegata.* (Given by Mrs. E. O. Hoelbeck.)

3 plants for the herbaceous grounds. (Collected by Mr. Percy Wilson in Pike County, Pa.)

1 plant of *Pogonia pendula.* (Given by Mr. M. S. Andrews.)

5 cacti from Colorado. (Given by Prof. Chas. E. Bessey.)

38 filmy ferns from New Zealand. (Given by Mr. L. Cockayne.)

2 plants for the conservatories. (By exchange with Phipps' Conservatories, Pittsburgh, Pa.)

1 *Echeveria Clevelandii.* (Given by Mr. R. M. Harper.)

2 plants from Costa Rico. (Purchased from Mr. Wercklé.)

7 plants for the herbaceous grounds. (Collected by Mrs. N. L. Britton.)

1 plant of *Uvularia sessifolia nitida.* (Given by Miss F. A. Mulford.)

6 bulbs and plants for the conservatories from Mexico. (Given by Miss M. H. Wentworth.)

22 orchids from Brazil. (Purchased from Mr. Neumann.)

SEEDS.

100 packets seed. (By exchange with the Botanic Garden, Edinburgh, Scotland.)

45 packets seed. (Collected by Mr. Percy Wilson in Porto Rico.)

40 packets fern spores. (Collected by Mr. Percy Wilson in Porto Rico.)

6 packets seed. (Given by Mr. T. D. A. Cockerell.)

NOTES, NEWS, AND COMMENT.

One of the sessions of the International Plant Breeding Conference was held in the Museum on October 2d, and the attending members were given an opportunity for inspection of the collections and plantations. The meetings of the conference were attended by a large number of botanists and plant breeders from Europe, the West Indies, Canada and the United States. About sixty papers were presented, a large number of which concerned results of the highest scientific interest, and great practical importance.

The total precipitation in the Garden during September, 1902, amounted to 5.83 inches. Maximum temperatures of 83° on the 1st, 81.5° on the 8th, 74° on the 17th and 20th, and 70° on the 23d were observed. Also minima of 43.5° on the 5th, 45° on the 14th, 44.5° on the 15th, 42.5° on the 16th and 47° on the 25th.

The temperature of the soil at a depth of a foot (30 cm.) ranged from 50° F. at the beginning of the month down to 39° F. near the end.

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The New York Botanical Garden

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.

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. Vol. I, Nos. 1–5, 449 pp., 3 maps, and 12 plates, 1896–1900. $3.00. No. 6, 232 pp., 20 plates. Free to all members of the Garden; to others, 50 cents.

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EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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HEALTH AND DISEASE IN PLANTS.*

A plant is in health when all of its organs or parts are doing their proper work, and the processes of growth and reproduction are going forward in the natural and regular manner. A diseased condition results when for any reason an organ fails to thus perform its usual normal function. The causes that induce disease are very numerous and are often obscure. For convenience diseases may be grouped under three headings: (1) environmental, (2) functional and (3) parasitic.

Under environmental diseases are classed those disturbances of normal growth caused by uncongenial surroundings, such as unfavorable soil conditions, too much or too little water, the absence or over-abundance of some of the food elements, or unsuitable soil temperatures; unfavorable atmospheric conditions caused by the pollution of the air with smoke or gases; or unfavorable position as to sunlight. Such unfavorable surroundings often cause a slow and feeble, through perfectly normal, growth that should not be confused with disease. It is starvation or semi-starvation and not sickness. The so-called "scalding" of plants after unusually heavy and protracted rains, the "tip burn" of lettuce and potatoes due to exposure to bright sunshine and dry winds after periods of wet cloudy weather, and the chlorosis or yellowing of the foliage of fruit trees on alkali soils in the West may be mentioned as examples of this class of diseases.

* Lecture given in the Autumn course at the Museum, New York Botanical Garden, September 11, 1902.

Functional diseases are due to abnormal activities within the plant itself. These may be the excessive or insufficient formation of enzymes or acids or other secretions, or the disturbance of nutritive or other chemical processes. The dreaded peach yellows and the new destructive disease known as "little peach" probably both belong here, though their true nature is not yet fully understood. The "mosaic disease" of tobacco, and the "yellow disease" of the china aster are examples of the ab-

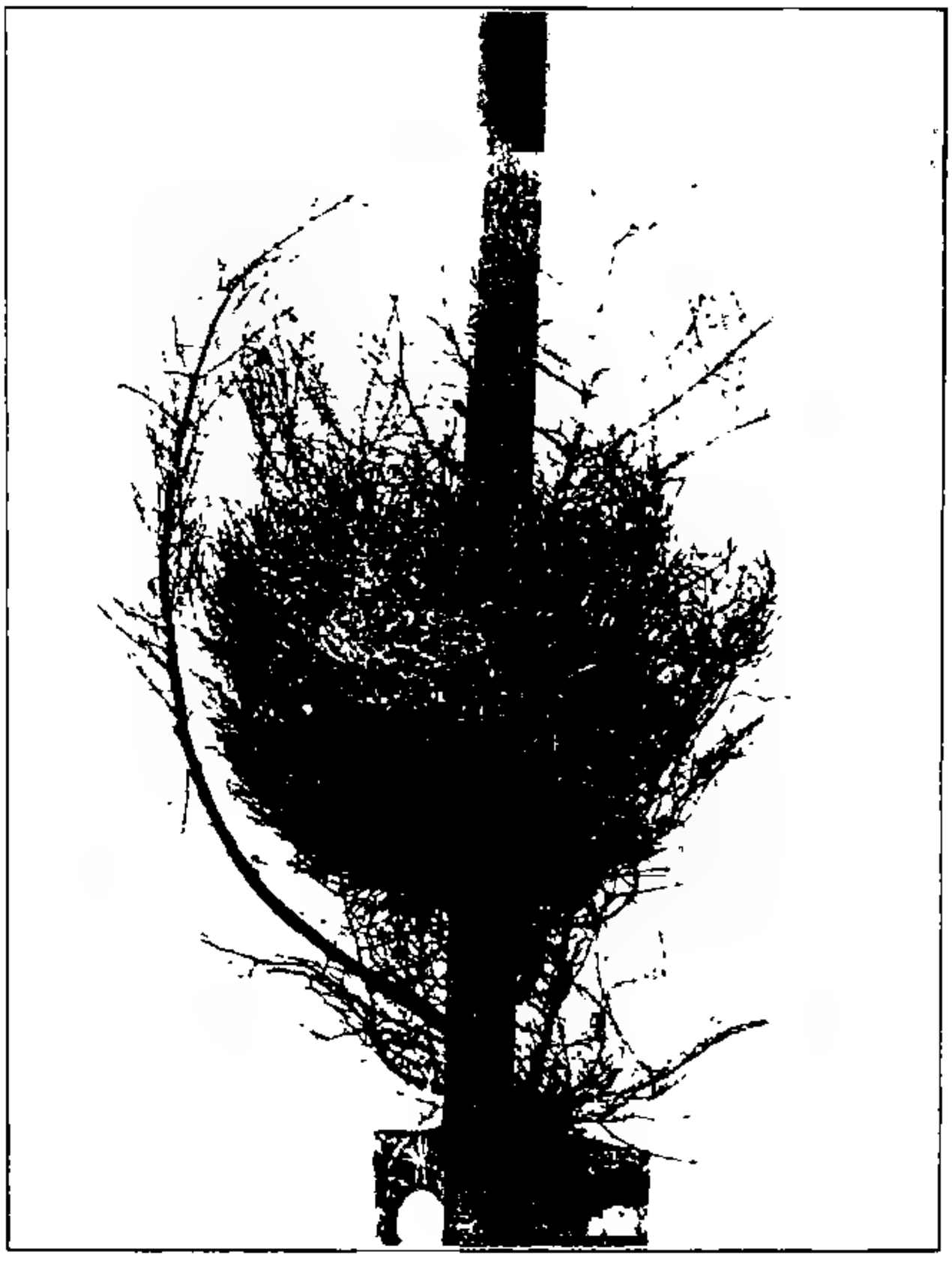

FIG. 26. Witch's broom found on branches of *Picea Muriana* (Black spruce) from Mt. Desert, Maine, caused by a fungal parasite.

normal production of an enzyme or terment. Diseases of this class are usually very obscure, and few of them are as yet fully understood. In the case of the "yellow disease" of the aster the trouble is caused by the failure of the leaf to secrete sufficient diastase, the enzyme or ferment that converts starch into soluble sugars. Starch is being constantly formed in green leaves when they are exposed to sunlight, but it is only after be-

ing acted on by diastase, and thus rendered soluble, that it can be taken up by the sap and used as food in the building up of new tissues. The failure to secrete sufficient diastase thus causes a condition quite comparable to that of severe indigestion in man or the higher animals.

By far the greater number of plant diseases are caused by the action of parasites. The number of kinds of parasites that infest plants is very great. Probably no plant of economic importance is free from them, and the more widely cultivated crops have to contend with a formidable number of parasitic foes. These may be either animal or vegetable, and they belong to widely differing groups. In the vegetable kingdom plant parasites are found among the slime moulds, the bacteria, the green algae, the fungi, and a few even among the flowering plants. In the animal kingdom they are less widely scattered, being found only among the nematode worms, the mites and the insects. It is in the great group of chlorophylless plants called fungi that we find by far the greatest number of plant parasites. The diseases known as smuts, rusts, mildews, leaf-spots and moulds are all caused by fungus parasites, while many of the blights, rots and wilts are also due to them.

All parts of the plant are liable to be invaded by parasites. Roots, stems, leaves, flowers and fruits each have their special enemies. The surface only may be the point of attack, or the parasite may burrow deeply in the tissues. The nature of the injury caused will depend on the habit and structure of the host plant, on the point of attack, and on the character of the parasite. In some cases it may be little more than the loss of a certain amount of food material, the host and the parasite being so adjusted to each other that the latter lives with a minimum of inconvenience to the former. Plants of wheat or oats infested by smut show very little inconvenience from the presence of the mycelium of the former in their tissues. It is only at maturity when, instead of ripened grain, we find the black powdery masses of fungus spores that the extent of the injury is suspected. Such cases, however, are rare. There are usually secondary complications that do far more harm than the mere loss of food. Thus the

coating of the surface of leaves by external growths of mildews and sooty moulds shuts off the light from the chlorophyl bodies, partially preventing photosynthesis, the process of starch formation. The presence of internal parasites often excites a morbid growth of the plant tissues causing galls, knots or other deformities, or they may cause an excessive formation of gums or resins. In other cases the parasites may multiply so greatly in the tissues as to plug the ducts in the vascular bundles, shutting off the ascending sap and thus causing the sudden wilting and death of the entire top. The rotting of the roots may cause a similar wilting. A bacterial parasite causes the fermenting of the sap in the soft cambium layer of pear and apple trees causing the sudden death of considerable branches.

Different fungi have acquired the power of parasitism in different degrees. The true parasites like the rusts and smuts have the power of taking their nourishment directly from the living protoplasm of their hosts. In most cases they do not kill the tissues in which they are embedded though they may interfere seriously with their normal functions. Other fungi that normally live on decaying vegetable matter have developed the power under certain conditions of penetrating tissues that are still living, These are called facultative parasites. They are not able as a rule to take nourishment directly from the living protoplasm as do the true parasites, but they push their hyphae into or between the living cells of the host, and by the secretion of poisonous acids and enzymes kill them and render their contents soluble, thus causing the actual destruction of the living tissue. Many of the species of fungi that are normally strictly saprophytic at times develop this power of killing and disintegrating living tissues. Most of the timber rots so destructive to forest trees and to structural timbers, belong among these facultative parasites.

It is only after the cause of a disease is thoroughly understood that we can begin intelligently to seek a remedy. The annual losses from plant diseases are so great as to be beyond computation, but it is safe to say that they reach many millions of dollars for the State of New York alone. Unfortunately, too, all of these losses come from what should be the farmer's profits, for it costs

the same to prepare the land, plant and harvest the grain crop when the yield is half smut as it does when it is all clean sound grain. The question of the prevention of plant diseases is thus one of very great practical importance. Vegetable pathology is one of the newest of the biological sciences. What we know of it has practically all been learned during the past thirty years. I remember that when in college during the seventies the only known remedies for plant diseases were that sulphur sprinkled on rose bushes and grape vines would, to some extent, prevent mildew, and that soaking seed oats in a weak solution of copper sulphate would prevent smut in the following crop. At least there was a popular impression that these were facts, but no conclusive experiments in regard to them had been recorded. Now the list of preventable or partially preventable diseases is a very long one. The number of remedial measures used is also considerable.

With the environmental diseases the obvious remedy is to correct the unfavorable conditions. If the ground is too wet, drain it. If too dry irrigate it, or cultivate so as to conserve moisture. If poor in plant food, fertilize it. Or if a certain crop is not suited to the prevailing conditions grow some other crop that will find them congenial. These I say are obvious methods for preventing troubles of this kind and yet the problem is by no means a simple one. In only too many cases we are unable to predict without actual trial whether or not a given crop will thrive under new and untried surroundings.

Our knowledge of the functional diseases is not yet sufficient to permit the suggestion of remedies. They must still, for the most part, be classed as incurable. We may know, as in the case of the aster "yellow disease," that an insufficient secretion of diastase prevents the assimilation of the starch grains but what cause prevents this normal secretion is as yet unguessed and consequently is unpreventable. No group of diseases is more urgently in need of farther investigation than these.

It is in the controlling and preventing of parasitic diseases that modern progress has been most marked. Remedial measures that may be employed against them can best be considered under the headings hygiene, topical applications and heredity.

Under hygiene are included cultural methods that aid the plant in resisting disease; the establishment of crop rotations so that plants liable to the same diseases shall not follow each other in the same field; the prevention of contagion by the destruction of diseased plants or parts of plants, and methods of pruning and training whether for removing diseased portions, as is often practiced with pear blight and plum black knot, or for regulating exposure to sun and rain as in some methods of training grape vines. A good example of the effect of cultural methods in controlling a disease is furnished by the so-called "black rust" of cotton, which often causes serious losses on light sandy lands. Experiments have conclusively shown that this disease can be prevented by incorporating vegetable matter in the soil and applying potash fertilizers. This so increases the vigor of the plant that the facultative parasites causing the disease an unable to gain a foothold. On the other hand, the injury to pear trees from blight can be much lessened by preventing a too vigorous growth and securing the early ripening of the wood. This can best be secured by withholding cultivation and nitrogenous manures. In this case the disease germs only flourish in the soft rapidly growing cambium and the hardening of the wood stops the spread of the disease.

Topical applications may be made to the seed before planting, to the growing plant in the form of fungicidal sprays, or in some cases to the soil. Treatment of the seed is useful only in those cases where the source of contagion is from spores that adhere to the seeds and are planted with them. Thus in harvesting and threshing oats the spores from smutted heads become dusted over the sound grains. It is almost or quite impossible to find seed for planting that is not more or less infested in this manner. If such seed is soaked in hot water of the right temperature or in certain fungicidal solutions, as formalin or copper sulphate, the smut spores will be killed without injuring the vitality of the grain; and the crop from this treated seed will be practically free from smut. Potato scab is a disease that is usually disseminated by the planting of diseased tubers for seed. Where once introduced in the soil it lives from year to year, so that seed treatment is not

always effective; but, if planted on clean land, even badly scabbed seed potatoes will yield a clean crop if soaked in a weak solution of corrosive sublimate.

The discovery that certain diseases can be prevented by sprinkling plants with a solution of copper sulphate mixed with milk of lime marked an important epoch in the treatment of plant diseases. This mixture, known as Bordeaux mixture from the town in France near which its use was accidentally discovered, is now the standard remedy for a large clase of diseases. In the case of many orchard and garden crops, spraying with Bordeaux mixture is as much a recognized part of proper culture as is the tilling of the soil. As first used the mixture was simply spattered over the leaves by means of a whisk broom. This method was unsatisfactory, as it was slow and did not secure a sufficiently even distribution of the liquid. Thanks to American ingenuity and particularly to the efforts of the late C. V. Riley then chief entomologist and of B. F. Galloway now chief of the Bureau of Plant Industry of the United States Department of Agriculture, suitable pumps and spraying nozzles were devised, by means of which plants can be quickly and evenly covered with this or other liquids in the form of a fine mist-like spray. Other compounds of copper have also been found to have strong fungicidal properties, but none are so generally useful as the Bordeaux mixture. When properly made and applied it does not injure the foliage except of a few particularly delicate plants and as it is not easily washed off by rains its effects are more lasting than with other fungicides. It is now the standard remedy for potato blight, grape rot and mildew, apple scab, peach leaf curl and a long list of similar diseases. It should always be remembered however that, except in the case of a few external parasites, spraying is a preventive measure and not a cure. Sprays cannot reach internal parasites when once established, but by coating the surface they prevent the germination of spores that find a lodgment there and thus prevent infection. The importance of early spraying before a disease makes its appearance, and of thorough work in reaching all exposed parts of the plant will be apparent from these facts.

The beneficial results from spraying have, in many cases, been so great that, for a time, pathologists were inclined to think it a cure for all kinds of diseases. It is now clearly realized that, notwithstanding its great usefulness, it has its limitations, that there are many diseases it cannot reach and many others where it should not be relied on alone, but should be used in connection with other remedial measures.

Soil treatment can be employed in comparatively few cases. Injections of carbon disulphide are sometimes used for certain animal root parasites. Spraying the ground along the row is recommended for the sclerotium wilt, a disease attacking garden vegetables in the Southern States. Sterilizing the soil in greenhouses, by heating it with live steam from perforated pipes, is now practiced with great success in preventing injury from nematodes and from various soil-inhabiting fungi.

The great importance of heredity as a factor in controlling plant diseases is only now beginning to be fully recognized. Individual plants, like individual men, vary in their ability to resist disease. Even in plants of the same cultural variety, this difference in resisting power is often quite marked. It has long been observed that some varieties are more resistant than others. It is now found that, like other qualities, this power of resistance is inheritable, and that by carefully breeding from the most resistant individuals, it is often possible to establish resistant strains or varieties. This point was clearly brought out at the recent Plant Breeders Conference in this city. The case of resistant strains of cotton, described by Mr. Orton, of the Department of Agriculture, was particularly interesting. In a very few years he has been able to select strains of cotton, practically immune to the wilt, a disease that has devastated large areas in the Southern States. Spraying to prevent disease is at best an expensive and exacting operation, and cultivators will welcome the day, if it shall ever come, when the breeding and selection of resistant varieties shall make it no longer necessary.

F. S. EARLE.

SOME INTERESTING ADDITIONS TO THE LIBRARY.

At intervals during the past summer, the library has, by gift or purchase, come into possession of quite a collection of old, and in some cases, rare works on botany and natural history. The majority of them, some four or five hundred volumes, were purchased as a collection in Berlin and as at present displayed in the library, previous to being shelved, are a most interesting exhibit of the development of printing and illustrating from the earlier books of the fifteenth century to the more elaborate and finished examples of the botanical knowledge of the latter end of the eighteenth century.

The oldest volume in this collection is a manuscript of the fifteenth century, Macer, "Floridus de virtudibus herbarum," written on thick vellum-like paper in close Gothic script interspersed with red initials. Its binding is contemporaneous with the script, of much-cracked red leather over wooden boards, embellished with large brass clamps and nails. The lining of the book is made up of a fine bit of old church musical ritual, which is yet quite legible both as to text and notes. With it also came a printed copy of the same work edited in Bâle in 1581. The latter is a quaint old volume dealing with the virtue of herbs of all sorts and kinds from the violet to the cabbage, which are illustrated by charmingly drawn little figures.

The earliest of the printed books in the collection are two copies of the "Ortus Sanitatis" and one of the "Herbarius." Of the "Ortus Sanitatis" one copy was printed in Venice in 1511 and the other probably in Strasburg between 1491 and 1500, though, as the title-page and colophon are missing, the exact date is uncertain. They are mainly interesting as illustrating the natural history and medical knowledge of the time. They and their prototypes of a few years earlier were later printed and reprinted in many languages and in many places; wherever in fact the rapidly increasing printing presses were established. They are the lineal ancestors from which all the elaborate modern illustrated natural histories of to-day have descended. As they were

mainly used as household books, many of them have disappeared and those that have come down to us are unfortunately too often in a dilapidated and battered condition. Both of the copies in the Garden library are still in their original vellum bindings. The copy of the "Herbarius" was printed in Venice in 1509 and also treats of the various medical uses of herbs. Another edition of the same work, "Herbolario," comes from Venice, 1540. They contain numerous coarse woods-cuts that often but doubtfully illustrate the plants described. That these blocks were copied from older editions, or even were old ones borrowed and often repeated, there is no doubt and this fact is emphasized by the delicate little sixteenth century cut of the Annunciation in the "Herbolario," showing the great advance of the graphic art of wood-cutting over that of the fifteenth century, and over the blocks illustrating the herbs contained in the same volume and which evidently were taken from a much earlier edition.

From the "Herbolario" to the superb folio edition of Rivinus is a long interval and the Garden has rightly a pride in its beautiful example of this famous old herbal. It was printed in Leipzig in 1690 and is fortunately a complete copy containing 402 full-page illustrations that are among the finest and most perfect delineations of plants of any time.

Another series of interesting plates are those in Rumphius' "Herbarium Amboinense," which deals with the flora of Malaysia in 1741, a beautiful and complete set in its original binding of dull red and yellow marbled levant.

Another unusual book is the "Hortus Eystettensis," a huge folio bound in vellum containing plates representing plants grown in the garden of the Bishop of the old Bavarian town of Eichstädt, in 1613, and doubtfully referred to the authorship of the Apothecary Besler. The figures are boldly executed steel engravings of well-known garden plants, daffodils, narcissus, both single and double, tulips, lilies, roses, irises, native European orchids, many herbs, an interesting series of carnations and lastly a series of autumn flowers and fruits, beginning with two great figures of the tomato, under the name of "Pome amoris fructu rubro," recalling a name still used locally in some parts of France, "Pomme d'Amour."

Other herbals as those of the Frenchman L'Obel and the Dutchman Dodoens in several editions and a series of the earlier works of the Englishman Ray, as well as a number of eighteenth century books on the natural history of the West Indies and South America, add materially to the usefulness of the Library.

Numerous books treating of the ornamental aspect of gardens and plants are among the new acquisitions, the most valuable of which is undoubtedly a fairly well preserved copy of Crispin de Pass' "Hortus Floridus," printed in Arnheim a year later than the Hortus Eystettensis. It is a small oblong folio bound in vellum containing plates and descriptions of a variety of familiar garden plants proper for the four seasons of the year. Each of the four parts has a title-page depicting a formal Dutch garden, showing in detail the quaint geometric, sparsely planted beds and pleached galleries supported on sculptured columns, so dear to the Flemish artists of the time.

Among the new acquisitions are several editions of Pliny's Natural History and a number of editions of Mattioli's "Commentaries of Dioscorides," the latter containing most interesting illustrations.

More modern botanical works are represented by several copies of Linnaeus' works, not heretofore in the Library. One interesting little pamphlet is the "Orbis eruditi judicium," printed at Stockholm in 1741, of which it is claimed that it is one of the four that are known to be in existence. It is Linnaeus' *Apologia pro vita sua*, and is the only thing he is ever supposed to have written about his own life and work. It is a small octavo of sixteen pages and begins with the record of the date of his birth, 1707, following which are various occurrences of his life up to 1739, an enumeration of his printed works, then already a formidable list, and a list of those of Van Royen, Gronovius and others, who in their works had followed his teachings, and terminates with a series of criticism of Linnean works from writings or unpublished letters. It is undoubtedly one of the rarest of pamphlets.

A partial set of the great illustrated Danish botany, "Flora Danica," in eighteen folio volumes has been completed after several

years collecting on the part of the Garden's agent in Germany, and the missing volumes of several important sets of periodicals have been obtained, notably some Dutch and Scandinavian series that, having been originally issued in small editions, are now difficult to procure. Saunders' "Refugium Botanicum," 1860, has also recently been purchased, the colored plates of which are important botanically as well as valuable and costly.

The horticultural department of the library is being slowly developed, but horticultural books are fairly difficult to collect. The periodicals in that line especially are not easy to find, and are becoming more desirable every year. The Garden Library has received during the year a set of the great French serial, "La Revue Horticole," which is complete except for a few of the early volumes.

The rapid increase in the number of the books has necessitated additional shelves which are in course of construction and which are to be put in place some time during the early winter.

ANNA MURRAY VAIL.

DRIVEWAYS, PATHS AND GRADING.

Construction work is going forward this fall at a number of points on the grounds preparatory to the extensive planting operations planned for next year. The building of the driveway and path system about the conservatories is nearly completed, and the grading, top-soiling, sowing and sodding of the land west and north of the conservatories, including the final shaping of part of the terrace on which they stand will be essentially finished before winter.

The path encircling the herbaceous garden has been partly completed, its Telford foundations having been mainly laid during 1901, and used as a road this past summer to cart stone over during the building of the new driveway through the woods to Pelham Avenue. This driveway is now being surfaced and will probably be opened for use during November; it will add a very attractive feature. The path, now relieved from heavy cartage, is being surfaced; at the same time it is being connected with the paths from the museum and conservatories by the building of about 200 feet of path needed to make these connections.

The driveway and sidewalk approaches to the front of the museum building have been completed, and the space between them and about the fountains in front of that building is being top-soiled and sodded. This work will be completed during November.

Grading and the building of driveways and paths through the fruticetum and the north meadows are progressing rapidly, and plans are in preparation for the stone bridges to carry the driveway and paths across the Bronx River, and across the valley in which the ponds northeast of the Museum building are situated.

The original study to make the top-soil and sod stripped from the areas devoted to roads, paths and buildings go as nearly as possible to make the completed planting surfaces has been carefully followed. This has of course necessitated stacking the soil at a number of places from which it is now being removed. All the rock excavated in grading operations has been similarly saved, and is being used for the Telford foundations of roads and paths.

N. L. Britton.

A NEW PALM FOR THE CONSERVATORIES.

At the conservatories of Mr. H. McK. Twombly, at Madison, N. J., there has been growing for some years a specimen of the wine or toddy palm, *Caryota urens* L. That this plant has received the best of care and attention is attested by its magnificent proportions and the vigorous appearance of its growth. This palm has been presented to the Garden by Mr. Twombly and adds to the collections a valuable and noble member of this interesting family. As will be seen from the accompanying illustration, it considerably overtops the other palms in the palm-house, and vies in height with the large bamboo, near which it is placed. The distance from the top of the tub to the tip of the uppermost leaf is 36 feet, 15 feet of this length composing the trunk which is about 15 inches in diameter at the base. Its broad decompound leaves measure 13 to 15 feet in length and their width is but little less, giving the palm a spread of about 28 feet. The lower leaves are horizontal, with the apex as well as the tips of the pinnae gracefully drooping. The ultimate seg-

ments are wedge-shaped, the apex being curiously and irregularly toothed with one side extending into a tail-like appendage, giving to this and other members of this genus the common name of fishtail palms.

At its old home, owing to its constantly increasing height, it had been found necessary to lower the tub into a pit which at the time of its removal was between six and seven feet deep. This considerably increased the difficulty of removing it, but by digging an inclined ditch to the base of the pit, it was possible to slide the plant out to the surface. It was transported on a large four-horse truck, leaving Madison at noon of October 21st, and arriving at the Garden about 24 hours later. The distance covered was some forty miles, and the weight of the palm was estimated at about two tons.

The genus *Caryota* comprises about 10 species, ranging from tropical Asia through the Malay region to New Guinea and the northern coast of Australia. The species under consideration is one of the largest, attaining a height of 30 to 50 feet, and inhabits India and the Malay region. This is one of the palms from which palm wine or toddy is obtained. To secure this the flowering spadix is cut off before it expands, and a vessel so arranged as to receive the flow of sap, which is said to continue flowing sometimes for a month. This sap when distilled becomes arrack, or Indian gin. A part of the sago of commerce is also secured from this palm; this important article of food is manufactured from the internal tissues of the trunk.

This palm is of rapid growth and its life is relatively but a short one, as it belongs to that class of palms which begin to flower at the summit. This process of flowering continues downward, the flower clusters arising from the old leaf sheaths, until the base is reached, when the plant dies. Some of the other species of this genus produce suckers or shoots from the base, thus perpetuating themselves, but this species does not resort to this. Its life, though comparatively short, is certainly blessed with a graceful dignity possessed by few of its relatives.

GEORGE V. NASH.

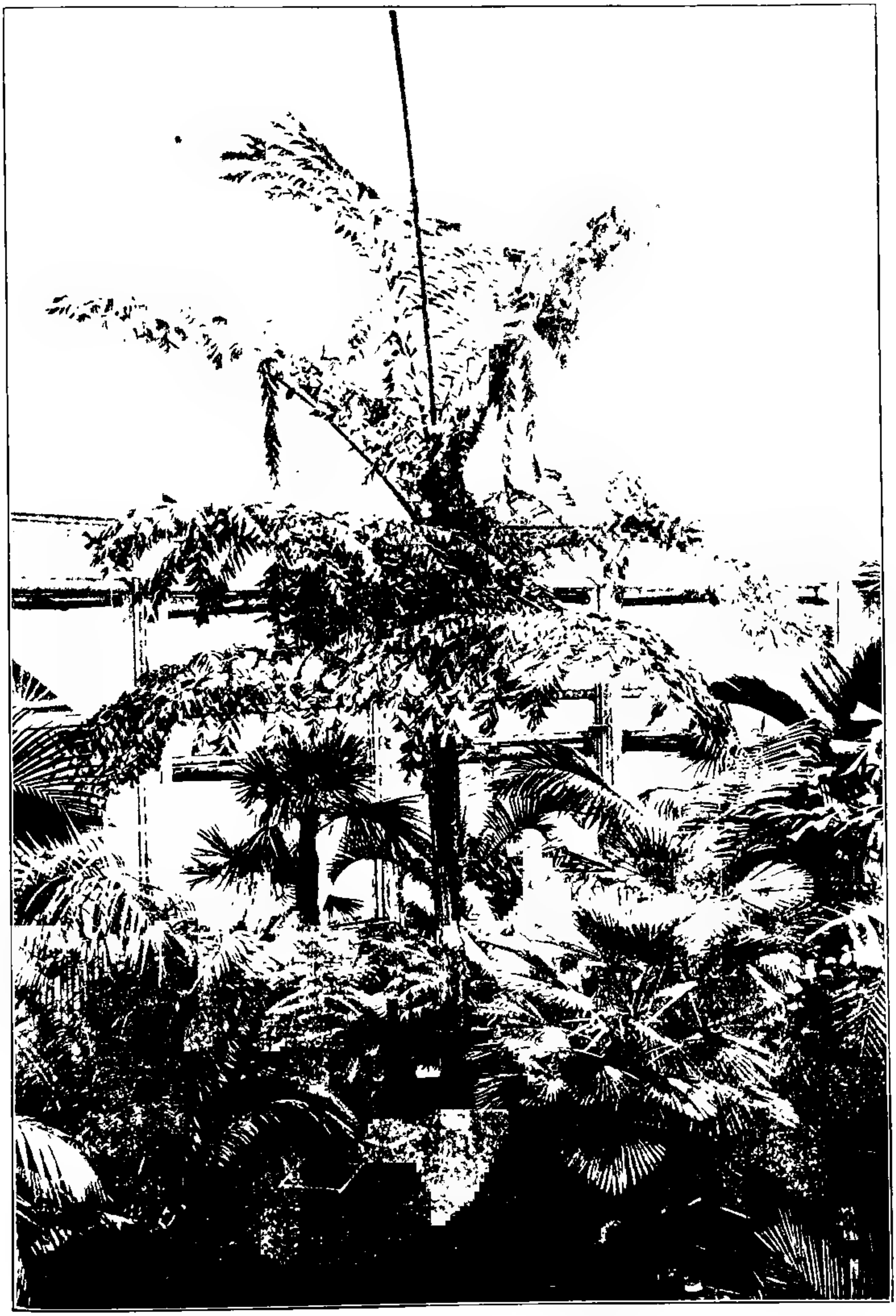

FIG. 27. Specimen of *Caryota urens* L., presented by Mr H. McK. Twombly.

NOTES, NEWS AND COMMENT.

Professor F. S. Earle, assistant curator, started for Jamaica on October 16 in company with the Hon. Wm. Fawcett, Director of the Public Gardens and Plantations, for the purpose of making an investigation of the diseases of logwood, banana, cocoanut, ginger, pineapple and other economic plants of the island. The investigations in question were undertaken at the request of the Government of Jamaica and every facility has been provided which might insure the successful prosecution of the work. Visits will be made to all of the important plantations in company with Mr. Craddock, an agricultural lecturer in the service of the government. The government, the fruit companies and the planters are coöperating in Professor Earle's investigations.

Dr. M. A. Howe, assistant curator, is making an extensive survey of the algal flora of the Florida keys and several shipments of preserved specimens have already been received at the Garden from him.

Dr. W. A. Cannon, who has recently received the degree of doctor of philosophy for his researches upon the embryological characters of hybrids has been appointed assistant in the laboratories of the Garden.

Mr. John Shafer, curator in botany at the Carnegie Museum, Pittsburg, devoted the entire month of September to the selection of ten thousand specimens from the duplicate herbarium of the Garden to be added to the collection now being built up in the Carnegie Museum. In addition he secured seeds of several hundred species from the herbaceous and shrub collections.

A contract for the construction of additional cases for all the museums, and for the herbarium, library and laboratories, together with other needed furniture for the Museum Building was awarded by the Commissioner of Parks to Thomas Dwyer on October 23d.

Owing to the crowded condition of many of the beds in the herbaceous grounds, due to the vigorous growth of the past season, and to the necessity of providing more room for the incor-

poration of other species still in the trial grounds, it has been found necessary to rearrange during the past few weeks the collection here installed, and to provide a number of new beds. It has been found that the welfare of the plants in some of the plots could be better provided for by somewhat altering their position, and this has been done, but their relative places in the sequence have not been changed. The essential completion during the past spring of the brook and pond system which traverses this area has added much to its beauty, and has provided also the necessary requirements for the installation of a number of aquatic families not hitherto illustrated.

The total precipitation in the Garden during October, 1902, amounted to 7.31 inches. Maximum temperatures of 73° F. on the 10th, 72° on the 13th, 67° on the 24th and 69° on the 27th were observed, also minima of 51.5° on the 3d, 34° on the 10th, 38° on the 15th, 27° on the 21st and 30° on the 30th. The first frost occurred on the 10th when the registering apparatus showed a temperature of two degrees above freezing in the nursery on an eastern slope. Cold air settling in the bowl-shaped valley in which the herbaceous plantation lies produced a temperature sufficiently lower to produce frost on the above date. The last frost of the spring of this season occurred on April 25th, thus giving an open season free from frost of 168 days.

The temperature of the soil at a depth of one foot (30 cm.) stood at 43° F on the 1st, falling gradually to 33° on the 18th, then rising to 36° on the 21st, dropping to 31° on the 23d. From the 23d to the 27th variations slightly above and below the freezing point occurred, and then on the 28th a gradual decrease set in which carried the temperature down to 29° on the 31th.

Mr. Geo. Nicholson, F.L.S., formerly Curator of the Royal Gardens, Kew, England, was a visitor at the Garden during a few weeks in October and November.

The U. S. Patent Office has granted Dr. A. P. Anderson letters patent No. 707892, dated August 26, 1902, upon the "Art of Treating Starch Material." The products resulting from the application of this method to seeds and other starch materials are

highly porous bodies which though greatly enlarged preserve the shape and appearance of the original, and being readily acted upon by the digestive juices form valuable and economic foods. The products are also readily emulsified by water and other liquids and lend themselves to use in the arts for sizing, pasting, etc. The method in question is essentially distinguished from other processes by being based upon the explosive action of the liquid contained in air-dry starch, and the principal features of the invention are set forth in the twelve claims of the inventor as allowed in the grant. Dr. Anderson's invention is based upon studies made in the laboratories in the Garden, and he is now engaged in the perfection of machinery and apparatus by which the products in question may be made in commercial quantities. (See this Journal, May, 1902, p. 87, and September, p. 175.)

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EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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SOME HISTORIC TREES.*

Considering their abundance and their economic importance it is a curious circumstance that there is a widespread ignorance of our native trees. From a testing of class after class in botany for the past twenty-five years added to information derived from association with people in general, we have come to the conclusion that less than one per cent. of our population know ten trees accurately by name. Aside from the pine, the oak, the maple, and the elm which every one would be supposed to recognize, but unfortunately does not, the ordinary trees, even those passed by daily for years are a sealed book to the great majority of our fellow citizens. An amusing illustration of this popular misinformation appeared a few years since in the successive issues of several of our New York papers. It commenced with *Harper's Weekly* which gave an elaborate account of the thirteen OAKS planted by Alexander Hamilton to commemorate the formation of the original states of the federal union. A little later the Spectator whose observations are to be found in the pages of *The Outlook*, took a short trip with a party about historic New York and in his account of the trip mentioned visiting the Hamilton MAPLES. Still later the *Times* gave one morning as a portion of "the news fit to print" an account of the dilapidated and neglected condition in which one of its reporters found the Hamilton ELMS. This called out a reply from your lecturer stating the true nature of the trees, and the morning after it was printed

* Lecture given in the autumn course at the Museum of the New York Botanical Garden, October 25, 1902.

came a letter from one of the grandsons of Alexander Hamilton stating that the trees were LIME TREES which his ancestor had ob-

FIG. 28. The group of sweet gum trees planted by Alexander Hamilton, Convent Ave. and 143rd St., New York city. From a recent photograph.

tained from Mount Vernon on one of his visits to Washington. Now the facts of the case are that these trees are not oaks and

not maples and not elms and not limes (or lindens) but plain straightforward examples of sweet gum (*Liquidambar*) a tree not uncommon in the native forests about New Yo k, and yet one whose corky-winged twigs are sometimes sold on the city streets as "the rare alligator-wood from the tropics."

These trees stand on Convent avenue and 143rd street, nearly opposite the old Hamilton grange, and to the shame of the city's regard for the historic have been allowed to suffer neglect, and at present only one or two of them are living and the dead trunks still standing are covered with signs "for sale." With the rapid increase of building in the vicinity they are certain to pass speedily out of existence.

Most trees, or at least those of the commoner sorts, are not difficult to recognize and that by very simple characters. Even a botanist of very fair ability might quail at certain of the critical species of oaks and hickories, but the greater number of even these groups are well-marked and unmistakable. Most trees have such pronounced characters that we ought to recognize them as easily as we recognize old friends, and their study has been greatly popularized by such works as those of Miss Keeler and Miss Lounsberry, and Miss Huntington's *Trees in Winter*. Most trees have characters that are to be found in the buds, in the leaves, in the bark, and in the general habit, so that by one or the other sets of characters they may be recognized in winter, spring, summer, or autumn. There is no more inviting and profitable field for amateur study in botany than among the trees, nor one that will yield surer, more pleasant, and more helpful results.

Trees have been associated with human interests and human happiness since the earliest times. Way back before historic times the savage looked to certain trees for protection from the lightning and from other violent demonstrations of the elements, and came to regard certain trees with greater esteem than others. With the early dawning of the religious instinct, trees were associated with early forms of worship and it was no mere poetical fancy that "the groves were God's first temples." The children of Israel found the Hamitic tribes, who occupied the promised

land upon their entry thereto, a race of tree worshippers, and the cutting down of the groves was a part of their work of destruction of the Hamitic idolatry, coördinate with the overturning of idols of wood, brass, and iron, and the destruction of heathen altars. Among the Mongolian races certain trees are held sacred and certain species whose allies have long since become extinct have been preserved to us in China and Japan by being planted and cared for about the temples. Even among the Celtic races the same conditions have prevailed to a certain extent. The Druids held the oak as a sacred tree and the practice was transferred to the Anglo-Saxons. Within the city of London a railway station still bears the name of "Gospel Oak" from the early practice of associating religious service with trees, and gospel oaks still exist in many parts of England where the name has not passed from the tree to the locality. It is perhaps not strange that the majesty of some of the grand old trees, more impressive than the aisles of the grandest cathedral man has formed, should lead men to cultivate the religious sentiment, for man's

> —"simple heart
> Might not resist the sacred influences
> Which from the stilly twilight of the place,
> And from the gray old trunks that high in heaven
> Mingled their mossy boughs, and from the sound
> Of the invisible breath that swayed at once
> All their green tops, stole over him, and bowed
> His spirit with the thought of boundless power
> And inaccessible majesty."

In more tropical lands, too, as the early inhabitants of America carried the elements of civilization across the Pacific, they carried with them the trees that were to them the most useful, and today there is not a tropic isle in either hemisphere that is not girdled with a fringe of cocoanut palms, and on every sea-girt islet it is true for the native inhabitant that —

> "To him the palm is a gift divine,
> Wherein all uses of man combine —
> House and raiment and food and wine!"

Besides the cocoanut palm other species stand in the same relation to island inhabitants. The date palm of the desert forms

the food of the Berber and in the recently added island of Puerto Rico the royal palm serves almost every possible use for the inhabitants from the siding of a house to the body of a saddle.

Trees have long been the subjects of familiar allusion in literature; there is no more delightful picture of forest life and forest scenery than Shakespeare's Forest of Arden in "As you like it" and many others besides Shakespeare and the banished duke have found "tongues in trees" and "books in the running brooks." Certain sorts of trees have suggested certain traits of character, as the oak of sturdiness, as in the case of the guard in Coriolanus who says of his general, "He is the rock, the oak not to be wind shaken," or again of toughness, as when the oak is mentioned as "unwedgeable," "hardest-timbered," "gnarled," and as possessing "knotty entrails." To the American poet a finer grain of sentiment is aroused by the white pine—"the murmuring pine," as in that most touching allusion to the burial of Hawthorne on that "hilltop hearsed with pines," which marks the last resting place of Emerson, Thoreau, and Hawthorne, whose life-long friend said of it

> "I only hear above his place of rest
> Their tender undertone,
> The infinite longings of a troubled breast,
> The voice so like his own."

Besides the oak and the pine, the lithe willow, the prickly holly, the bearded hemlock, the evergreen magnolia, and the spreading beech have all been the subject of the poet's song. The last named tree with its smooth bark yielding so easily to the knife has for ages been the lover's tree; it was surely such a beech that Orlando selected as the medium on which to convey his thoughts of Rosalind:

> "These trees shall be my books
> And in their barks my thoughts I'll character;
> That every eye, which in this forest looks,
> Shall see thy virtue witnessed everywhere.
> Run, run, Orlando; carve on every tree,
> The fair, the chaste, the unexpressive she."

And it was for this offence that the melancholy Jaques begged him to "mar no more trees with writing love songs on their barks."

Trees have also played their part in history and romance and sites of important events have long been marked by them. Where the event occurred apart from trees it has often been customary to mark the spot by a tree planted by some distinguished person. Albert Edward, now King Edward the seventh, planted a tree at the grave of Washington on the occasion of his visit to America in 1860; General Grant planted the tree which marks the site of the Lexington church on the centenary of the battle, April 19, 1876, and Li Hung Chang planted the sacred tree of China over the site of the first burial place of Grant on the banks of the Hudson.

Herne's Oak at Windsor, under which the festivities of Hallowe'en were held and under which Falstaff played the fool and came to grief through the merry wives of Windsor, was not obliterated until 1863, not far from Windsor Castle. Every Yankee school boy knows the story of our own most famous oak where the royal charter of Connecticut was hid, and the church bells of Hartford tolled a requiem when the old tree fell in 1856. All about New York are trees which traditions say were the hanging places of British spies; one of the most noted of these is the old "cow-boy oak" at Yonkers.

The linden tree was one of the favorite trees of German legend and even to-day there are usually lindens standing in the market places of most of the smaller cities and towns where the peasants of the Fatherland sing and dance "unter den Linden." The famous street of Berlin which bears this name from the double row of lindens along its central esplanade loses much of its fascination when we find that the trees, far from meeting our expectations, are of recent planting and form an inconspicuous setting to the higher buildings that line either side of the street. One of the most famous lindens in Germany is the one at Nuremberg which stands,

"In the court yard of the castle bound by many an iron band,"

reputed to have been planted by Kunigunde, wife of Duke Henry the second, of Bavaria, who was crowned king of the Germans in the year 1002, and emperor in 1014. At the time Longfellow wrote his famous Nuremberg poem in the early forties it was

rapidly going into a decline, and when I saw it in 1895 it bore only one tuft of living leaves from a single adventitious sprout.

The elm has long been the favorite tree for bordering walks and drives and among the most famous have been those on either side the "Broad walk" at Oxford; our own New Haven elms and those of Boston Common have also been justly famous in the past, but now are fearfully ravaged by the beetles and caterpillars as well as passing into the decline that early overtakes all the shade trees of modern gas-lighted cities. Perhaps no single tree in America is better known than the elm that stands opposite Cambridge Common under which Washington took command of the American Army in 1775. Other famous elms are those of Waverley and Sheffield in Massachusetts, and Canaan in Connecticut.

The horsechestnut, a native of Central Asia, has long been planted in Europe and vies with the American elm as a shade tree, attaining there a magnificence unknown in this country. Among the most famous of this species are those of Bushy Park near Hampton Court, whose trunks measure three and four feet in diameter, and the solitary one at the side of Brasenose College in Oxford, known as Bishop Heber's chestnut, as it still shades the window of the room he occupied when a student in the university, long before he wrote of "Greenland's icy mountains."

Certain beeches are also well known, particularly in Europe, where the tree stands in higher repute than with us. The Burnham beeches are perhaps the most noted, and some of those at Fontainbleau are famous because of their history and associations.

Botanical gardens have frequently served to preserve trees of historic interest. At the Botanical Garden of St. Petersburg they point out the poplar planted by Peter the Great; at the Jardin des Plantes in Paris is the cedar of Lebanon which Jussieu brought from the Holy Land in the crown of his hat; and at the Kew Garden are the "Seven Sisters" planted for the daughters of King George — now decrepit elms, while on the banks of the neighboring Thames is "Queen Mary's elm," still older, and the spreading linden under which the children of George the third had their out-of-door school.

In considering the age of trees it must be borne in mind that the so-called annual rings are entirely unreliable for determining age. These rings represent periods of growth, but not necessarily *annual* periods. A tree known to be eight years from the seed has been found to possess thirteen rings. The same may be said of the growth of the shoot which is sometimes used to measure the age of branches. Every grower of trees from the seed is familiar with the fact that the second terminal bud on any given shoot is likely to expand during a season with alternations of rain and drouth, and one who has grown trees extensively from the seed has told me of five successive terminal buds appearing one after another on the same shoot during the present season. It is probably true that during the ordinary season the average tree will produce but a single growth ring, but it is likewise true that it may produce two and even more the same year.

It is true that there are traditions of trees that are two thousand years old, but it is certain that most of these rest on very hazy historical data and in the few cases where the evidence is more reliable it still lacks much of certainty. We have cited the instance of the old linden at Nuremberg nine hundred years old, and there are oaks in the forest of Thüringen around which legends have clustered for eight hundred years, and doubtless some of the oaks of our New England openings have an age of five hundred, but in these latter cases we must content ourselves with estimates.

It is generally supposed by Americans that the big trees of California are the largest trees of the world, but if we can credit the best botanical authorities of Australia, there are gum trees, species of *Eucalyptus*, on that continent that are at least two hundred feet higher than the tallest of the giant redwoods. But while the old world may exceed us in this, our oaks, our maples, our elms, and our pines are all much finer than the corresponding species of Europe, so that if we are not first in all things we are in many even in our forest productions.

LUCIEN M. UNDERWOOD.

A REMARKABLE PLANT OF A SOUTH AMERICAN TAIL-FLOWER.

In the latter part of the summer of 1900 an exceedingly interesting collection of plants of varied character was presented to the Garden by Mrs. F. L. Ames, of North Easton, Mass. A detailed account of this appeared in the October number of the Journal for that year, and reference was made at that time to the large specimen of *Anthurium Veitchii*, one of the gems of that collection, and the subject of this sketch. It was at that time stated to be the largest plant in cultivation in this country, and it was supposed to have no equal in Europe. During the past spring the writer visited the principal botanical gardens of Europe, and at none of them was a plant seen to equal this one, and at but one place, the palm-garden at Frankfurt-am-Main, was a plant observed which at all approached it in proportions and vigor.

The accompanying illustration will give some idea of its appearance, but only a visit to the plant itself will give an appreciation of the delicate shading and color of the striking leaves. Its removal resulted of necessity in somewhat of a check to the plant, but it soon became acclimated and put forth new leaves which rapidly replaced those unavoidably damaged in transit. Within a few months it had recovered its wonted vigor, and this improvement has continued until at the present time it has assumed the place of dignity in the house in which it is installed. It is located in the westerly side of No. 4, on the opposite side to the bananas, where it has been since its arrival. The plant now has a spread of a little over eight feet and has about seventy leaves, the majority of them having a length of about four feet and a width of one foot. These are pendulous from long petioles, in some cases equalling the leaves in length, and entirely conceal the body of the plant and also in large part the tub in which it is planted.

While the aroid family, to which this belongs, is widely distributed, mainly in tropical regions, the anthuriums, or tail-flowers, as they are sometimes called, are not found outside of tropical America. Some 200 species are known up to the present time,

and by far the greater part of these are from South America, with Central America second; a few scattering species occur in the West Indies.

There are many showy foliage plants among the members of the aroid family, but few, if any, can equal this in the noble pro-

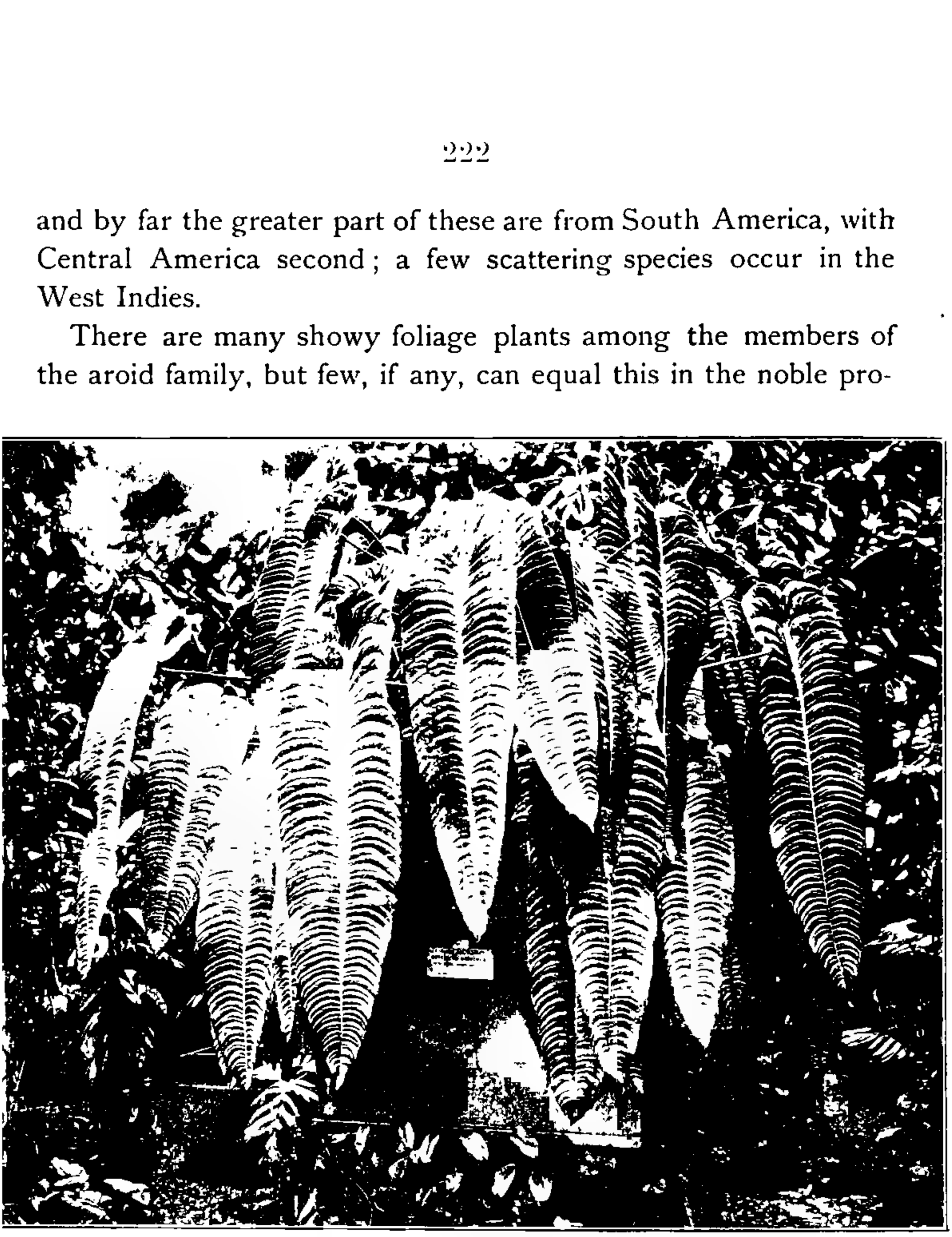

FIG. 29 *Anthurium Veitchii* Masters. Given by Mrs. F. L. Ames.

portion of its leaves or in their rich coloring or delicate shading. Between the modest little jack-in-the-pulpit of our own wet woods and this giant from the forests of Colombia there is apparently a world of difference, and so there is in general appearance, but an examination of the flowers of each will quickly show that they are members of the same family, and it is these constant and essential resemblances which indicate their affinity.

GEORGE V. NASH.

REPORT OF THE DIRECTOR-IN-CHIEF ON HIS VISIT TO THE ROYAL GARDENS, KEW.

To the Scientific Directors,

Gentlemen. By permission of Mr. D. O. Mills, President of the Board of Managers, I was absent from the Garden for the four weeks between August 16th and Sept. 13th on a visit to the Royal Gardens, at Kew, England.

My visit was for the purpose of comparing certain unnamed specimens in our collections with authentically named specimens in the collections of that institution, and to study certain cultural methods and the arrangement of museum, conservatory and out-of-door collections. About five hundred specimens were taken from our herbarium for comparison, twelve of which proved to represent species new to science, and a large number of others are of particular scientific interest as illustrating morphological facts hitherto unknown and extensions of geographic distribution.

The greater part of my time while at Kew was given to the study of the collections of North American sedges (Cyperaceae) for the more complete and accurate descriptions of these plants in my monograph now in preparation; the examination of these collections was the more important on account of the prolonged study already given to them by Mr. C. B. Clarke of Kew, who has for many years been preparing a monograph of the Cyperaceae of the world. Mr. Clarke most obligingly gave me continuous aid during my visit, including the use of much of his manuscript, and critically examined many of our specimens at my request. I am deeply grateful for his advice and assistance.

A considerable number of specimens of plants of the West Indies obtained by our collectors in Porto Rico, Cuba and by myself in St. Kitts, were also compared and satisfactorily determined, and I also took advantage of the opportunity to examine the type specimens of many species of North American plants, especial attention being given to some of the Crassulaceae.

My examination of the collections of living plants was greatly facilitated by the personal attention of Sir William Dyer, Director of the Royal Gardens, to whom we are greatly indebted for much valuable information and suggestion.

Respectfully submitted,

N. L. BRITTON,

Director-in-Chief.

NOTES, NEWS, AND COMMENT.

Professor M. Treub, Director of the Botanical Garden, at Buitenzorg, Java, was a visitor at the garden during a few days in mid-November and again toward the end of the month. In addition to the inspection of some of the other botanical institutions of America, Professor Treub made a study of the organization of the Bureau of Plant Industry of the U. S. Department of Agriculture. The entire botanical and agricultural needs of the island of Java, with its twenty-four millions of inhabitants, are cared for in the Buitenzorg Garden, which is thus in effect a department of Agriculture of the Dutch government for the island. Very important arrangements for future exchanges of seeds, specimens and books were made with him.

Dr. and Mrs. F. C. Clements, of the University of Nebraska, are in residence at the Garden making some special studies of the flora of Nebraska in connection with ecological work in that region and in the Rocky Mountains.

Professor A. D. Selby, botanist, and chief of the division of plant physiology and pathology in the Ohio Agricultural Experiment Station has obtained leave of absence for six months and has come to the Garden to carry on some special investigations in pathology and physiology.

Dr. M. A. Howe, assistant curator, has returned from a six weeks' collecting trip along the coast of Florida, bringing a large number of specimens of the algal flora of the Keys.

Professor F. S. Earle, assistant curator, returned from Jamaica on December 2d. During his tour on the island of Jamaica an

investigation was made of a number of diseases of the economic plants and a large collection of fungi was made.

The Garden has recently obtained, by purchase, a collection of 68 specimens of fossil plants from the Cretaceous (Dakota Group) of Kansas, collected by Mr. Charles H. Sternberg.

The collection includes 22 genera and 36 species and varieties, all but nine of which were previously unrepresented in the paleobotanical museum. All are beautifully preserved and will be fine material for display. One undescribed species is included, which represents a petal of a large magnolia flower. This has been figured and will shortly be made the subject of an illustrated article.

The total amount of precipitation in the Garden during November, 1902, amounted to 1.72 inches. Maximum temperatures of 65° on the 14th, 64.5° on the 22d, and 55° on the 24th, and minima of 32° on the 1st, 30° on the 6th, 26.5° on the 24th, and 23.5° on the 29th were recorded.

The Hallock thermograph recorded a temperature of the soil at a depth of one foot (30 cm.) of 29° on the 1st, rising to 32° on the 16th, and falling to 28° on the 30th.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

3 specimens of *Polygonum Zuccarinii* from Missouri. (Given by Prof. G. W. Letterman.)

13 specimens of flowering plants from Illinois. (Given by Dr. J. Schneck.)

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

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

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

15 specimens from New Mexico and Colorado. (By exchange with Prof. T. D. A. Cockerell.)

10 specimens, 3d decade, "North American Violaceae." (By exchange with the U. S. National Museum.)

7 specimens from central New York. (Given by Miss M. L. Overacker.)

50 specimens, "Musci Am. Sept." (Distributed by Messrs. Renault and Cardot.)

5 specimens of mosses from Mt. Central, Colorado. (Collected by Mr. Carl F. Baker.)

26 specimens of mosses and lichens from Peru. (Collected by M. de Lautreppe.)

47 specimens of mosses from Europe and America. (By exchange with the Botanical Garden, Copenhagen.)

10 specimens of mosses from Vermont and Long Island. (Collected by Dr. A. J. Grout.)

27 specimens of mosses from Virginia and New York. (By exchange with Dr. W. A. Murrill.)

6 specimens of mosses from the Upper Susquehanna Valley. (By exchange with Mr. E. G. Barbour.)

18 specimens from Norway. (Collected by Dr. P. A. Rydberg.)

6 specimens from Central New York. (Given by Mr. H. D. House.)

18 specimens of fungi from California. (By exchange with Mr. A. A. Heller.)

5 specimens of *Quercus* from New Mexico. (Given by Prof. T. D. A. Cockerell.)

197 specimens from Colorado. (By exchange with Mr. Geo. E. Osterhout.)

3 specimens of *Heuchera* from Western Pennsylvania. (Given by Mr. John Shafer.)

4 specimens of white-fruited strawberry from Pennsylvania. (Given by Mr. O. P. Medsger.)

23 specimens of mosses from Huntington, Long Island. (Given by Miss J. E. Rogers.)

26 specimens "Musci Pleurocarpi." (Distributed by Dr. A. J. Grout.)

8 specimens of *Salix* from Nevada. (By exchange with Mr. Carl F. Baker.)

2 specimens from California. (Given by Mr. L. R. Abrams.)

1 specimen from Colorado. (Given by Dr. J. H. Barnhart.)

44 specimens from Wyoming. (Given by Professor J. F. Kemp.)

1 specimen of *Ribes prostratum* from Lake Champlain, N. Y. (Collected by Dr. D. T. Macdougal.)

11 specimens of *Aster* from Kentucky. (By exchange with Miss Sadie F. Price.)

70 specimens of mosses from western Minnesota. (Collected by Prof. J. M. Holzinger.)

228 specimens, "Plantes Crypt. de France Exsiccatae." (Distributed by M. J. B. H. J. Desmazieres.)

19 specimens of hepatics from New York and New Jersey. (By exchange with Miss C. C. Haynes.)

15 specimens of mosses from Virginia and North Carolina. (Collected by Dr. John K. Small.)

105 specimens of mosses and lichens from Woodland, New York. (Given by Mrs. E. G. Britton.)

51 specimens of European mosses. (By exchange with Dr. G. Roth.)

4 specimens of Crassulaceae from the Sierra Nevada. (Given by Mr. S. H. Burnham.)

19 drawings of Bahama plants. (Given by Mrs. J I. Northrop.)

3 specimens from New Jersey. (Given by Rev. L. H. Lighthipe.)

36 specimens from eastern North America. (By exchange with Miss F. A. Mulford.)

1,200 specimens from Florida. (Collected by Dr. J. K. Small and Mr. G. V. Nash.)

4,100 specimens from Porto Rico. (Collected by Dr. A. W. Evans and Mr. P. Wilson.)

2,300 specimens from Texas, New Mexico and Illinois. (Collected by Messrs. Earle and Tracy.)

6,500 specimens of marine algae from Florida. (Collected by Dr. M. A. Howe.)

PLANTS.

9 succulents. (By exchange with the National Museum, Washington, D. C.)

7 plants for the conservatories. (By exchange with the Buffalo Botanic Garden.)

54 Veronicas for the conservatories. (By exchange with the Botanic Garden, Cambridge, England.)

75 Irises, mostly hardy. (By exchange with the Botanic Garden, Cambridge, England.)

4 Begonias. (By exchange with Mr. Ludwig.)

24 plants for the herbaceous grounds. (Collected in the vicinity by Mr. P. Wilson.)

31 plants for the herbaceous grounds and conservatories. (By exchange with Mr. H. A. Dreer.)

23 plants for the herbaceous grounds. (Collected by Mr. D. S. George at Salisbury, Ct.)

277 plants for the conservatories. (By exchange with the Botanic Garden, Berlin, Germany.)

4 tree ferns from Porto Rico. (Collected by Mr. P. Wilson.)

26 plants for the herbaceous grounds. (Collected at Swartzwood Lake and Newton, N. J., by Dr. N. L. Britton.)

3 plants of *Nymphaea* sp. (Collected by Mr. M. J. Elrod, Big Fork, Mont.)

1 *Caryota urens.* (Given by Mr. H. McK. Twombly.)

25 *Stapelia* cuttings. (By exchange with the Royal Gardens, Kew, England.)

1 *Araucaria Bidwillii.* (Given by Mrs. C. L. Iselin.)

1 *Agave Americana.* (Given by Mrs. Wyler)

1 *Ribes prostratum.* (Collected by Dr. D. T. MacDougal at South Bay, Lake Champlain.)

12 *Rhododendron Catawbiense.* (Collected by Dr. W. A. Cannon.)

1 *Agave Morrisii.* (By exchange with the Missouri Botanical Garden.)

4 plants for the herbaceous grounds. (Given by Miss F. A. Mulford.)

3 *Castalia* sp. (By exchange with the National Museum, Washington, D. C.)

1 *Isoetes Engelmannii.* (Given by Dr. D. S. Johnson.)

2 orchids for the herbaceous grounds. (Given by Mr. T. E. Hazen.)

SEEDS.

4 packets seeds. (Given by Miss F. A. Mulford.)

30 packets seed. (Purchased from Miss E. Harter.)

1 packet seed of *Pachyrhizus Thunbergianus.* (Given by Miss E. C. Haynes.)

4 packets of seed. (By exchange with the National Botanic Garden, Washington, D. C.)

14 packets of seed. (By exchange with the Biltmore Herbarium.)

1 packet seed of *Cypripedium reginae.* (Given by Mr. Henry Ryder.)
1 packet palm seed. (Given by Dr. H. H. Rusby.)
1 packet seed of *Prunus eximia.* (Given by Mr. H. Lacey.)
26 packets of seed. (Given by Mr. Sidney Rauschenberg.)
1 packet seed of *Rosa gymnocarpa?* (Given by Dr. T. F. Wilcox.)
1 packet seed of *Vincetoxicum Alabamense.* (Given by Miss A. M. Vail.)
2 packets of seed. (Given by Mrs. Hunter.)

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DEATH OF DR. TIMOTHY F. ALLEN.

The death of Dr. Allen, on December 5th, at the age of sixty-five, removed one of the few remaining of the older botanists of the city, and one whose advice has been constantly sought by the younger generation during the whole history of the modern development of botanical science in America. He was early associated with Dr. John Torrey, and was one of the group of enthusiastic plant lovers who organized and incorporated the Torrey Botanical Club in 1871, and he has served as one of its Vice-Presidents for many years. His early botanical studies were chiefly devoted to the flora of the vicinity of New York City, and in the Catalogue of that flora, published by the Torrey Botanical Club in its "Bulletin," from 1870–1876, he appears as one of the most important contributors. He subsequently took up the study of water plants, and later restricted his researches almost wholly to the peculiar and interesting group of Stoneworts, or Chara family, which inhabits fresh-water ponds and pools nearly all over the world; in search of these plants he personally explored a very large part of the United States, and he employed collectors to obtain them for him in both North and South America and Asia, and by exchanges of duplicate specimens with European students, gradually brought together one of the largest herbaria of these plants ever formed; this he presented to the New York Botanical Garden early in 1891, and for some months was a frequent visitor at the Museum Building, continuing his studies and arrangement of these specimens, and pursued this work until failing health rendered it impossible. He has also contributed many books to the Library of the Garden, of which he was one of the original incorporators.

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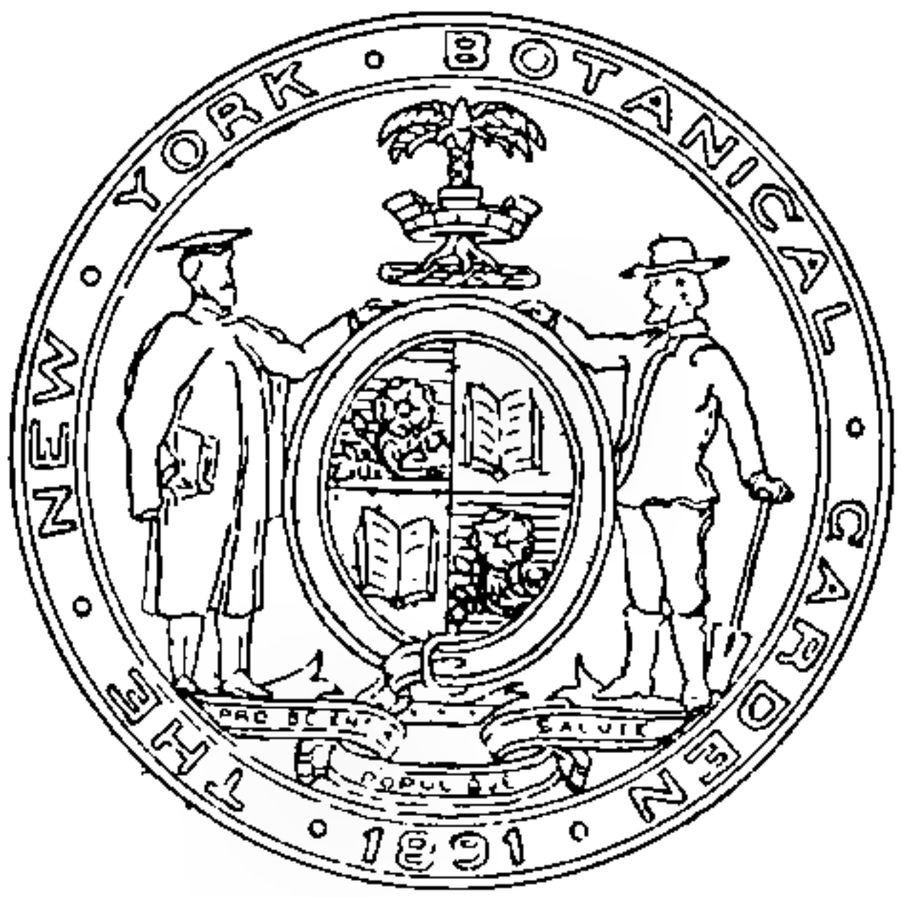

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VOL. IV. January, 1903. No. 37.

REPORT ON A TRIP TO JAMAICA.

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

Sir: In accordance with your directions I sailed for Jamaica on October 16, reaching there on October 20 and remained until November 26. The trip was undertaken on the invitation of the Hon. Wm. Fawcett, Director of the Jamaica Public Gardens, for the purpose of investigating certain diseases of logwood, cocoanuts and other economic plants. My instructions were also to secure living specimens of tree-ferns for the conservatories, and to collect fungi and other cryptogams for the herbarium. Thanks to the hearty coöperation of the Jamaica Government and the United Fruit Company, and to the invaluable aid given by Mr. Fawcett and his associates, Mr. Wm. Harris and Mr. Wm. Cradwick, the objects of the expedition were successfully accomplished. Forty-five specimens of tree ferns representing fourteen or fifteen species were secured and forwarded to the Garden. Six hundred and thirty herbarium specimens were collected, of which nearly five hundred are fungi, the remainder being lichens and mosses with a few fresh-water algae. These will be studied and lists prepared as soon as other duties will permit. The following plant diseases were observed. In a number of cases cultures were secured of the organisms found in the diseased tissues and a more extended account will be prepared when laboratory studies and inoculation experiments with these organisms have been completed.

Logwood Root Rot. — On some estates, especially toward the western end of the island, logwood trees are dying in consider-

able numbers. The diseased trees usually occur in groups, the infection spreading slowly but in constantly widening circles. An examination of dying trees shows the roots to be badly rotted. Their surface tissues are invaded by a white fungus mycelium that is usually more abundantly developed in the space between the bark and the wood. The disease seems first to attack the small rootlets, gradually spreading to the larger roots and to the crown, when the tree dies. In many cases seemingly healthy trees near the borders of infested areas were found to have the roots on the side next the dying trees badly diseased, while on the other side they were still perfectly healthy. The fungus seems to be the mycelium of some one of the Hymenomycetes. Numerous species of Polyporaceae and Thelephoraceae were found on logwood stumps and logs, but in no case could their connection with this root rot be satisfactorily proven. Whatever the nature of the fungus, leaving stumps of trees that have died from this disease in the neighborhood of living trees is clearly dangerous. Dying trees should be dug out and the roots burned as soon as the disease can be detected. Where it is confined to certain small definite areas, as is often the case, it would be advisable to dig a trench three feet deep just outside of the diseased area in order to prevent its spreading underground to the roots of healthy trees. On a few of the estates examined the disease was so widely scattered that this method of treatment would not be practicable. Here it would seem best to clear the infested tract entirely of logwood, marketing such as was sufficiently mature and allowing the land to grow up in pimento and limes or reserving it for pasturage or cultivation. It should be mentioned in this connection that pimento trees are said to die from a similar root rot in some parts of the island. If this should prove to be identical with the logwood root rot, pimento would not be available as an alternative crop.

This root rot seems to spread slowly. One old logwood chipper assured me that trees had been dying for thirty-five years on a spot that he pointed out. This area does not now include over three or four acres. This would indicate that by vigorous measures it could be controlled. The disease was found on

various kinds of soils and under moisture conditions varying from dry rocky hillsides to the margin of swamps. In some cases the diseased areas were on spots where the soil was rich and deep and the moisture and drainage conditions perfect. It was not observed on the heavy clay lands toward the eastern end of the island, but whether this was due to the absence of infection or to the character of the soil could not be determined.

"Bastard" Logwood.—The logwood dye of commerce is extracted from the heart wood of mature trees of *Haematoxylon Campechianum.* In Jamaica occasional trees are found in which little or no haematoxylin is found. In its place is a substance yielding a dull yellowish-green dye. Such sticks are rejected by logwood buyers for they not only yield none of the desired coloring material, but if mixed with the normal wood in any quantity, do harm by spoiling the tint of the extract. Complaints have been reaching the Botanical Department of Jamaica, from certain quarters for some time, that the amount of this so-called bastard wood was increasing. The cause of this lack of haematoxylin in certain trees was one of the problems I was requested to investigate and considerable time was given to it. The facts ascertained are as follows :* (1) Logwood is a variable plant showing marked differences in form, color, and texture of leaf, time of blooming, form and extent of the ribs on the trunk, color of bark and especially in the color and dye-producing quality of the heart-wood. Four well-marked varieties are said to be recognized in Honduras and three are usually recognized in Jamaica, but there are many other intermediate forms. (2) Bastard wood is not the result of disease or of any lack of vigor. The trees producing it are perfectly healthy and normal. (3) It is not the result of soil or climatic conditions, since bastard and normal trees are found growing side by side under absolutely identical conditions. (4) It is not the result of immaturity. Aged trees may produce bastard wood, while in normal trees the heart-wood, as soon as formed, contains a good percentage of haematoxylin. These facts seem to point to heredity as the probable cause of the trouble.

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* I am under obligation to Dr. Amiel Bucher, Superintendent of the West India Chemical Works, for much information in regard to logwood.

That is, that certain trees produce only bastard wood because they grow from the seed of a bastard tree; or in other words that bastard logwood represents a variety of *Haematoxylon Campechianum* that normally produces little or no haematoxylin, just as one Honduras variety has smaller, shorter, thinner and lighter colored leaves. Experiments now in progress at Hope Gardens, Jamaica, and at the New York Botanical Garden with seedlings from the seed of bastard and of normal trees should in time settle this question conclusively. No data were obtained to show whether or not the trouble was increasing as is claimed by some. An increase could be readily accounted for by the fact that on many estates a tree that is chipped into and found to be bastard has been allowed to stand and produce continued crops of seed, while the normal trees have been cut down on reaching maturity. A wise policy would insure the prompt destruction of such trees whenever detected, as they have no value except for firewood, and should not be allowed to produce seed. It is unfortunate that there seems to be no constant difference in leaf or trunk by which these bastard trees can be distinguished, that would allow of their still earlier destruction.

Cocoanut Bud Disease.—Outbreaks of a serious disease of cocoanut trees have occurred on Jamaica at various times. Some years ago the groves in the neighborhood of Montego Bay * were badly injured by it and the industry was completely destroyed on the Grand Cayman † island, probably by the same trouble. At present it is attracting but little attention although numerous cases of it exist widely scattered over the western end of the island, a few being observed as far to the eastward as Port Antonio. It was not observed to the east of a line between Port Antonio and Kingston. One of the first symptoms of the disease is the dropping of the immature nuts. In some cases the lower clusters hang on and reach maturity however. The leaves droop a little, and become somewhat yellow. Often those that are just unfolding are seen to be distorted and blackened on the edges. The young flower buds still enveloped in the spathe

* See Bulletin of the Botanical Department, Jamaica, September, 1891, p. 2.

† See Bulletin of the Botanical Department, Jamaica, February, 1889, p. 3.

rot and finally the central leaf bud rots and the entire top falls away. Such trees are often pointed out by the planters as having been struck by lightning. Others attribute the death of the trees to a large borer said to work from the trunk up into the bud. In the numerous cases examined death was not due to either of these causes. The head of the tree was in all cases invaded by what seems to be a bacterial rot. The organism develops in the sweet, slimy coating found on all the young protected organs. It eats into the sheathing bases of the petioles and attacks the flowering sheaths. As the spathe grows the surface becomes cracked and the disease reaches the soft flower buds through these cracks. Finally it reaches the "cabbage" or central growing point, which it soon reduces to an offensive rotten mass. The top now falls away leaving a circle of the lower leaves that had matured before the tree was attacked. These persist for a time but of course finally die also as the tree has no power of branching or of producing a new growing point. The means by which the contagion is conveyed from tree to tree could not be determined nor could any estimate be formed of the time elapsing between infection and the death of the tree. Numerous cultures were secured and the study of the disease will be continued.

At Port Antonio the petioles and midribs of the leaves of some of the diseased trees were found to be invaded by a parasite that caused the browning and death of the tissues. This petiole disease was found on some trees that did not as yet show signs of the bud trouble. Whether or not the two troubles are caused by the same organism can only be determined by the further study of the cultures that were secured.

From our present imperfect knowledge of this disease it is impossible to suggest a remedy. Remedial measures, or rather successful preventive measures would probably depend on the method by which the disease is conveyed from tree to tree. This can only be determined by careful and prolonged field study. The importance of the industry involved would fully justify the expenditure and effort necessary to obtain a complete understanding of this disease. The necessity for the destruction of the contagion by the prompt cutting and burning of all infected trees is shown

by the marked tendency of the disease to spread from each center of infection.

It is claimed by some planters that a certain green-skinned variety of cocoanut is less liable to this disease than the reddish and yellowish kinds. The facts observed seemed to support this view. If it is confirmed by further observations it will be a factor of the greatest importance as it would make possible the selecting of a resistant race of cocoanuts.

Cocoanut Wasting Disease. — In the eastern part of the island between Morant Bay and Manchioneal, a disease occurs that can best be described by the above name. The nuts fall a few at a time. The lower leaves droop and fall prematurely, while the new leaves that are produced become successively smaller and less vigorous. In the final stage the leaves are reduced to less than half the normal size and the few that remain stand erect as a thin wisp at the apex of the bare stem which is seen to be abruptly tapered almost to a point. At length the tree dies, but the course of the disease is always slow, and affected trees may live for months or perhaps years. In the trees examined a white scale insect was always found at the base of the petioles and on the fruiting peduncles. The slow loss of vitality shown by these trees is a result that could be expected from the presence of this class of insects in sufficient quantity, but they did not seem numerous enough to fully account for the serious effect on the tree. In all the cases examined there was also a slow rotting of the sheathing bases of the petioles and of the fruiting sheaths. The scale insects were also observed on some trees that did not as yet show recognizable symptoms of the disease. Whether such symptoms would ultimately develop can only be determined by observations continued through a considerable period. Mr. Wm. Cradwick, of the Jamaica Agricultural Department, has undertaken to make further field studies and as specimens of the scale and cultures from the diseased tissues have been secured it is hoped we may ultimately gain a better understanding of this interesting but obscure trouble.

If, as seems probable, the scale is the first inciting cause of the disease it should be possible to devise some remedial treatment. Owing to the height of the trees and the method of growth, the

scales being largely sheltered by the fibrous sheathing bases of the leaves, the successful application of insecticides would be difficult but not necessarily impossible. Mr. Cradwick will undertake some experiments on this line.

An interesting experiment has been tried on one of the plantations of the United Fruit Co., in firing the dead leaves and fibers hanging on the diseased trees. The flame kills all the fruits and open flowers and most of the expanded leaves, but the apical bud is not injured and new leaves and flowers are soon developed. This seems like heroic treatment, but two trees were pointed out that had been fired six months ago, when they were in advanced stages of the disease. Now they seem entirely recovered and are putting on a new crop of fruit. This firing of the trees has also been suggested as a remedy for the bud disease. The chances for success would seem to be much less in that case, for the disease so soon becomes deeply seated.

Cocoanut Trunk Borer. — A few trees were observed where areas on the trunk two or three feet or more in extent had been bored full of small holes about 1 mm. in diameter. Minute white larvæ were found at the bottom of some of these burrows but none were taken in condition for identification. A rotting of the trunk soon follows these borings, and if the insect was abundant it would cause considerable loss. It was only observed in one grove and there only in a few trees.

Cocoanut Trunk Rot. — A few cases were observed where some slight injury allowed the entrance of a rot that destroyed the entire center of the trunk. In one case an outer rind of less than half an inch of healthy wood remained, a decomposing liquid running out when this was cut through. Strangely enough the top of this tree still seemed healthy and vigorous, but the rot in the center of the trunk had reached to within a few inches of the base of the bud. Such cases seem to be very rare, but they show the importance of avoiding unnecessary wounds of the trunk.

Banana Leaf-Blight. — On one locality at Stony Hill, north of Kingston, a serious banana disease was observed. It causes the browning of the vascular bundles in the veins and midrib of the leaves. This is soon followed by the blackening of the entire

leaf-blade, and eventually by the decay of the leaf and petiole. It does not seem able to extend from the petiole into the tissue of the stem. The terminal bud is not attacked, but continues to push out fresh leaves. These soon become infected in turn, so that usually not more than three or four of the younger leaves are free from the disease. Infected plants are much stunted in growth and do not bear fruit. In the small field where it was first observed fully three fourths of the plants were infected. The contagion was in this case probably introduced with the suckers that were used for planting, as these were said to have been taken from some neglected patches in the neighborhood, and a visit to these showed that they were also infected. The disease evidently spreads slowly as it had not crossed a wide hedge row separating this infected field from one adjoining. It may never prove troublesome, but the advisability of immedately destroying all diseased plants was strongly urged. If so destructive a disease should by any chance become widely scattered the result would be truly disastrous.

Apparently it is due to a bacterial parasite. Cultures were obtained and it is hoped to study the disease further. No evidence was secured as to the means by which it is conveyed to the fresh leaves or from plant to plant. So far as known it is confined to this one locality, which is at an elevation of some 1,200 feet and on red land. Such locations are not considered to be adapted to bananas, yet all uninfested plants were growing and fruiting satisfactorily.

Orange Root-Grub.—Orange growers, especially in the neighborhood of Bog Walk, are much troubled by a grub that gnaws the bark of the roots. Often the injury is sufficient to cause the death of the trees. Where the trees do not die, the growth ceases, the leaves turn yellow and the crop fails. The grub is a footless larva, probably that of *Praepodes vittata*, one of the Curculionidae. (See Journal of Jamaica Agric. Soc., Jan., 1898, p. 11.) From what I am told of the habits of this insect it can best be destroyed when in the adult stage. The beetles are said to gather in great numbers on the orange trees, eating the foliage. If such is the case, they could be killed by arsenical sprays. They are said to be clumsy flyers and to have the habit common

to many of the Curculionidae of falling to the ground when jarred or disturbed. This should make it possible to catch them by jarring on to sheets as is done with the peach curculio. The larvae could doubtless be killed in the ground by injections of carbon disulphide, but whether this could be done without injury to the tree and at an expense that would make it practicable, can only be determined by carefully conducted experiments in the field. Whether tobacco or other substances worked into the soil about the tree would prevent the depositing of eggs, is perhaps worthy of trial. The insect is thought to be a general feeder and is not confined to the orange, though it seems to be particularly partial to all citrous fruits. Some growers claim that they have suffered more when practising clean cuitivation than when weeds and bush are allowed to grow for part of the year, the roots of which may serve to divide the attention of the grubs.

In this connection it may be noted that orange scale insects are not likely to prove seriously troublesome, for in the moister regions at least they are quickly destroyed by fungus parasites. The orange rust mite occurs on the island, but it only seems troublesome on certain wet heavy soils.

Cocoa Stem Canker. — This trouble was only observed in the neighborhood of Port Maria, but it probably occurs in other parts of the island. Slightly swollen areas occur on the trunk or larger branches. The tissues in the central part of the swellings soon die and the yellow perithecia of some Nectriaceous fungus develop on the bark. The swelling continues to grow at the margin till finally it often girdles and kills the tree. Keeping the trunks and larger branches painted or sprayed with Bordeaux mixture should be a complete protection from this disease. It would also destroy moss and lichens and keep the trunks in a clean healthy condition. Promptly cutting out the diseased areas and painting the cut surfaces with sulphate of copper or sulphate of iron solution and then coating with tar or paint would probably in most cases save trees that are already attacked.

Cocoa Pod Rot.—Examples of rotting cocoa pods were seen at various places. Apparently more than one species of fungus is concerned in this rotting. This point will be reported on later.

This rotting is not attracting much attention, but with the Creola variety at low altitudes it is certainly very serious and under certain conditions it is liable to prove destructive to other kinds. Whether or not the blasting of the young pods is due to the growth of a fungus could not be certainly determined. This blasting occasions a very considerable loss, especially to the fall crop.

Cocoa Root Disease.—There is trouble from the dying of cocoa trees on certain areas. The roots examined all showed signs of having been gnawed much as in the orange trouble, but in addition the injured roots were attacked by some fungus mycelium. Want of time prevented a thorough investigation of this trouble.

Cassava Root Rot.—It was stated by some laborers that cassava roots rotted if planted on land where logwood trees had died. A cassava patch was examined that had been planted on such lands. A number of unthrifty plants were noted and on digging them up the roots were found to be enveloped in a white mycelium and to be rapidly rotting. Dead logwood stumps were near these diseased plants. This was on a rather light, upland, red soil, that was well adapted to the growth of cassava. The connection between the cassava rot and the logwood root rot could only be inferred.

In conclusion I would say that this somewhat hasty reconnoissance demonstrates the presence in Jamaica of a number of diseases of economic plants some at least of which are liable to prove destructive. The short time at my disposal was not sufficient for a thorough study of any of these and the few remedial and preventive measures suggested above are tentative only, and are intended simply as the basis for field experiments. I would respectfully suggest to the Jamaica Government that the Agricultural Department can do no more useful or practical work than to provide for a further study of these diseases.

While thus emphasizing the great importance of acquiring a full knowledge of such diseases as do occur, I feel like congratulating the planters of Jamaica on the fact that serious diseases seem to be so few. Most countries with equally diversified crops have to contend with a much greater number of these pests.

F. S. Earle.

THE DESERT BOTANICAL LABORATORY OF THE CARNEGIE INSTITUTION.

The Board of Trustees of the Carnegie Institution has made an appropriation of $8,000 for the establishment and maintenance of a desert botanical laboratory for the fiscal year 1902–1903, and at the request of the Executive Committee of the Institution Dr. D. T. MacDougal, Director of the Laboratories, has been permitted to serve with Mr. Frederick V. Coville, Chief of the Division of Botany, of the Bureau of Plant Industry of the U. S. Department of Agriculture, as an advisory board in relation to this undertaking.

The Desert laboratory has been established for the purpose of making a thorough investigation of the physiological and morphological features of plants under the unusual conditions to be found in desert regions, with particular reference to the relations of the characteristic vegetation to water, light, temperature and other special factors.

A resident investigator to be placed in immediate charge of the laboratory will begin a series of researches upon certain more important problems outlined by the Board and facilities will be provided by the aid of which a few other investigators from any part of the world may carry on work upon any problem connected with desert plants.

North America contains more than a million square miles of territory known to the geologist, geographer and botanist as desert. The conditions offered vegetation in these districts show such wide departures from those of humid temperate, and tropical regions, the living flora is accessible to so few workers, and the entailed investigations are necessarily so wide in scope, so expensive and difficult in execution that the advance of systematic knowledge of the fundamental processes of desert plants has been comparatively slow, and this lack of information has made many current generalizations concerning the activity of plants very unsafe. The establishment of this laboratory promises results concerning the fundamental processes of plant protoplasm

as important as any in the whole realm of botany, and withal results which once known and incorporated in the science of botany might well offer facts of the greatest value not only to the inhabitants of the arid regions of America, but to the people of other desert regions, as well since no similar inquiry has yet been instituted in any part of the world.

A statement of the scope, purpose and plan of organization of the laboratory approved by the Board was read by Dr. MacDougal before the botanical section of the American Association for the Advancement of Science at Washington, D. C., December 30, 1902. In the discussion that followed Dr. W J McGee, Professor J. W. Toumey, Dr. David Griffiths, Dr. J. H. Harshberger, Mr. T. H. Kearney, Prof. W. W. Rowlee, and Dr. H. C. Cowles, laid stress upon the importance of the work devolving upon such a laboratory, and brought out the chief problems to be investigated.

President Gilman, of the Carnegie Institution, participated in the discussion, and described the attitude of the Board of Trustees of the Carnegie Institution toward research.

THE PALM COLLECTION.

(With Plates XI.–XIII.)

The palm collection has now attained a size to warrant its description somewhat in detail. The past year has seen an important increase, the collection now embracing about 130 species and varieties, illustrating over fifty genera, so that it is rapidly becoming of value for a comparative study of the palms. The major part of the collection, embracing the larger specimens, is installed in the large central palm house, no. 1; some of the smaller plants are to be found on the center bench in house no. 15, which is just to the east of the palm house; while a number of the smaller specimens, or such as require special treatment as to humidity and heat, are at the propagating houses on the east side of the Garden, but these are few in number, so that practi-

cally the entire collection is represented at the public conservatories.

A pleasant feature in the bringing together of this collection has been the interest shown by many members of the Garden, expressed in direct gifts of large and valuable specimens, many of them not otherwise procurable, or in the provision of funds for exploration purposes, by means of which many specimens, unique in cultivation, have been obtained. Exchanges have been arranged with other institutions, both in this country and in Europe, and by this means many other species have been added, so that up to the present time this collection, consisting of several hundred individuals, has been brought together wholly by gift or exchange.

Before entering into a more detailed account, it may be well to give a somewhat general description of the palm family itself, stating its characters, method of blooming, distribution and economic importance.

The palms form a well-marked family, their nearest relative being a small group of plants, the Cyclanthaceae, to which, in foliage and habit, they bear a strong resemblance, but are separated by the more essential characters of flowers and fruit. They are also related, and not very distantly, to the aroid family, to which our own jack-in-the-pulpit and skunk cabbage belong. They are either nearly stemless, bearing their leaves close to the ground; or, as is most frequently the case, the stem is developed into a trunk; this is smooth, or sometimes armed with stout spines; in some it is over 100 feet long, in some creeping on the ground, in other cases slender and vine-like and climbing over tall trees by means of spiny leaf-stalks or special organs of a similar character; but commonly it is stiff and erect. The leaves which are borne at the summit of the stem and often have the petioles armed with stout spines, are fan-shaped, as in *Chamaerops humilis*, with the ribs running from a point near the base; entire and feather-veined, with the ribs running from a central rib, as in the genus *Phoenicophorium*; or, as is more frequent, divided into numerous segments, giving them a plume-like appearance, a character well shown in the cocoanut-palm. The inflorescence is enclosed in

one or more usually hard leathery organs, called spathes, which are disrupted by the expanding flowers and frequently fall away. The organ bearing the flowers is called the spadix, and may be a single stem or much-branched. This inflorescence and its spathes are (1) borne either along the trunk in the axils of old withered leaf-sheaths or where they have been, or up among the green leaves and in their axils; or are (2) terminal. In this latter case the palm either dies immediately on perfecting its fruit, or it continues flowering downward along the trunk until it finally dies from exhaustion. Most of the palms belong to the first class, that is, the inflorescence is not terminal, so they keep on increasing in height, theoretically without limit. There are comparatively few of the second ciass, which in the Garden collection is well represented by the large specimen of *Caryota urens*, recently presented by Mr. Twombly.

The flowers individually are quite small, but, occurring as they usually do in large masses, the inflorescence is often an object of much beauty. The flowers are perfect, that is with the staminate and pistillate organs in the same flower; monoecious, or with the two in different inflorescences on the same plant, or in different parts of the same inflorescence; or dioecious, with the two borne on different individuals. The sepals and petals are commonly three each, and the stamens usually double that number, or in some few cases as high as fifty. The fruit is dry, berry-like, or a drupe.

The entire family, comprising about 1,100 species and 140 genera, may, in a general sense, be called tropical, for only relatively few species pass beyond the tropics into subtropical or temperate regions. The greatest development has been reached in America, Asia and Australia having relatively but few, and the representation in Africa being even more meager. Notable exceptions to the tropical range of the family are: *Chamaerops humilis*, the only native palm in Europe, as far as 44° N.; the palmetto, of our own southern states, to about 36° N.; in the southern hemisphere, *Phoenix*, in Africa to 34° S.; *Rhopalostylis* in New Zealand to 44° S.; and *Jubaea* in Chili to 37° S.

Economically the value of the palms can hardly be estimated, for there is scarcely an essential of life in tropical regions which

cannot be supplied by some member of this royal family of plants. They vie with the grasses in importance to mankind. Articles of food and drink; materials for the manufacture of all kinds of household utensils; fabrics for the making of ropes, lines and clothing; materials for house-building; and other uses too numerous to mention are filled by many of these plants. In civilized lands they take an important place in our decorations, adding much of beauty and grace, and the love of them and their culture has been the cause of the bringing together of many collections.

Returning now to the description of the Garden collection, the palm which will first attract attention upon entering the large palm house by the southerly door and bearing to the right, will be the large specimen of *Caryota urens*, the wine or toddy palm, standing to the left and towering well above all its neighbors. This was illustrated and described in the November number of the Journal for last year. Immediately under the widely spreading leaves of this palm, and dwarfed by its greater height, is a specimen of *Sabal Palmetto*, the cabbage palmetto of our southern states. It is now making a new crown of leaves after its importation. It is found wild from North Carolina, south along the coast to the southernmost part of Florida, and up the west side of that state to a considerable distance. Along the east coast of Florida it occurs in great groves and forms a marked feature of the landscape. The tuft of young leaves is said sometimes to be used as a vegetable.

To the left of the *Caryota* is another noteworthy palm, but quite unlike its neighbor. This is *Phoenicophorium Sechellarum*, a native of the Seychelles Islands, as its specific name indicates. An illustration and description of this plant will be found in the Journal for September of last year, and it is unnecessary therefore to further allude to this palm, except to again refer to it as an example of the feather-veined leaf. Immediately in front of this is a specimen some 15 feet tall of *Coccothrinax argentea*, the broom palm, from the Isthmus of Panama, and in the immediate vicinity are smaller plants of a closely related species from Trinidad, *C. radiata*, which is much more common in cultivation; and

also a third species, *C. jucunda*, known only from southern Florida, from whence it was but recently imported, and very rare in cultivation, will be found nearby. The leaves of *C. argentea* are used in the manufacture of brooms and baskets and other kinds of wicker ware. On the right side of the walk and nearer the entrance is a plant some 15 feet high of *Acrocomia media*, but recently collected in Porto Rico by an expedition sent out by the Garden, and just beginning to send out its new leaves. Its trunk is thickly covered with stout spines which give it quite a formidable appearance. Close at hand is a small plant of a species widely spread throughout India and Malaysia. Its economic importance is the only excuse for alluding to it here, as the plant is as yet too young to show character. This is the betel-nut palm, *Areca Catechu*, which has been in cultivation a very long time, and as a result many varieties have been produced, each having its native and local name. It attains a heighs of 50–60 feet and bears large bunches of orange fruit about the shape and size of a small hen's egg. The outer covering is thick and fibrous, enclosing a much smaller nut, and it is for this nut that the palm is so extensively cultivated and highly prized by the natives. It is chewed in conjunction with the leaves of some species of the pepper-vine with an admixture of various other ingredients. The constant chewing of this mixture makes the teeth black and gives to the mouth and lips a brick-red color. The nuts are valued for the amount of astringent matter they contain, the more of this element present the more highly are they esteemed. The spathes are frequently used to form drinking and baking utensils. Small plants of other species of *Areca* are in this group, among them several of *A. Sanderiana*, from New Guinea.

On the same side of the walk, but near the entrance to house no. 15, is *Thrinax microcarpa*, and in a corresponding position on the other side of the doors is another species, *T. Floridana*, and also a tall specimen of *Pseudophoenix Sargentii*, all three known only from southern Florida, where they were secured by a Garden expedition; they are very rare in cultivation. Close to *Thrinax microcarpa* is a vigorous plant of *Rhopalostylis*

Baueri, from Norfolk Island, a short distance north of New Zealand ; this represents an extreme southern extension of the palms.

Close to the *Pseudophoenix* will be found two species of *Pritchardia*, *P. Pacifica* from the Fiji Islands, and *P. Martii* from the Sandwich Islands. These plants are not common in cultivation. Nearby is *Geonoma Schottiana*, from Brazil, one of the smaller growing palms ; this genus is confined to tropical America. In contrast with the foregoing are the *Chamaedoreas*, with their slender annulated stems from which spring the clusters of flowers and fruit. This genus is represented by several species, one of which, *C. Sartorii*, from Mexico, will be found in several specimens near the *Pritchardias*, in both staminate and pistillate plants ; the dark green fruit, which is borne in considerable abundance, makes a fine contrast with the orange-red stem and branches of the inflorescence. Opposite to these are two species of *Rhapis*, a genus inhabiting the eastern part of Asia ; these are *R. flabelliformis* and *R. humilis*, both natives of China, the former also found in Japan. It will be noted that these grow in dense clumps, a habit rather unusual among the palms. The stems are manufactured into walking sticks.

Just back of *Rhapis* is a plant of *Archontophoenix Alexandrae*, named in honor of the present queen of England, at home in Australia, and on the corresponding corner is a mate of this. They tower well above their immediate neighbors, being about 25 feet tall. In the immediate vicinity are some smaller plants of *A. Cunninghamii*, the Illawarra palm, also a native of Australia ; it is sometimes known as *Seaforthia elegans*, and is much in use as a decorative plant. Both species flower with us freely ; *A. Alexandrae* has pure ivory white flowers, and the other purple ones.

Just opposite the north entrance is the group of *Phoenix*, containing a number of species and varieties, although most of the plants are as yet small and too young to flower. The most important species is *P. dactylifera*, the true date palm, of which there are many cultivated forms, two or three being represented here in small specimens. This is a native of Africa, although it has been extensively introduced into other tropical countries and into

southern Europe. The prepared fruit of this tree is too well known and appreciated to need description here. It is dioecious, that is it bears the staminate and pistillate flowers on different plants, so that the precaution is usually taken to artificially fertilize the female flowers to insure a good crop of fruit. It attains a height sometimes of 80 feet, terminating in a crown of elegant gray-green leaves. It has many other economic uses in addition to its fruit, which, of course, is its most important product. The leaves are made into brooms and brushes, and the thick fiber which binds the petioles together is manufactured into all kinds of rope and twine. To the inhabitants of northern Africa and the oases of Sahara this palm is of inestimable value, in fact it is the great resource of that region. Their houses are made from its leaves and trunks; the wood is used for fuel; the dates form a large part of the food, both for man and beast; and even the date stones are consumed by the cattle after first being soaked in water to soften them.

Immediately back of the *Phoenix* group is another palm with a spiny trunk, *Martinezia caryotaefolia*, from South America. Nearby is a plant of *Trachycarpus Fortunei*, the Chusan palm, from northern and central China. The trunk is clothed with a very strong brown fiber which is used by the Chinese for many purposes, such as the manufacture of ropes, hats, and other wearing apparel. *T. excelsus*, from Japan, a closely related species, is also in the collection.

The genus *Cocos* occupies a place near the entrance to house no. 2, the aroid house. With the exception of the cocoanut palm, *C. nucifera*, they are natives of South America, largely of Brazil. There are two plants of *C. plumosa*, one on either side of the walk, about 25 feet tall; this is a native of Brazil. In extreme contrast with this is the delicate little *C. Weddelliana*, another inhabitant of Brazil. Its graceful leaves of a rich shining dark green with their narrow drooping segments give this little plant a dainty and well-kept appearance which readily accounts for its popularity as a decorative plant. Of *C. nucifera*, the true cocoanut, there are several specimens, ranging from 2 to 10 feet in height, the smaller ones having been germinated at the Garden.

This palm is one of the stateliest among a family of stately members. Its trunk attains a height sometimes of 100 feet and its leaves a length of 15 to 20 feet. Economically it is probably the most valuable of all the palms, for in addition to its production of a fruit which is used the world over, it furnishes many other things of great value. Its wood is employed in building purposes and for the manufacture of furniture; from its leaves are made thatching for huts, baskets, screens, and many other articles; and the heart, consisting of the young leaves, forms an excellent vegetable. At the base of the petioles is a network-like tissue which at maturity becomes coarse and tough and of a brown color. One of its many uses is to act as a sieve for straining liquids. But it is from the fruit, which is freely produced, that most is derived. A tree will yield several bunches in a year, each bunch maturing a dozen or more fruit. As an article of food this is used by the natives mostly when young and immature, but from the mature fruit is extracted an oil. From the shells of the nut are manufactured cups and other household utensils. From the flowers is obtained a powerful astringent which is much used in medicine in Ceylon. Toddy or palm-wine is procured from the inflorescence, and from this, by fermentation which takes place within a few hours, is produced a yeast used in making bread. Vinegar and arrack, a kind of gin, are also procured from this sap, as well as a kind of coarse brown sugar by boiling. The fibrous rind or husk of the cocoanut is manufactured into matting, hats, ropes, etc. Before leaving *Cocos*, attention must be called to the plant of *Cocos australis*, a native of Paraguay and one of the most graceful of the lot. The drooping leaves and segments of a gray-green hue will at once distinguish it from all the others in the collection.

Here also will be found a small plant of *Calamus ciliaris*, from Malaya. This is one of the climbing palms, referred to earlier, and the long slender spiny organs used by it in climbing will be noted; by means of these the plant pulls itself up by laying hold of surrounding objects, for these organs are provided with downwardly turned spines, well adapting them to this clinging process.

Adjoining the cocoanuts are specimens of the royal palm, *Roystonea regia*, and the West Indian cabbage palm, *R. oleracea*,

both natives of the West Indies, the former also occurring in the southern part of Florida and in Panama. The plants are only about 15 feet tall and are just beginning to show the trunks, which make these palms in their tropical home such a striking feature of the landscape. The cabbage palm, sometimes attaining a height of over 100 feet, is of great economic importance. The broad bases of the petioles of the old leaves are used for a number of purposes, and the heart of tender young leaves is made into pickles or used as a vegetable. The trunks are used for making troughs; from the interior tissues is manufactured a sort of sago; and from the nuts is procured a kind of oil. Just at the entrance to house no. 2 are plants of *Pinanga Kuhlii*, Kuhl's palm, from Malaysia; the yellowish-white petioles, rather unusual in the palms, make it quite conspicuous.

On the opposite side are the *Howeas*, natives of Lord Howe's Island, lying just east of Australia, *Howea Belmoreana* and *H. Forsteriana*, both much in use for decorative purposes in this country, commonly under the name of *Kentia*.

These are followed by a large group of the genus *Livistona: L. Chinensis*, the Bourbon palm, or, as it is frequently called, *Latania Borbonica*, another of our decorative plants, in several specimens, one of which is about 20 feet high; *L. australis*, at home in Australia; and *L. rotundifolia*, from Java, a neat bright looking species, which is much in favor as a house plant. Another palm much used in decorating is grouped near the south door, *Chrysalidocarpus lutescens*, the yellow-fruited palm, known more commonly as *Areca lutescens*. The base of the trunk soon surrounds itself with offshoots, and these, with the graceful leaves with their bright colored petioles and midribs, make the plant peculiarly attractive for decoration. It is a native of Madagascar, where it attains a height of 30 feet; the taller of our plants are about 20 feet, and one of these fruited the past summer.

Just back of these is *Ptychosperma Macarthurii*, one of the Australian feather-palms, with its tall, slender annulated trunk; this is usually in flower, as it is a free bloomer; it is native to Australia. *Licuala grandis*, a most difficult plant to grow successfully, is represented in a single plant to the right near the

Chrysalidocarpus ; it comes from New Britain Island, one of the Bismarck Archipelago in the East Indies. Another species, *L. horrida*, quite different from this in the appearance of the leaves, will be found in house no. 15 ; this is from Malaysia. In the same house is also a small plant of *Arenga saccharifera*, of great economic use in the East Indies, where it is widely distributed. It grows to about forty feet in height and furnishes many articles necessary to the inhabitants ; among others the coarse fibrous material borne at the base of the petioles is manufactured into ropes, clothing, etc., which are very durable as the fiber has the property of shedding water. This is also one of the toddy and sago palms of that region.

Near *Licuala grandis* is another of our native palm genera, *Neowashingtonia*, in two species, *N. filifera*, the weeping palm, from southern California and western Arizona, and *N. robusta*, from western Mexico. Our plants are quite small, *N. robusta* just beginning to show its trunk. *N. filifera* grows from 20 to 40 feet tall, the base diameter of the trunk measuring 2 to 3 feet. The old leaves are persistent, hanging down and entirely concealing the upper part of the trunk in old specimens, and giving the palm a very shaggy appearance. *N. robusta* is similar to this, but is stouter and has shorter and more spiny petioles.

Near the southern entrance, to the right of the walk, will be found a specimen of another rather rare plant, *Didymosperma porphyrocarpon*, from Java. This is a low-growing species, 4–8 feet tall, making numerous offshoots from the base. It resembles in leaf-form the genus *Caryota*, to which it is related. It has been in flower off and on for the past few months, and gives promise of so continuing for some time.

Perhaps the rarest plant in the collection is the small one of *Lodoicea Sechellarum.* This was secured from Mr. Falconer, of Pittsburgh, and is one of several he succeeded in germinating, a feat, we believe, not before accomplished in this country. Its small size and difficulty of culture require keeping it, at least for a time, at the propagating houses, where it can get more heat and moisture than is possible in the large palm house. It is called the double cocoanut, from the twin character which the

fruit usually assumes ; a specimen of this may be seen in the collections in the museum building. Long before the discovery of the tree itself, its fruit was found floating in the Indian Ocean, and from this circumstance it derived its old name of Coca de Mer. The unknown origin of these odd fruits gave rise to most astounding tales. One of these was to the effect that the fruit was not a product of the land but of the sea itself, and that it was produced by a tree growing in the ocean and similar to the true cocoanut ; this was said to be visible upon the coast of Sumatra, but immediately disappeared did any one dive down to investigate. This mystery of its origin and its scarcity made its fruit appear to the native mind most valuable and to possess wonderful properties of healing, and in one land a royal edict made punishment by death the penalty for its possession by any but the king himself. The discovery in 1743, in the Seychelles Islands, of the palm which bore the fruit, put a stop to all such tales, and its mystery gone the fruit soon lost all its reputed healing properties and became an object of mere curiosity, or a convenient article to be manufactured into necessary apparatus, such as receptacles for carrying water, dishes, plates and other household utensils. The fruit is often 18 inches long and sometimes weighs 40 or 50 pounds, and requires about ten years to reach maturity. The tree attains a height of 80 to 90 feet.

GEORGE V. NASH.

NOTES, NEWS AND COMMENT.

The total amount of precipitation in the Garden during December, 1902, amounted to 7.57. Maximum temperatures of 51° on the 2d, 38° on the 11th, 54° on the 21st, and 65° on the 22d, were observed : also minima of 13° on the 6th, 4.5° on the 9th, 7° on the 15th, 21.5° on the 17th, and 8° on the 29th.

The temperature of the soil at a depth of a foot as registered by the Hallock thermograph ranged from 28° on the 1st to 32° on the 16th and to 38° on the 30th.

ACCESSIONS.

LIBRARY ACCESSIONS FROM NOVEMBER 19 TO DECEMBER 20.

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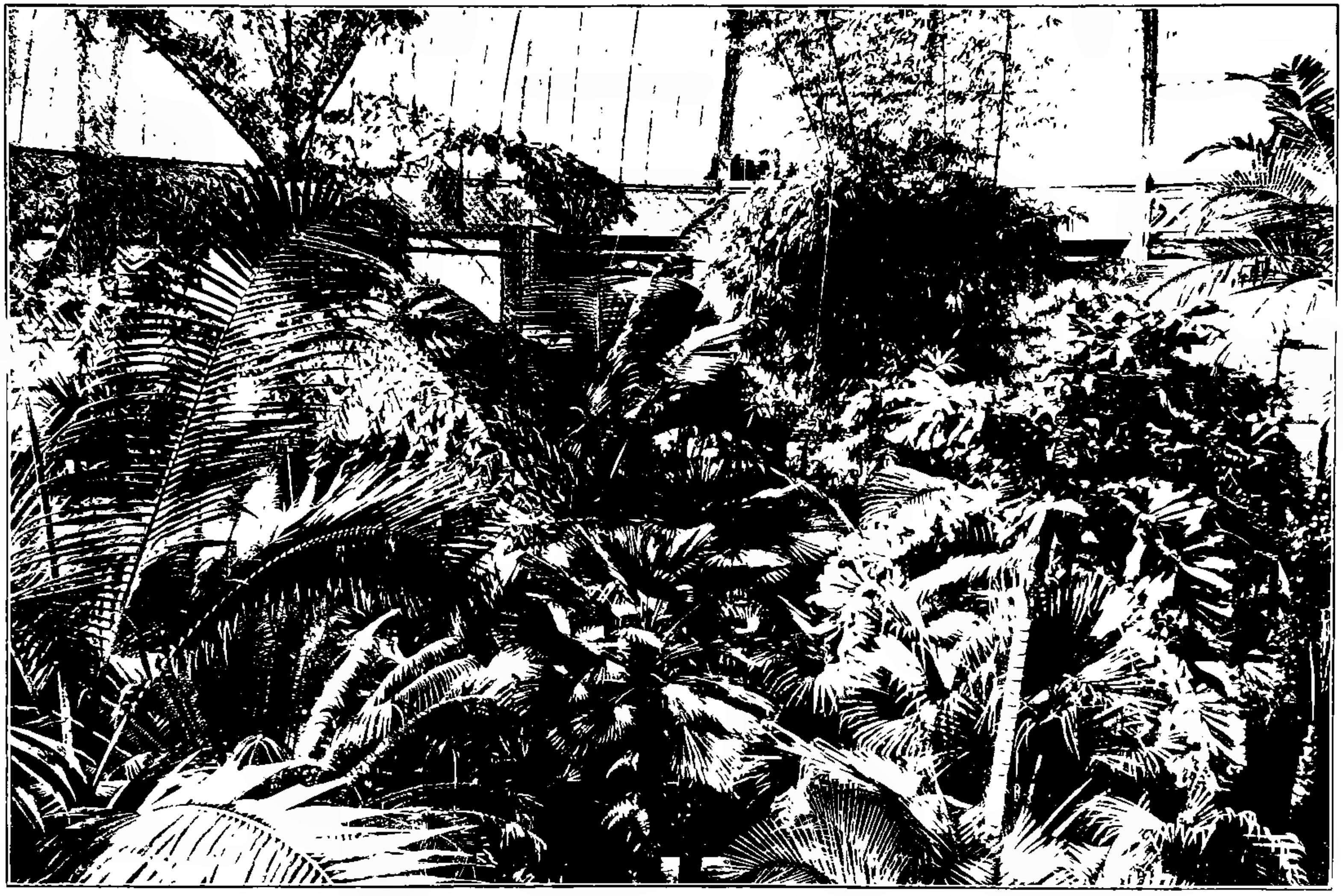

View from the top of the north vestibule of the Palm House

onea and *Neowashingtonia* to the right; *Livistona* and *Archontophoenix* to the left.

Group of *Phoenix* with *Martinezia caryotaefolia* in the center.

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EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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RESIDENT RESEARCH SCHOLARSHIPS AT THE NEW YORK BOTANICAL GARDEN.

At the annual meeting of the Board of Managers of the New York Botanical Garden, held January 12, 1903, provision was made for the establishment of scholarships of the value of $50.00 a month to each person to whom such privileges may be granted. The scholarships are designed to meet the needs of professors or instructors in colleges, officers of museums, or other botanists of equivalent training or experience, who desire to utilize the facilities of the Garden for continuing investigations already commenced, or for carrying out investigations which require facilities additional to those at their command at home. At a meeting of the scientific directors of the Garden, held January 13, the following regulations for these scholarships were adopted :

1. Applications for the privileges of resident research scholarships should be made in writing to the Director-in-Chief. Such application must present a detailed statement of the nature of the investigations the applicant desires to pursue, the facilities needed, and the time the applicant desires to hold the scholarship. The application must give a statement of papers published by the applicant, copies of which must be submitted if desired.

2. Holders of resident research scholarships must devote their entire time to the investigation undertaken and make detailed reports to the Director-in-Chief relative to the progress of their investigations whenever requested by him.

3. Any and all papers dealing with the results of the investigations carried out during the time applicant holds such scholarship shall be published in such manner as the Director-in-Chief may approve, and shall bear the imprint "Investigations prosecuted by the aid of a research scholarship in the New York Botanical Garden."

4. The Director-in-Chief may grant resident research scholarships to such applicants as may in his judgment be worthy of such privileges. Provided, however, that the Director-in-Chief shall not confer such scholarships on any person for a period to exceed six calendar months at one time. It is also provided that the Director-in-Chief may terminate the term of any scholarship at any time when the holder thereof fails to make satisfactory use of the privileges accorded him.

5. Resident research scholars shall be regarded as students of the Garden, and shall have all the privileges of students.

N. L. BRITTON,
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JONAS BRONCK AND HIS BOUWERY IN NEW AMSTERDAM.

With his friend Johann Petersen Kuyter, a man of means and education, and a native of Ditmarsen, that portion of the little Duchy of Holstein lying between the mouth of the Elbe and Eider Rivers, Jonas Bronck came to America about 1639; at least that is the time when his name first appears in the records.

On his arrival in New Amsterdam he purchased of the Indians some five hundred acres of land, situated upon the mainland beyond the Harlem River, where he established the bouwery that bore his name, and which after his death was known as "Bronck's Land." Later it received the appellation it still bears as that important division of New York City known as the Borough of the Bronx. It was the pioneer settlement of the colony beyond the Harlem in Westchester County and was called by its owner "Emaus." It covered what is now known as Morrisania.

It is on record that Pieter Andriessen and one Laurens Duytts were hired by Jonas Bronck to clear portions of the tract of land which he had purchased, and the agreement between them in 1639 is still extant. One hundred and twenty-one florins were to be paid for their board on the ship and the two were to have the privilege of planting tobacco and maize on Bronck's land on condition that they should break up a certain portion of the wild land every year, as payment for their use of it, and then surrender it to the owner for the planting of grain.

Of the personality of Jonas Bronck comparatively little is known, but he must have been a man of means and considerable education as is attested by the inventory of his effects. He died in or about 1643 and his property passed into other hands. If not a Dane by birth, he must at least have been one by adoption as it is recorded that he had served the King of Denmark as commander in the East Indies.

The inventory of his effects was made on May 6, 1643, and is a most interesting document relating to the property holdings of the earlier Dutch Colonists. It is a list of the goods and effects found at the house of Fenntije Jeuriaens, widow of Jonas Bronck, and the entire property is enumerated. We read of 1 stone house, covered with tiles, 1 barn, 1 tobacco-house, a few panes of window-glass, and among the household articles are 2 beds and 6 pairs of sheets, 31 pewter dishes, 1 silver cup, 7 silver spoons, 1 silver salt-cellar, 1 ditto little bowl, 4 tankards with silver chains, iron pots, 2 mirrors, 4 little alabaster dishes, carpenter tools and a goodly quantity of clothes, such as a black satin suit, an old quilted satin doublet, a blue damask woolen shirt, two hats, a black cloth mantle, an old mantle of colored cloth, six old shirts and other items of a like nature.

His library was mainly of a religious character, and contained among other books, a Bible (folio), another in German (quarto), Luther's Psalms and Catechism, several doctrinal treatises and histories, a Danish child's book, a Danish chronicle, a Danish law book and calendar, some books on sea-travel and navigation, 18 old printed books and 17 manuscripts of which the titles are not given; these, with 11 pictures, big and little, form the sum

total of the library that is the first one recorded in what is now the state of New York, and which must be considered a fair sample of the literature that a well-to-do and educated pioneer from the Low Countries would be presumed to bring with him into the wilderness of Manhattan.

One gold signet ring and one Japanese cutlass were also the property of Jonas Bronck. His live stock was plentiful, and all are listed from the cows, calves, mares, stallions and oxen, to the hogs, of which there were "numbers unknown running in the woods." We read also of 6 skepels of wheat, 66 ditto of rye and 3 of winter barley "sowed in the bouwery in the cleared land." This inventory is dated May 6, 1643. His widow later married Arent van Corlaer, Commissioner at Rensselaerwyck, the man who first established the friendship with the Indians and who founded Schenectady.

So many and so graphic are the descriptions of the New Amsterdam landscape which have come down to us, that though little is now left of that luxuriant wilderness, it is not an altogether difficult matter to reconstruct the surroundings into which Jonas Bronck moved in 1639. His contemporary, Adriaen Van der Donck, purchased about the same time an estate on the Hudson, near the upper extremity of Manhattan Island and his land bounded the land and river of Bronck. In his "Description of the New Netherlands," said to have been printed in Dutch about 1653, and translated many years later, he gives an interesting and it is not to be doubted an accurate description of the country between New Amsterdam and Albany. He writes of the great rivers teeming with fish of all kinds, the many "fine waters, kills, brooks and streams, which are navigable," always abounding with fish and suitable for every kind of waterwork, and of the many waters "which are agreeable to men and animals" and which "may be drunk without danger," many of which were highly thought of by the Indians for their medicinal value.

The hilly country around New Amsterdam is described vividly with its abundant covering of trees, "several kinds of oaks, such as white, smooth bark, rough bark, gray bark and black bark.

It is all durable wood, being as good as the oak of the Rhine or the Weser when properly worked, according to the opinion of our woodcutters, who are judges of timber and are sawyers. The nut-wood grows as tall as the oak, but not so heavy. It is probable that this kind of wood will be useful for many purposes, it grows straight and is tough and hard. We now use it for cogs and rounds in our mills and for threshing-flails, swivel-trees and other farming purposes. It also is excellent firewood, surpassing every other kind, and setting at naught our old adage, 'The man is yet to come, who can find better wood to burn than oak.' This wood is far better as well for heat as duration. It possesses a peculiar sap, which causes it to burn freely, whether green or dry. If we draw it up out of the fresh water where it has lain a long time, still, on account of its hardness, it is even then uncommonly durable on the fire. We all agree, that no turf, or other common fuel is equal to nut-wood. When it is dry, it keeps fire and sparkles like matches. Our women prefer nut-coals to turf for their stoves, because they last longer, and are not buried in ashes. This kind of wood is found all over the New Netherlands in such abundance, that it cannot become scarce in the first hundred years with an increased population. There also is oak and ash enough to supply its place for many purposes. The land also is so natural to produce wood, that in a few years large trees will be grown, which I can say with certainty from my own observation; and that unless there be natural changes or great improvidence, there can be no scarcity of wood in this country."

The "bush burning" of the Indians is described, and the injuries done to the woods in consequence. Chestnuts were in plenty and would have been more so except for the practice of the Indians, who stripped off the bark to fashion covering for their houses. "They and the Netherlanders too were in the habit of cutting down the trees in the chestnut season, and cutting off the limbs to gather the nuts, which also lessens the trees."

The "water-beeches" (*Platanus occidentalis*) are especially noticed as growing to great size along the water courses and being larger and heavier than any other tree. "Canoe-wood" (*Liriodendron Tulipifera*) grew also very large and was used for

flooring "because it is bright and free from knots." Our other trees, lindens, birch, yew, poplar, alder, with various shrubs and lesser fruit-bearing trees are enumerated in order, with often the properties accorded to them by the Indians.

At that time the country was covered with wild grape-vines and scarcely a nook of land was without its fragrant covering, even great trees were covered to their tops with that most luxuriant of vines. The wild flowers of the country are also noticed along with those numerous ones which the ever-flower-loving Dutch settlers had brought with them. Very early in the history of the colony the various fruits for the propagation of which the Netherlanders are famed, were brought to this country, various kinds of apple and pear trees, cherries, apricots and many sorts of the smaller fruits, currants and gooseberries. Flowers also were not neglected, and many varieties of white and red roses, gillyflowers, lilies and others were brought from Holland and added to the gardens where there were already many flowers of native growth, sunflowers, red and yellow lilies, "red, white and yellow maritoffles (a very fragrant flower)" (*Cypripedium?*)* and many others; "to which I have not given particular attention, but *amateurs* would hold them in high estimation, and make them widely known." The kitchen garden products were also numerous and are mentioned in detail as well as the herb garden with its rows of rosemary, sage, balm, pimpernel, five-finger, tarragon, laurel, artichokes and asparagus. The medicinal herbs were not neglected and it is on record in one of the colonial MSS. preserved at Albany that seeds for this purpose were early requested of the botanical garden of the University at Leyden and were duly sent.

The agricultural products were elaborately gone into, maize, tobacco and other important crops and their manner of cultivation described. Many details are given about the game, peltries, water-fowl and fishes. Of the latter an amusing story is told as to "a tradition that there were but ten species of fishes known to the Dutch when they discovered America, and that

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* The translation of "maritoffles" would be "Mary's slipper" or Lady's-slipper.

when they caught the shad, they named the fish Elft (Eleventh); the bass Twalft (Twelfth); and the drum Dertienen (Thirteenth)," and at the time of Van der Donck's recital these various fishes were still known by the names thus derived.

ANNA MURRAY VAIL.

CHEMICAL STUDIES OF THE PITCHER PLANT, SARRACENIA PURPUREA.

At the suggestion of Dr. MacDougal, a few weeks ago, I began an investigation of the digestive powers of the pitcher plant, *Sarracenia purpurea*. Two previous references to this matter will serve to indicate the desirability of such a study.

A few years ago Vines, in referring to the mode of secretion of the digestive juices of insectivorous plants, had the following to say regarding *Sarracenia*:

"In * * * *Sarracenia* there are, according to Batalin, no specialized glands, but the effect of the contact of organic matter (insects, meat, etc.) with the cells of the lower part of the pitcher is to cause the excretion of some substance (*probably the digestive secretion*) between the cuticular and the deeper layers of the cell-wall of the cells which have been touched, and this is followed by the rupture of the cuticular layer. This rupture has the effect not only of bringing the excretion into relation with the introduced organic matter, but also of enabling the cells which have thus lost their cuticle to absorb the organic matter." (Lectures on the Physiology of Plants, 1886, p. 247.)

More recently Green has written of the pitcher plants as follows:

"Insects attracted to the plants are enticed into entering the pitcher and are drowned in the liquid they contain. Some of these plants, particularly *Sarracenia*, * * * *have nothing but water in the pitchers* and the insects drowned therein undergo ordinary putrefaction, the products of which are absorbed by the plant." (The Soluble Ferments and Fermentation, 1899, p. 210.)

Thus far my experiments in this connection have been directed to the detection of an enzyme or zymogen in the tissue of the

pitcher. Plants now growing in the Garden will be utilized later for a study of the properties of the pitcher fluid.

Two quantities of *Sarracenia* from different localities have thus far been placed at my disposal by Dr. MacDougal. Glycerin extracts of the thoroughly macerated tissue of one set of plants showed moderate though distinct digestive action on fibrin at 38° C. in the presence of slight amounts of hydrochloric or oxalic acids, the control experiments giving negative results. All of the extracts of the second set of plants, however, were entirely without digestive action.

In view of the negative results in the second series it is impossible at present to draw a satisfactory conclusion in this connection. It may be that the positive results in the first case were due to a bacterium specially favored by the medium furnished by the constituents of the glycerine extract, or to enzyme in unobserved diseased portions of the plants. Again, the negative results may have been due to a less favorable degree of acidity, or the secreting cells of the pitchers may have been in a "resting condition," without either enzyme or zymogen. Further experiments, with these matters controlled, and on pitchers gathered at a more favorable season, will surely settle these questions.

The growing plants in the Garden will also be used for direct determinations of the influence of putrefactive products introduced into the pitcher fluid.

In the course of the digestive experiments I had occasion to try the activity of the extracts under neutral, acid and alkaline conditions. Observing that the diluted neutral extract was practically colorless, the acid mixture crimson and the alkaline fluid green, I made a few tests to determine the significance of the colorific effects.

These tests resulted in showing that *Sarracenia purpurea* contains a pigment which in concentrated glycerin extract has a reddish color, but which when diluted is practically colorless. At such dilution, when scarcely any color is to be seen, a drop of dilute acid produces a bright pink throughout the whole fluid; alkali in minute amounts turns it green. The pink is converted to green by alkali, *vice versa* by acid. Even in crude glycerin

extract the pigment appears to be very sensitive and may be used to advantage in titrimetric work.

I have named the pigment alkaverdin, because of the beautiful green produced on treatment with alkali, preferring to reserve the term sarracin for any digestive enzyme which later may be found to exist in the pitcher.

Excellent "test papers" have been made with the pigment in glycerin extract. Ordinary filter paper dipped into the red, concentrated extract is colorless, wet or dry. The dry paper turns a bright pink when dipped into acid, a deep green is produced when in contact with alkali.

The pigment of *Sarracenia* bears superficial resemblance to the coloring matters in red cabbage, the purple flowers of mallow, buckthorn berries, elderberry, dahlia and alkanet root, but various tests, thus far, indicate that it is unlike each in fundamental qualities. Preliminary observations indicate that its solutions are without special influence on the spectrum. A chemical study of the qualities of alkaverdin is now in progress.

The aqueous and saline extracts of *Sarracenia* contain an abundance of dextrorotary, reducing and fermentable substances, the characters of which, together with other bodies as yet undetermined, I hope to report in due time.

WILLIAM J. GIES.

NOTES, NEWS AND COMMENT.

Dr. J. C. Arthur, professor of plant physiology and pathology in Purdue University spent January in the Garden in some work upon the plant rusts which he has had under way for several years.

Mr. Percy Wilson, museum aid, started for Honduras early in January and will make collections for the Garden in the regions near the coast. Mr. Wilson's work will be greatly facilitated by the fact that he is the guest of Mr. Martin Lippmann, who plans the establishment of a plantation at Puerto Sierra.

Dr. W. A. Cannon, laboratory assistant in the Garden, has been selected as resident investigator of the Desert Botanical Laboratory of the Carnegie Institution. Dr. D. T. MacDougal, in company with Mr. Frederick V. Coville, chief of the division of botany of the U. S. Department of Agriculture, started on the 24th for a reconnaissance of the region along the Mexican boundary for the purpose of fixing upon a site for the new laboratory.

Dr. L. M. Underwood, professor of botany in Columbia University, has secured leave of absence until October 1, 1903, and has started on a collecting tour through the West Indies. Professor Underwood will visit Jamaica, Cuba and a number of the smaller islands for the purpose of studying the native ferns and will go to Europe in midsummer to complete some critical work upon the collections in the herbaria at Paris, Kew and Berlin.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

85 specimens of fungi from Virginia. (Given by Dr. W. A. Murrill.)

6 specimens for the local flora. (Given by Mr. S. H. Burnham.)

31 specimens of fungi from western North America. (By exchange with Professor A. Nelson.)

173 specimens of flowering plants from the southwestern United States. (By exchange with the U. S. National Museum.)

24 specimens of grasses from western North America. (By exchange with Bureau of Plant Industry.)

8 plates of western American plants. (Given by Miss C. C. Haynes.)

13 specimens of hepatics from the Pacific Slope. (Given by Messrs. A. J. Hill and C. F. Baker.)

637 specimens of cryptogams from Jamaica. (Collected by Mr. F. S. Earle.)

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

21 specimens of fungi from California. (By exchange with Miss Alice Eastwood.)

42 specimens of flowering plants from Yukon Territory. (By exchange with the Geological and Natural History Survey of Canada.)

8 specimens of lichens from Nevada. (Collected by Mr. C. F. Baker.)

1 specimen of *Agrostis* from British Columbia. (By exchange with Mr. E. W. D. Holway.)

41 specimens of fungi from Georgia. (Collected by Mr. Roland M. Harper.)

79 specimens of flowering plants from Utah and Idaho. (By exchange with Oberlin College.)

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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. Vol. I, Nos. 1–5, 449 pp., 3 maps, and 12 plates, 1896–1900. $3.00. No. 6, 232 pp., 20 plates. Free to all members of the Garden; to others, $1.00. No. 7, 408 pp., 8 plates. Free to all members of the Garden; to others, $1.50.

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BRONX PARK, NEW YORK CITY

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OF

The New York Botanical Garden

EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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THE BRONX PARK STATION OF THE MANHATTAN RAILWAY.

Early in 1902 the Manhattan Railway Company arranged to extend its elevated railroad from Fordham northward to the southwestern corner of the Garden, having purchased from St. John's College a strip of land bordering the right-of-way of the New York Central and Hudson River Railroad Company.

The Manhattan Railway Company requested of the Board of Managers of the Garden the privilege of an entrance to the Garden at this point, and after a careful study of the subject the following agreement was entered into on April 29, 1902:

THIS AGREEMENT, made the 29th day of April, 1902, between the NEW YORK BOTANICAL GARDEN, a corporation organized and existing under Chapter 103 of the Laws of 1894, of the State of New York, hereinafter called the Garden, party of the first part, and the MANHATTAN RAILWAY COMPANY, a corporation of the State of New York, hereinafter called the Company, party of the second part, WITNESSETH:

That the Garden, in consideration of One Dollar and other valuable considerations, the receipt of which is hereby acknowledged, covenants and agrees with the Company, as follows:

FIRST: The Garden will upon request of the Company forthwith construct a platform designed to afford access to the grounds of the Garden in Bronx Park from the terminal station of the Company adjoining the grounds of the Garden at Bronx Park, said platform to extend from said station along the southerly portion of the Bronx Park about three hundred feet; and will connect the easterly end of said platform with a path leading to other paths to all parts of the Garden, for use when the Garden is opened to

the public, and said platform shall be subject to the rules and regulations prescribed for the government of the Garden by its Board of Managers.

SECOND: Said platform shall be constructed in accordance with plans and specifications to be approved by the Garden, the Company, and the Commissioner of Parks for the Borough of the Bronx; and said plans and specifications when so approved shall be annexed hereto and form a part of this agreement.

THIRD: The bids for constructing said platform shall be examined, and the contract therefor approved by the Company before the same are accepted or entered into by the Garden. The work of constructing said platform shall be completed within four months after the approval of said plans and specifications, unless unavoidably delayed, and the Company will pay the cost thereof as herein agreed, within fifteen days from the completion of said work as herein provided.

FOURTH: Said platform when completed shall be maintained in good order by the Garden, and the Company will from time to time repay the reasonable expense of such maintenance.

FIFTH: The Garden reserves the right to terminate the use of said platform at any time hereafter, if the same be found inadequate, dangerous or prejudicial to the public interests or to the interests or safety of the Garden, or for other sufficient and lawful cause.

IN WITNESS WHEREOF, said parties have caused this agreement to be signed in their names by their respective presidents or vice-presidents, and their respective seals to be hereto affixed, attested by their secretaries, the day and year first above written.

Attest:
D. W. MCWILLIAMS,
Secretary.

MANHATTAN RAILWAY COMPANY,
by ALFRED SKITT,
Vice-President.

Attest:
N. L. BRITTON,
Secretary.

NEW YORK BOTANICAL GARDEN,
by D. O. MILLS,
President.

The approach and viaduct called for by this agreement were constructed during the summer and were opened for use in the autumn. The work was located by Mr. John R. Brinley, Landscape Engineer of the Garden, and designed by Mr. R. W. Gibson, architect. The approach from the Garden is of rubble masonry, built of crystalline dolomite quarried from a ledge of this rock which was exposed in grading east of the public conservatories; this approach is 130 feet long, providing a path 15

feet in width, and it opens against the traffic road of the Garden, leading directly to a path to the public conservatories, which intersects other paths leading to all parts of the Garden. The viaduct connecting this approach with the terminal Bronx Park Station is 200 feet in length, built on brick piers and has an ornamental iron work cornice and parapet on each side; the walk, both of the approach and viaduct, is of concrete.

The accompanying illustration is from a photograph recently made of this work, and shows also the station, which is one of

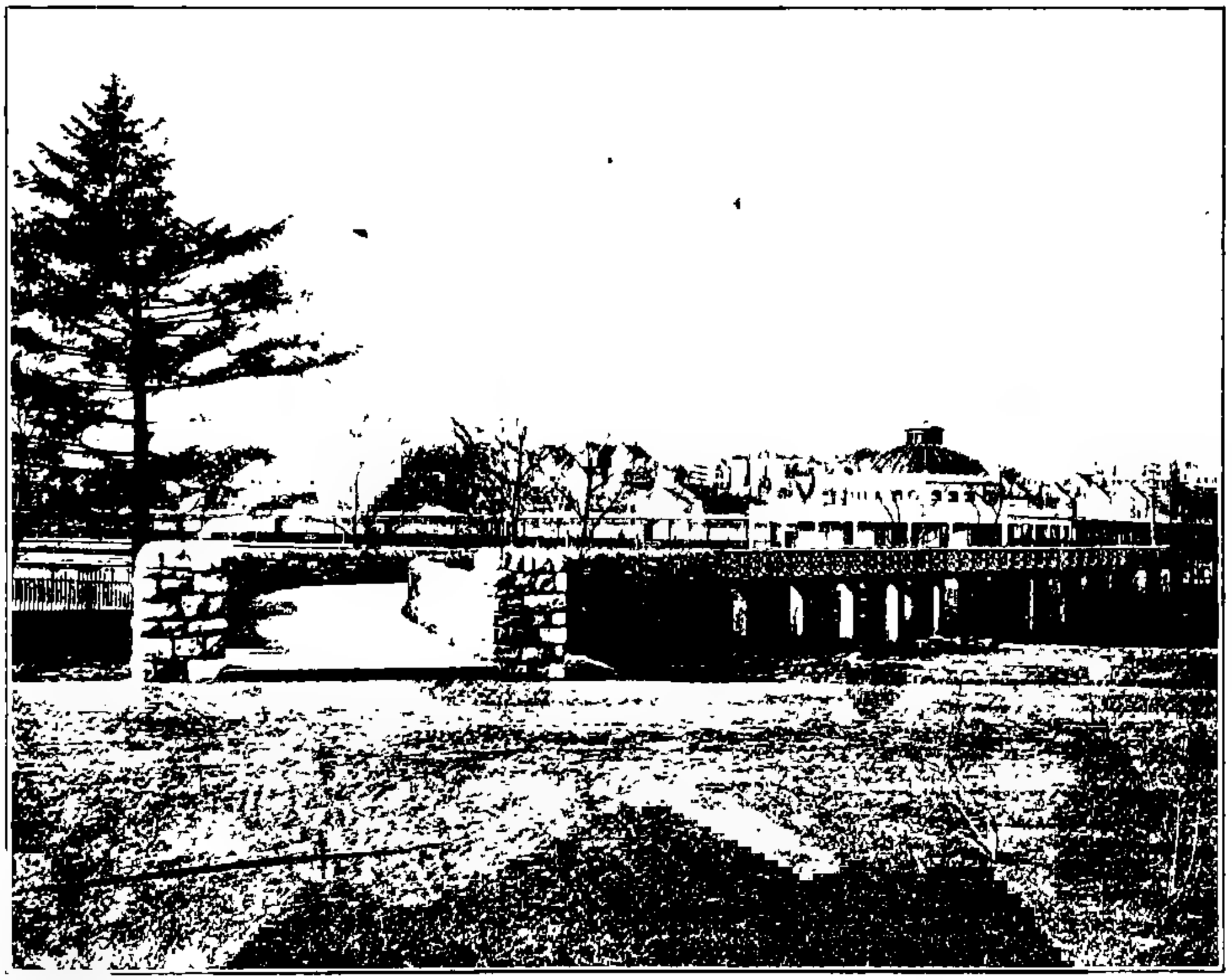

FIG. 1. Manhattan Railway Approach and Station.

the most commodious, and certainly the most ornamental of any yet built by the Manhattan Railway Company.

The total cost of the approach and viaduct was $15,426.72, which amount was paid over to the Garden by the railway company, in accordance with the terms of the agreement.

The work was sufficiently completed to enable a plantation of shrubs to be built along side of it during the autumn, and this,

with other shrub plantations between this station and the public conservatories and with the numerous trees to be planted in that part of the Garden during the spring, will ultimately make this entrance very attractive.

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

REPORT OF DR. M. A. HOWE, ASSISTANT CURATOR, ON A TRIP TO FLORIDA.

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

Dear Sir: In accordance with your permission and instructions, I was absent from the Garden for about seven weeks in October and November last, for the purpose of making collections and field studies of the marine algae of Florida. I left New York on October 2, going south by rail to St. Augustine, where the first stop, of one week's duration, was made. My only previous expedition southward in search of seaweeds had been made in June and July of 1900, when Bermuda was visited, and the choice of the season for the Florida trip was determined not so much by any expectation at finding the marine flora at its best in October and November as by the wish to become familiar with the seasonal variations in the algal flora of the warmer parts of the continent. The coast about St. Augustine is almost wholly of sand or mud and offers little in the way of a natural foothold for marine plants, but certain kinds were found upon the sea-wall and upon jetties and wharves and a few others were found washed ashore from deeper water. St. Augustine is far enough north, doubtless, to make spring or summer much the best collecting time, at least so far as the number of species is concerned. At St. Augustine I was so fortunate as to meet Mrs. G. A. Hall, a well-known collector of algae, who very generously facilitated my work by helpful suggestions based upon an experience of ten years or more in exploring the shores of Florida. It was at her suggestion that my second stop was made at Jupiter Inlet which is on the east coast, 246 miles south of St. Augustine, and a little south of the 27th parallel of latitude. At this point Mrs. Hall had found several very rare algae which I was fortu-

nate enough to collect again in good quantity. Jupiter Inlet is at the southern end of the Indian River, which is a narrow body of tidal water running parallel to the coast and separated from the open ocean by a series of long narrow low-lying islands. Rock is exposed here occasionally along the coast and seaweeds have a better opportunity to gain a foothold than at St. Augustine, yet the collecting *in situ* here is unimportant in comparison with the "wash-up" which drifts in through the inlet from the

FIG. 2. Strand Flora, Anastasia Island, Florida.

deeper water outside the bar. Practically all of the rarer kinds here are found in the detached masses which are swept in and out through the inlet by the changing tides. The best way of collecting was to stand in the water and review the procession of floating and suspended "weeds" as they were carried past by the incoming tide. The real home of many of them could not be determined with the means at hand, but they probably grew on

a rocky or shell-covered bottom in several fathoms, at least, of water. I was informed by residents that the " wash-up " was the most abundant in the autumn months, at its best, perhaps, in September.

From Jupiter I went on by rail to Miami, 83 miles further south, where a steamer was taken for Key West. A stop of one day was made at Miami, which permitted a brief inspection of the adjacent shores and a few collections.

FIG. 3. Banyan Tree, Key West.

Key West is only about one degree north of the Tropic of Cancer, is in close proximity to the Gulf Stream, and has an almost tropical climate. The island is about six miles in length, one or two miles in width, and its maximum elevation above the sea is said to be sixteen feet. The town covers perhaps a little more than a third of the area of the island, occupying its western end. The rock which constitutes the basis of the island is of the so-called coral formation and is freely exposed over a large part

of the shore-line. Off the western end, the water soon becomes from eighteen to thirty feet deep, but to the north and east it is very shallow and at low tide one can easily wade out several rods from the shore, and, in fact, at the eastern end, can very nearly wade to the next "key." Here, then, are excellent opportunities for finding the algae where they actually grow. The ordinary rise and fall of the tide is only two or three feet, and, as in Bermuda, comparatively few of the marine plants grow between the tide-marks, but from the low tide line outward to a depth of several fathoms they are found in great profusion. On the

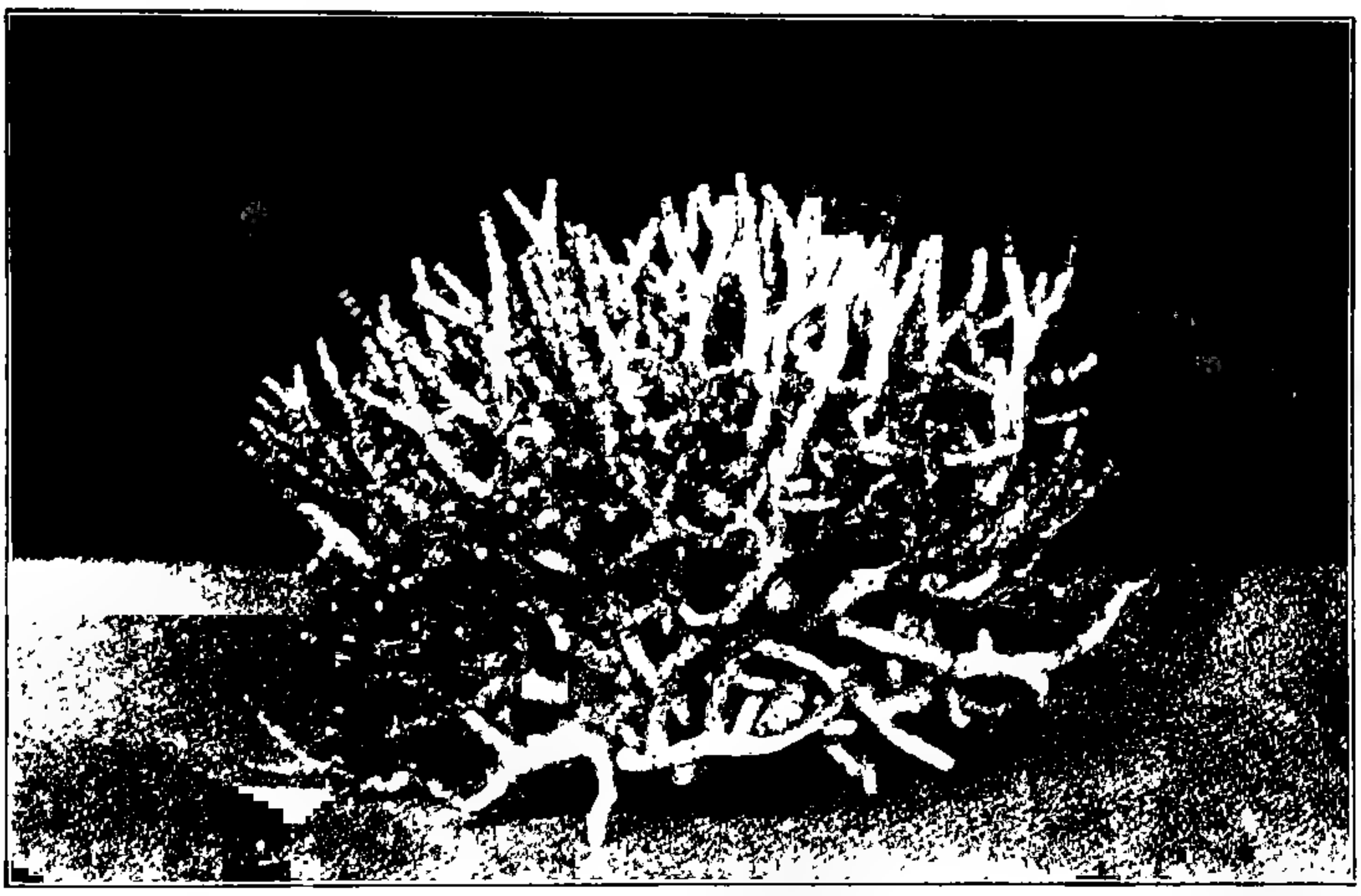

FIG. 4. Coralline Seaweeds (*Lithothamnion*), from Key West.

southern side considerable masses of sea-wrack were found cast ashore, consisting, at the time of my visit, chiefly of species of *Laurencia*. Certain other kinds of seaweeds growing off this same shore in great abundance were not cast on land at all or only in small quantity. Some which otherwise would have been missed were obtained by locating them from a boat with the aid of a water-glass, after the manner of the sponge-fishers, and then securing them by using a long-handled rake. Nothing further in the way of dredging was attempted. A striking feature of the marine flora of Key West, though not usually perceived unless

one is working from a boat, is the luxuriant growth of one of the calcareous green algae, *Halimeda Opuntia*, which forms immense beds in the floor of the ocean, mostly in water that is from three to ten feet deep at low tide. It is no exaggeration to say that there are hundreds of tons of this lime-coated seaweed near the shores of Key West. The roots and pneumatophores of the mangroves serve as places of attachment for a certain group of species of algae and this group was found to be well represented among

FIG. 5. Spanish Moss (*Tillandsia usneoides*) on Trees, Tampa Bay, Florida.

the two or more species of mangroves which occur on the northern and eastern borders of the island. Curiously enough, however, the roots of the abundant mangroves about Jupiter appeared at the time of my visit to be entirely free from algal epiphytes. Four weeks from October 23 to November 20, were spent in making collections at Key West. This island has been visited by several collectors of algae and enjoys the reputation of being

the home of more species of marine algae than any other known place on the eastern coast of North America. Dr. W. H. Harvey, of Trinity College, Dublin, author of the classical Nereis Boreali-Americana, spent a month there in the winter of 1850, and it is the type locality of several species described for the first time by him in that work. Later, Key West was visited by Mr. Samuel Ashmead, of Philadelphia, and by J. Cosmo Melville, an Englishman, who have written accounts of their findings, and also by others who have sent their collections to well-known phycologists for determination. Less is therefore to be expected in the way of novelty from Key West than might be the case from a less explored locality; however, as a basis for proposed work, it was highly desirable that the marine flora of this somewhat classical spot should be well represented in the collections of the Garden.

On the return journey, a stop-over of two days was made at Port Tampa which permitted a little collecting at this point on the west coast of Florida. New York was reached again on November 26. On the trip as a whole, 602 numbers were collected, representing at least 6,000 dried specimens, as specimens of algae are commonly counted. Many of the numbers are represented also by material preserved in formaldehyde solution; these will be added to the exhibits in the public museum or reserved for future studies or for use in instruction. Some of the algae, as is well known, undergo such changes in drying that fresh material or fluid-preserved specimens are absolutely essential to a proper understanding of their form and structure. It may be remarked that the mode of reproduction of several of the larger algae inhabiting our warmer seas still remains entirely unknown. Much will doubtless be learned by the person so situated as to be able to keep the living plants under continuous observation throughout the year.

Respectfully submitted,

MARSHALL A. HOWE.

SOME INTERESTING PLANTS IN BLOOM IN THE CONSERVATORIES.

The large palm, *Phoenicophorium Seechellarium*, to which attention has been called before in this JOURNAL, is again preparing to bloom. The large horny sheaths enclosing the inflorescence are pushing out from the base of one of the leaves. This has occurred now annually for three years, and it is to be hoped that it will so continue, as it is usually a shy bloomer, and the rich yellow of its flowers makes them a welcome addition in the palm-house. In the immediate neighborhood of this palm is another plant differing widely in appearance and belonging to another family, the Cycadaceae. Botanically these are much more closely related to the ferns than to the palms. This plant is *Encephalartos villosus*, the golden-fruited kaffir-bread, a native of southern Africa. Only the female plant is represented in the collection, but its large golden cone, now at maturity, measuring some eighteen inches in length and about six in diameter, makes it a feature of much interest and beauty.

In the orchid house, no. 15, is a curious variation from the ordinary form of *Epidendron cochleatum*, which is widely spread in tropical America, and occurs also in the southern part of Florida, where the writer saw it growing in great quantities some months ago, forming large masses on live oaks and other trees in the neighborhood of Miami. Among many plants of the common form collected at that time one was noted which differed largely in the color of the lip of the flower, this organ being a light brown instead of the deep black purple usual in this species. It is this plant which is now in flower, and the character noted in the field is again apparent. Plants of the ordinary form are also in bloom so that the difference can be readily appreciated.

In no. 12, one of the temperate houses, is another orchid, and while common in cultivation, the beauty and delicacy of its masses of pure white flowers is abundant excuse for calling attention to it. There are a number of large plants in fine shape. This is *Coelogyne cristata*, a native of the Himalayan region. The thickened stems, or pseudobulbs, bear a marked resemblance

to olives, and when not in bloom this feature is frequently remarked upon by visitors. Other plants of interest in this house are *Chorizema varium*, an Australian shrub, with its odd colored flowers borne in great profusion; and two other Australian shrubs, *Greville rosmarinifolia* and *G. alpina*, the latter being especially effective and decorative, having a blooming period of about two months.

In house no. 13, another devoted to temperate plants, will be found the Australian acacias in many species looking much alike in flower. The dainty feathery blossoms with their bright yellows and sweet perfume are very attractive.

In no. 4, the banana house, the corresponding one at the other end of the range, perhaps the most interesting plant for the past few weeks has been *Theobroma Cacao*, the chocolate tree, from the beans of which chocolate and cocoa are derived. There are four or five plants four or five feet tall which have been raised here from seed. These have flowered several times, but during last summer one of them set a single fruit, which has been slowly developing, until now it has arrived at maturity. Differing from most trees, this bears its flowers and fruit along the trunk and at the base of the larger branches. Opposite to the *Theobroma* is a large plant of *Medinilla magnifica*, a native of the Philippines. It is at present bearing its pink panicles of flowers in great profusion. Not only the flowers themselves are pink, but the panicle stem and branches and its large bracts are also of this color. Unlike most of the members of this family, the Melastomaceae, the leaves have not a number of longitudinal nerves, but are feather-veined.

The bananas in this house, of course, are always an object of interest, and some one or more of the plants are always in flower and fruit. *Musa coccinea*, a native of China, a low-growing species, with its bright red bracts, is now very showy, as is also *M. ornata*, from Asia, with its long tail-like inflorescence and large pink bracts.

GEORGE V. NASH.

MARCH 2, 1903.

NOTES, NEWS AND COMMENT.

Mr. F. S. Earle, Assistant Curator, has gone to Santiago, Cuba, to join Professor Underwood for about a month, for the purpose of exploring eastern Cuba and making collections for the Garden. His special object on this trip is the continuation of his studies on the fungi of the West Indies; a report of his observations in the Island of Jamaica last autumn, was published in the January issue of this JOURNAL, and he has given considerable time since his return from Jamaica to studies of the specimens secured there.

Mr. A. A. Heller, who has recently spent about two months in Porto Rico, has returned with a considerable collection of specimens secured in the vicinity of Ponce, a set of which will be placed in the herbarium, and will supplement previous collections made by Mr. Heller, Professor Underwood, Mr. Wilson and others on that island. Mr. Earle is now studying the fungi of this last collection by Mr. Heller.

It was recorded in the February JOURNAL that Mr. Percy Wilson, Museum Aid, had started on an exploration of Honduras; Mr. Wilson has already commenced to send collections, two large boxes of living orchids and bromeliads, and one box of herbarium and museum specimens having recently been received in good order.

Dr. D. T. MacDougal, Director of the Laboratories, spent the month of February in company with Mr. F. V. Coville, Chief Botanist of the U. S. Department of Agriculture, in Arizona, northern Mexico and southern California, on behalf of the Carnegie Institution of Washington, for the purpose of determining the most desirable site for the new desert botanical laboratory of that institution, the establishment of which was recorded in the January number of this JOURNAL. Dr. MacDougal will subsequently present a report of his observations on this trip; he secured a considerable number of cactuses and other succulent plants for the Garden during his absence.

Dr. N. L. Britton, Director-in-Chief, Mrs. N. L. Britton and Mr. John Shafer, Curator of the Herbarium of the Carnegie Museum of Pittsburg, started for a visit to the western portion of

Cuba on the 5th, for the purpose of making an examination of the flora of that region, in which they will have the coöperation of Professor de la Maza, of Havana. Herbarium material, objects for the systematic and economic collections and living plants for the conservatories will be secured. A critical study will be made in the field of several West Indian genera of mosses and flowering plants. The expedition is expected to return early in April.

The total precipitation in the Garden during January, 1903, amounted to 4.03 inches. Maximum temperatures of 45° on the 2d, 45.5° on the 11th, 47° on the 17th, 48° on the 21st, and 51° on the 28th were observed; also minima of 12° on the 11th, 6.5° on the 19th, 7° on the 21st, and 14° on the 26th.

The temperature of the soil at a depth of a foot (30 cm.) recorded by a Hallock thermograph showed a variation from 38° on the 1st to 41° on the 31st.

The total precipitation during February amounted to 4.57 inches. Maximum temperatures of 52° on the 3d, 57° on the 13th, 41.5° on the 16th, and 63° on the 28th were observed; also minima of 26° on the 7th, 30.5° on the 14th, and 5° on the 18th.

The temperature of the soil at a depth of a foot (30 cm.) varied from 41 on the 1st to 44.5 on the 27th.

The dropping of sap from the branches of the sugar maples along the driveway, east of the Museum Building, was first noticed this year on February 7, and on the following day had formed sap icicles as much as a foot in length on several of the trees. Other indications of the approach of spring are seen in the flowering of the skunk cabbage in sheltered places, first noticed in full bloom on February 11, and in the partial unfolding of the catkins of Siebold's willow, first noticed on February 2. A fully expanded flower of the "Christmas Rose" (*Helleborus niger*) was observed on February 8.

ACCESSIONS.

LIBRARY ACCESSIONS FROM JANUARY 1, 1903, TO FEBRUARY 9.

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MUSEUM AND HERBARIUM.

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11 specimens of flowering plants from Connecticut. (Given by Professor M. L. Underwood.)

4 specimens of drugs. (Given by Messrs. Lehn & Fink.)

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1,427 specimens of fungi from New York, New Jersey and Connecticut. (Collected by Mr. F. S. Earle.)

28 specimens of fungi from Kentucky. (By exchange with Miss Sadie F. Price.)

3 specimens of fungi. (Given by Professor L. M. Underwood.)

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1 packet of seed. (Given by Dr. M. A. Howe.)

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OF

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EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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JOURNAL

OF

The New York Botanical Garden

VOL. IV. April, 1903. No. 40.

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 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 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 large Conservatories, the Herbaceous Collection, the Hemlock Forest, the Fruticetum and parts of the Arboretum site.

The spring course of lectures will be delivered in the Lecture Hall of the Museum Building of the Garden, Bronx Park, on Saturday afternoons, at 4.30 o'clock, as follows: April 18, "A Tour of American Deserts," by Dr. D. T. MacDougal; April 25, "The Vegetation of the Florida Keys," by Dr. M. A. Howe; May 2, "The Framework of Plants," by Dr. H. M. Richards; May 9, "Illustration of Some Features of the West Indian Flora," by Dr. N. L. Britton; May 16, "The Food Supply of Young Plants," by Prof. F. E. Lloyd; May 30, "The Color Variations of Flowers," by Dr. C. C. Curtis; June 6, "The Streams, Lakes and Flowers of the Upper Delaware, and the Story of the Sundew," by Mr. Cornelius Van Brunt; June 13, "Vegetable Foods," 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.

A COLLECTING TRIP TO BOLIVIA.*

Leaving New York July 9, 1901, I took a through steamer to Colon, crossed the isthmus to Panama, where I met the other three members of our party, and proceeded down the South American coast to Mollendo, the chief port by which one enters Bolivia, landing at that place August 4, twenty-six days out from the city. The steamer made various stops along the Pacific coast and at Payta I obtained ten or eleven species of plants that were of interest, growing as they did in the sand and rocky ravines in a region where rain is said to fall only once in five or six years. The specimens were subsequently lost; among them were represented two bushes, each attaining a height of five or six feet, but never, apparently, producing fruit.

From Mollendo an excellent railway to Lake Titicaca carries one in eight or ten hours to Arequipa, at an elevation of 7,500 ft. The first part of the route and up over the first hills to an elevation of between 3,000 and 4,000 ft. has considerable vegetation, small trees or bushes growing along the few streams and various shrubby plants, grasses, etc., on the hillsides and in the ravines. After ascending this first range the road passes through a comparatively level tract that seems to be an absolute desert, extending over many hundreds of square miles. From the train there was nothing living to be seen, either plant or animal, as far as the eye could reach in all directions, except along the track at the stations. It is in this desert that the curious moving sand-hills occur. Apparently the higher winds all blow from one direction, sift out the light colored sand, lighter also in weight,

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* Upon the request of representatives of The Bolivia Co. Mr. R. S. Williams, Museum Aid, was detailed on leave to accompany an expedition to eastern Bolivia in July, 1901. Mr. Williams made very large collections, which are now being studied by Dr. Britton and Dr. Rusby.

from the darker sand and rocks that compose most of the surface, and pile this light sand into more or less crescent-shaped hills up to perhaps six or eight feet in height and fifty feet or more in length; these advance slowly with the wind as it blows the sand on the exposed side over the crest to the sheltered side. These hills, moreover, not only stand out clearly defined over the darker surface, but they are covered all over the windward side by the most delicate tracery of little waves, closely imitating those produced on water by a slight breeze and they are so numerous that at a little distance the outline of one hill becomes merged into that of its neighbors on either side.

For the use of the railway as well as for the town of Mollendo, water is brought in pipes the entire distance from Arequipa, 106 miles, and from this source sufficient is taken to cultivate small gardens at the stations, containing bananas, oranges, corn, beans, passion flowers, roses, pinks and various other ornamental and useful plants, that together produce a delightful contrast to the desolate wastes shutting them in.

As one rises and approaches Arequipa vegetation gradually appears again to some extent. Various tall, more or less branching cacti are conspicuous, shrubby composites are common and various small bushes and grasses appear on the gravelly hillsides and ravines. Even a few ferns and mosses are found, but everywhere the country is too dry for any extensive cultivation without artificial irrigation and this is carried on quite extensively, both in Arequipa and neighboring valleys. The railway on leaving Arequipa rises rapidly, winding in and out among the bare hills till near the summit of the continental divide, when the grade becomes more gradual and one scarcely realizes that he is at the highest point at a station called Crucero Alto, 14,666 ft. above the sea. Let one attempt the slightest exertion, however, and at once the great difference in the air is perceptible by the difficulty of breathing, often accompanied by headache and even nausea. Vegetation is not uncommon at this attitude, some of the best and most abundant grasses thriving at from 12,000 to 14,000 ft.; various cacti also occur, although what may be termed the cactus belt is somewhat lower, from about 6,000 to 10,000 ft.

Rather above the grasses and near the summit of the divide a resinous composite a foot or two high is abundant, large quantities of which are pulled out by the roots, made into bales and sold for fuel. At about the same height also are several odd cespitose plants. One is perhaps umbelliferous. It grows in hard, dense masses, that when dug out are nearly the size of a bushel basket and furnish an excellent fuel. Another species forms more or less complete yellow-brown rings over the surface of the ground. This last evidently continues to grow about the outside of the dense tuft it first forms. Finally the center, composed of the older branches, dies away and becomes replaced by sand, thus leaving a very perfect ring, often several feet across and of a peculiar yellowish color, in strong contrast with the dark sand around and within it.

As one approaches Lake Titicaca the low flats bordering the lake are observed to be extensively cultivated. The principal crop raised is barley, next perhaps comes kenoa, then potatoes. The barley is mostly cut before maturity and used for fodder, and the potatoes are small and poor in quality. The kenoa, a species of *Chenopodium*, varies from a small plant without branches and only ten or twelve inches high to a great branching weed-like thing, three or four feet tall. It becomes bright red at maturity and a large specimen doubtless produces half a pint or more of seed. The seed is cooked and eaten much the same as rice, but requires more care, as the first water in which it is boiled should be drained off. When thoroughly cooked the spirally coiled embryo becomes separated from the endosperm and gives the dish an odd appearance. At best it is quite inferior to any of the cereals as a food.

Puno, the railway terminus on the lake, is in Peru, while Chililaya, at the southern end of the lake, is in Bolivia, so that one enters Bolivian territory while on one of the small steamers plying weekly between these points, and although scarcely more than 15° south of the equator, the great elevation, 12,540 feet, makes the climate anything but tropical. Heavy frosts are common the greater part of the year. Snow storms are not rare, and during the colder periods some little ice forms about the margin of the lake.

No native trees or bushes of any size were observed about the shores and wood for building purposes and fuel is very scarce. In the shallower parts of the lake a tall rush much like *Scirpus lacustris* is abundant and out of this the Indians make a very neat, boat-shaped raft called balsa, with sail also of rushes, which they use in navigating the smaller arms and bays, rarely going more than three or four miles from shore however. They also use this boat in netting and spearing fish and in pulling up from

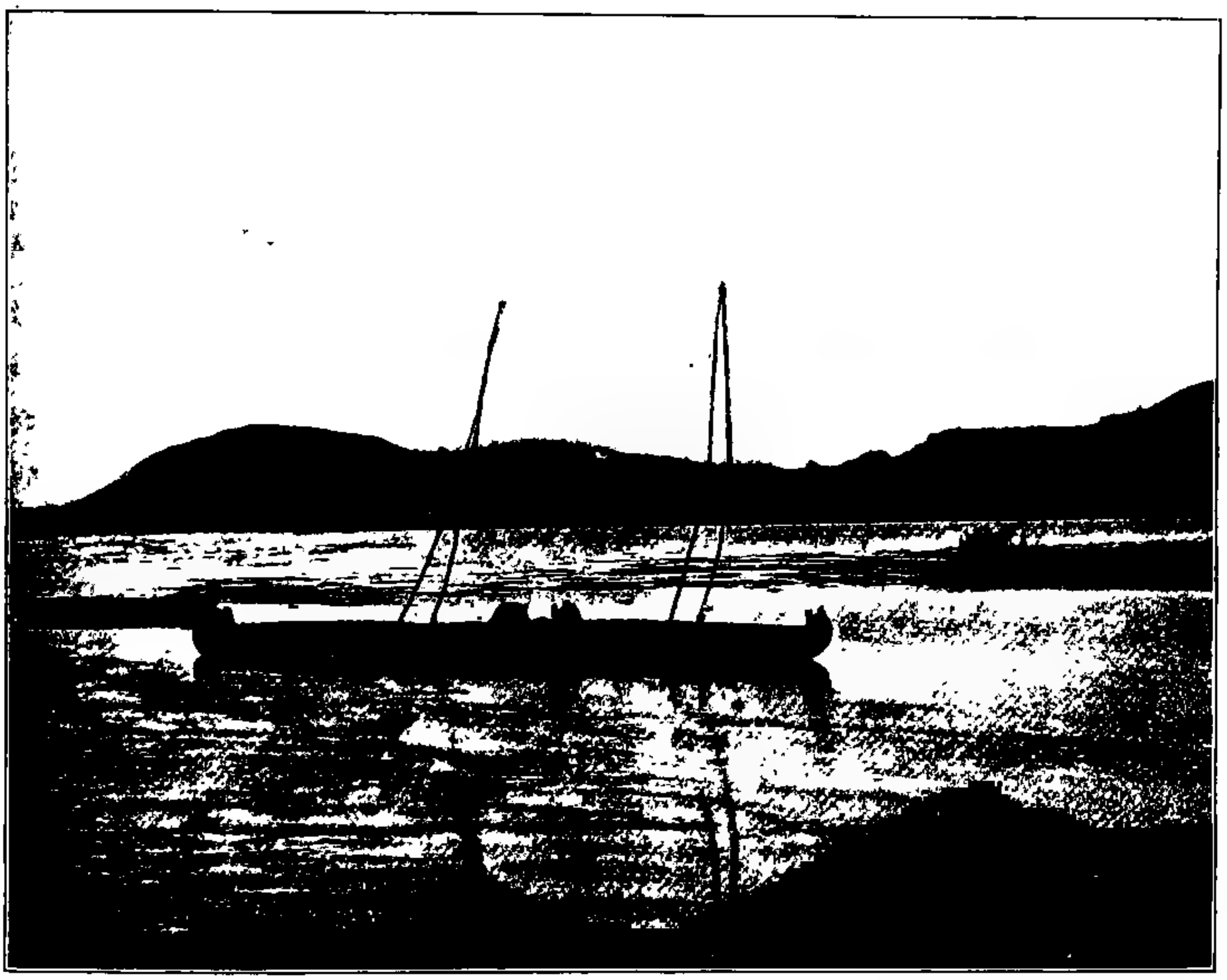

FIG. 6. Balsas made of *Scirpus* on Like Titicaca.

the lake bottom water plants which they feed to cattle picketed out along shore. This rather unusual fodder consists largely of a species of *Myriophyllum* and a somewhat grass-like plant, possibly a *Potamogeton*, mixed with *Chara* and a green filamentous alga. The cattle eat these things, doubtless, from necessity rather than choice, but the rush above mentioned they will wade far out into the water to obtain, so that when feeding little more than their backs and heads are visible.

A very fair stage road extends from Chililaya to La Paz, a distance of 45 miles over a high, rolling plateau and here as elsewhere all the arable land is well cultivated, with ditches for irrigating wherever water is to be obtained. Large areas are so gravelly and rocky as to be quite unfit for cultivation, yet over many square miles of such ground the larger boulders have been thrown up into heaps, each containing many tons; these in places are so abundant that the piles seem to occupy the greater part of the surface. It is scarcely evident at the present day for what purpose such an immense amount of work has ever been done. The scanty vegetation that at present exists, consists largely of scattered tufts of grass, two or three cespitose species of cactus, and a few shrubby composites.

The city of La Paz is in a great gulch some 1,000 feet lower than Lake Titicaca and about twice that distance below the surrounding plateau. The *Eucalyptus* is the commonest tree in cultivation, several fine groves standing out conspicuously as one looks down upon the town. Another much smaller tree in some of the gardens with handsome purplish flowers is a *Cantua*, apparently the species *laxifolia*. Tall, branching, cylindrical jointed cactuses are common as a hedge plant along various lanes and in the lower part of the town a weeping willow grows finely.

From La Paz we went with mules to Sorata, the trail passing around the northwest base of the Sorata range, over a pass some 14,000 feet elevation and down quite rapidly 6,500 feet to the town of Sorata. Some time before reaching the summit of this pass, known as the Huillata, I obtained specimens of a tree growing at the highest elevation of any collected on the trip, about 13,000 feet. The species proves to be a *Buddleia* of the family Loganiaceae and was growing to a height of 20 feet with a broad, rounded top and a trunk 18 inches in diameter. Only two or three individuals were noted and they were evidently not natives of the region. Sorata, being 4,000 feet lower than La Paz, has a most agreeable climate the year round. Here, as in the latter town, *Eucalyptus* trees were the most conspicuous of any, but various other species were quite common, especially

a black walnut, the fruit of which furnishes the Indians one of their dyes. The mountain sides near town are well cultivated for probably a distance of 2,000 feet up, and when we were there, in early June, thousands of acres of fine fields of Indian corn and bearded wheat were just maturing. Potatoes are common and they seem to grow best at 8,000 or 9,000 feet. In the plaza and gardens about town a good many peach trees seem to thrive but the fruit is of little or no value, I was informed; also a few grape vines occur, but these evidently do better at a somewhat lower level. Among the numerous native bushes on the hillsides near by were two species of *Rubus*, but, although they were fruiting abundantly and looked quite tempting, the berries proved to be rather dry and tasteless. Fine strawberries are cultivated and a few scarcely ripened ones were coming into the market just as I left early in October.

In leaving Sorata, if one could follow down the Sorata River, the tropical forests on the tributaries of the upper Amazon would soon be reached without further climbing into regions of snow and ice, but as it is, in order to avoid the great cañons and precipices of that river, the main trail to the lower country crosses over several high ridges thrown off from the Sorata range, of which the highest is in the neighborhood of 16,000 ft. elevation, or about the lower limit of perpetual snow. At this height, doubtless, quite a number of species of plants could be found if one had the time to look about. As it was I hastily gathered a few things at some 15,000 ft. or above, including a small fern in fruiting condition, one or two mosses (Grimmias), a handsome flowered *Blumenbachia*, of the Loasaceae, with stinging, nettle-like hairs, and one or two composites.

With the mules traveling at times at a snail's pace over these high bare ridges, we were three days out from Sorata before reaching Tolapampa, about 11,000 ft. elevation and not much above the upper limit of the forests of the eastern slopes. It is in coming over and down the ridge just above this place that the cloud-masses so frequently hanging over the hot forests beneath come into view. There, spread out suddenly before the eye and just below one was one level sea of clouds with the bright sun

shining down over all, and here and there, many miles away, great black mountain tops thrusting themselves up through like islands. A little later, as we descended and the sun sank lower, the clouds formed a great bank on the right of the ridge, while the sun, shining opposite, threw on them a shadow, quite well defined, of each individual as he passed along, and circling each shadow at some little distance was a nearly complete, bright ring of light. We reached the stone house, put up to shelter travelers at Tolapampa, in good season, camped over night and the next morning found the clouds all gone and a heavy frost over everything. I attempted to collect a few mosses, growing abundantly near by, but they were so covered with ice it was scarcely possible to distinguish one from another and moreover they had to be cut out in solid chunks not at all agreeable to handle when obtained. Two days' traveling down long ridges from this point takes one to Mapiri, at an elevation of only 1,600 ft., and there, with tropical fruits and plants of all kinds on every side and the thermometer ranging from 85° to 95° F., day after day, one has no trouble in realizing that, after all, he is in the tropics. Some of the cultivated plants of this place are platanos (including plantains and bananas), sugar-cane, rice, cacao (the chocolate tree), lemons, oranges and cassiva root. On the mountain sides about are rubber trees, and fine coffee grows up to 3,000 or 4,000 ft. elevation. Just above this height, quina, the Peruvian bark tree, is common.

From the town of Mapiri we went down the Mapiri and Beni rivers on cayapas, as two or three balsas bound together side by side are called. These river balsas are simply rafts, pointed and turned up in front, made of logs of the well-known balsa tree, *Ochroma lagopus*, and usually with a light framework eight or ten inches above the logs on which to sit and to place the cargo.

The whole country passed by, while gliding down stream with the current on these rafts, seemed to consist of a succession of low mountain ranges, densely clothed to their summits with medium-sized timber and bushes. Occasionally a tree would stand out from the green foliage around, decked in a mass of yellow, from the multitude of its flowers, or a vine in bloom would so

cover a tree that only a splendid mass of purple or red was visible. Many fragrant flowers occurred and in such abundance as to perfume the whole surrounding forest.

San Buena Ventura is just outside the last foothills extending from the great table-land to the westward, and eastward is an almost unbroken forest reaching to the Atlantic. There are occasional openings near the foothills that gradually increase in size and frequency southward till they join the pampas of the Argentine, but in central Bolivia they are not extensive, often only a mile or two across. These open places are known as pajonales and often have more or less standing water over their surface with luxuriant grasses and sedges everywhere. Occasionally some round-topped tree grows out from the circling forest, and low hills of sand rise here and there overgrown with brush, while handsome flowers peep out between tufts of grass and along the borders of the woods, the whole making a delightful change after riding

FIG. 7. River balsa of Cork-wood on Mapiri River.

through the dark forests that limit one's view often to only a few rods in any one direction.

We made various trips from one Indian village to another as well as to one or two little-known rivers, including even a journey out to La Paz and back over the passes, obtaining some general collections of plants over the different routes till a little over a year elapsed before again passing through Mapiri on our way home.

R. S. WILLIAMS.

FOSSIL PLANTS FROM KANSAS.

The Garden has recently acquired by purchase, from Mr. Charles H. Sternberg, of Lawrence, Kansas, a fine collection of fossil leaves from the Cretaceous (Dakota Group) sandstone of that state. The collection contains twenty-five genera and forty-nine species and varieties, included in about 250 specimens, exclusive of counterparts, of which latter there are a large number. They were selected for display in the museum and hence were all carefully prepared by shaping the matrix and by chiseling off any surface inequalities, wherever this was advisable for the better definition of the leaves. Many are in nodules, which are split open and show each leaf in counterparts, or as both impression and cast. In nearly every instance the outline, petiole and nervation are as perfectly preserved as in herbarium specimens.

Several of the leaves are folded or bent in a remarkable manner, apparently having been subjected to the disturbing influence of flowing water at the time when they were deposited. One of these is shown in the accompanying illustration.

Although the collection was not designed for other than display purposes it was found to include two unique specimens which are of special interest, not only on account of their beauty as fossils, but also for the reason that they represent objects which are rarely preserved and are species new to science.

One of these is a petal of a *Magnolia*, similar to the living *M. foetida* (L.) Sarg. — the other is a fruit of a fig. They were shown at the Washington meeting of the Botanical Society of America,

in December, and at a recent meeting of the Torrey Botanical Club, and may be found described in an illustrated article, in the

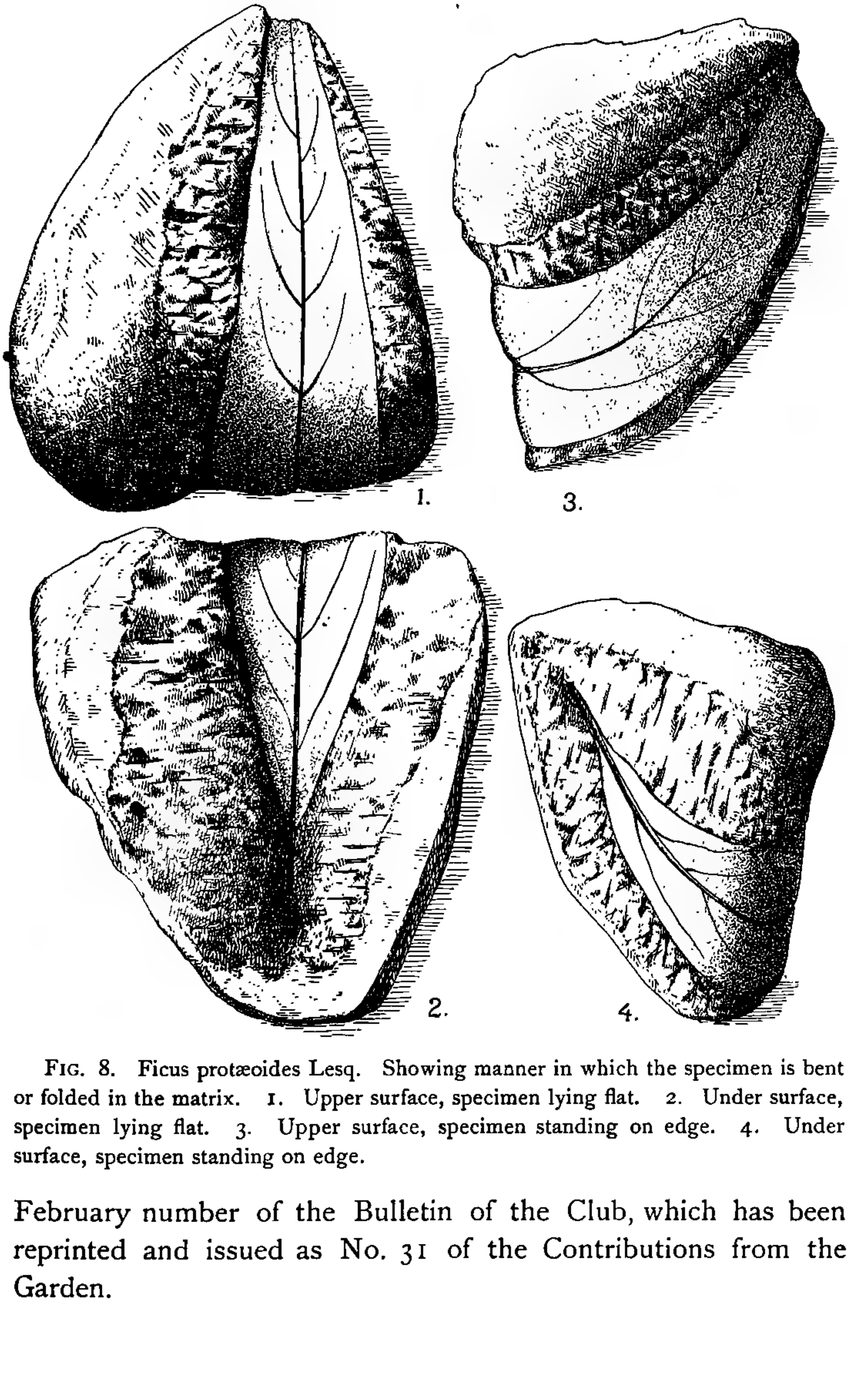

FIG. 8. Ficus protæoides Lesq. Showing manner in which the specimen is bent or folded in the matrix. 1. Upper surface, specimen lying flat. 2. Under surface, specimen lying flat. 3. Upper surface, specimen standing on edge. 4. Under surface, specimen standing on edge.

February number of the Bulletin of the Club, which has been reprinted and issued as No. 31 of the Contributions from the Garden.

The collection will be arranged in one of the new floor cases in the palaeobotanical museum.

ARTHUR HOLLICK.

INTERESTING PLANTS IN BLOOM.

The most interesting plant which has flowered the past month is *Strelitzia Nicolai*, named in honor of Prince Nicolajevitsch. It is a native of southern Africa, as are the other 3 or 4 species of this genus. Southern Africa is a large area, and the exact location from which this species was derived is at present a matter of uncertainty. Its large leaves at once make manifest its relationship with the banana family, to which it belongs, but its flowers do not at all resemble those of the banana. This noble member of the genus attains a height sometimes of 25 feet, but the plant in the conservatories is still relatively small, although in its way a goodly sized plant, and has not yet begun to show its trunk. The large banana-like leaf-blades are 4 or 5 feet long and about 2 feet broad, truncate at the base and rounded and hood-shaped at the apex; these are supported on petioles about 4 feet long.

The flowers first opened on March 15 and were photographed; a reproduction of this photograph accompanies this article. The inflorescence consists of two large dull gray green horizontal bracts, measuring about 14 inches in length, from each of which emerge 2 or 3 large flowers. The outer divisions of the perianth are broadly lanceolate, acuminate, about 7 inches long, and are of a pale yellowish white. The inner divisions are united into an organ much resembling a bird's tongue; this is mainly pale blue, narrow at the base and with a hastate blade which runs out into a long white acumination, measuring over all about 8 ½ inches. This plant will be found in no. 4, opposite to the bananas.

In the same house are two large plants of *Tamonea magnifica*, the Mexican Blue-leaf, a native of Mexico. These are near the large plant of *Medinilla magnifica*, referred to in the last number of the Journal and which is still in bloom; they are both members of the Melastomaceae. One of this pair flowered for the

first time on March 15. The flowers are inconspicuous and disappointing, as the magnificent large leaves warrant one in expecting something much finer.

Another plant which has flowered with us for the first time is *Sobralia macrantha*, from Mexico. This showy orchid has large rose-purple flowers with petals and sepals 4–5 inches long. The stems are from 4–6 feet tall and leafy throughout. This plant is in house no. 15.

FIG. 9. Flowers of *Strelitzia Nicolai*.

In house no. 13 the Australian Bottle-brush Tree, *Callistemon citrinus*, is now a blaze of color, its brilliant red spikes attracting much attention. The resemblance of these spikes to the bottle-brushes in common use is very striking. In the same house is a large orange tree, *Citrus aurantium*, loaded with flowers, the fragrance of which fills the whole house.

The unusually early spring has stirred the plants out of doors into sudden activity, and many plants in the herbaceous grounds are sending up their tender young shoots. It is to be hoped that no unwelcome frost, such as occurred early in May two years ago, will come to blast these. Among the first to flower during March were *Hepatica acuta*, the sharp-lobed liverwort, *Helleborus Colchicus*, and *Eranthis hyemalis*, the winter aconite, all noted in bloom on the 15th, and all members of the crowfoot family. The hepatica is a native of our own country and finds its home from Quebec and Ontario to Minnesota and Iowa and south in the mountains to Georgia, but it is very rare along the Atlantic coast. *Helleborus Colchicus* has large purple flowers and is a native of Asia Minor. The winter aconite is a native of Europe, and is sparingly naturalized in some places in this country.

The pink flowers of *Saxifraga crassifolia* and its allies have made a pretty show in the saxifrage family. The large fleshy evergreen leaves make a rich setting for the bright flowers.

Arabis albida, in the nearby cruciferous bed, has been a mass of white; and the butterdock, *Petasites Petasites*, and the white butterdock, *Petasites albus*, have been in full bloom in the far end of the grounds among the Compositae, to which family they belong.

GEORGE V. NASH.

March 31, 1903.

ADDITIONS TO THE LIBRARY.

During the last two years persistent efforts have been made towards the building up of the horticultural portion of the library.

In some cases the Garden owned broken sets which had to be filled up and in others was fortunate in procuring complete ones. Such notable periodicals as "Gardener's Chronicle," "The Garden," "Garden and Forest," "Hovey's Magazine of Horticulture," "The Horticulturist," "La Revue Horticole," "L'Illustration Horticole," "The Florist," "Neubert's Deutsches Magazin für Garten und Blumenkunde," "I Giardini," Loudon's "Gar-

dener's Magazine" and other series treating solely of orchids, as "Lindenia," "The Orchid Review," "Journal des Orchidées" and "L'Orchidophile" are now in complete files on the shelves.

The periodicals in the botanical series proper are also in complete sets with the exception of two or three. Among these is the "Oesterreichische Botanische Zeitschrift," the back numbers of which are most difficult to obtain and of which a complete series but rarely comes on the market.

The acquisition of these series, and last summer, that of a collection of the older botanical literature * along with usual and current accessions, have crowded the shelves to such an extent that increased shelf room was needed.

The first additions were four fire-proofed oak book-cases, built into the recesses of the reading-room. They were put in place early in 1902 (Fig. 11), and accommodated a number of books that had remained stacked in a store-closet for lack of space. These shelves were soon filled to overflowing and since the beginning of the present year, sixteen sections of steel stacks, constructed to match in every way the existing ones, have been added to the book-room. The new sections have an estimated capacity of three thousand volumes and will provide for the development of the library for several years to come (Fig. 10).

A new card index case has also been constructed against one of the piers of the reading-room (Fig. 10) and into it are sorted the accumulated cards, so that the catalogue is now in a continuous series and complete to date. It contains the catalogue of the books as well as the "Index to recent Literature relating to American Botany" which has been issued by the Torrey Botanical Club since 1894. Besides this main catalogue, the library has a separate set of the "Index of recent Literature relating to American Botany," a set of the "Card-Index of Genera, Species and Varieties of Plants published since 1885" published by Miss Josephine A. Clark and a set of the "Index Botanique Universel" begun by the Bulletin de l'Herbier Boissier in 1902. A subject catalogue has also been started, but is necessarily of very slow growth.

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* Journal, vol. 3, p. 203.

The current periodicals until complete, are placed in temporary bindings, and heretofore were arranged on several large tables. They now are concentrated on a large, especially constructed octagonal flat-topped cabinet that fills the center of the reading-room (Fig. 11). The lower portion of this cabinet is fitted with doors and contains shelves for the storing of manuscripts, pic-

FIG. 10. The Book-Room.

tures and other collections that are inconvenient to keep on the open shelves.

A large and commodious desk as well as a smaller working table has been provided for the use of the librarian and twelve smaller tables for the use of the students and assistants. This practically completes the amount of furniture that can be accommodated in the library.

FIG. 11. The Reading-Room.

Among the interesting and valuable gifts received by the Garden during the past year, one of the most prized is that of an oil painting of the old Elgin Botanic Garden (Fig. 9). It was presented by Miss Rebecca Harvey, a granddaughter of the late Dr. David Hosack. The famous old New York garden that it depicts was established in 1801 by Dr. Hosack, but unfortunately languished after a few years for lack of funds and was given up.

Numerous interesting books have just reached the Garden from Berlin. Among them may be cited a copy of von Martius' "Palmetum Orbignianum," containing the descriptions and figures of the palms of Bolivia and Paraguay; Bateman's "Orchidaceae of Mexico and Guatemala," the "Iconographia Phycologica Adriatica," by Zanardini, illustrating the algae of the Adriatic and the Mediterranean, a complete set of Sturm's "Deutschlands Flora," and a number of other important books and separates on the Algae.

ANNA MURRAY VAIL.

NOTES, NEWS AND COMMENT.

Mr. A. D. Selby, Botanist to the Agricultural Experiment Station at Wooster, Ohio, who has been in residence at the Garden since December, has been granted a research scholarship of the Garden in accordance with the conditions announced in the Journal for February, 1903.

The Desert Botanical Laboratory of the Carnegie Institution will be located at Tucson. Mr. Frederick V. Coville and Dr. D. T. MacDougal, the Advisory Board of the Laboratory, after a trip in January and February through the deserts of Texas, New Mexico, Arizona, California, Chihuahua and Sonora, reported in favor of locating the laboratory at Tucson, and the Executive Committee of the Carnegie Institution has approved the selection. The actual site of the building is on the shoulder of a mountain two miles west of the city of Tucson. This mountain and the adjoining mesas bear a splendid representation of such characteristic desert forms as *Cereus giganteus*, *Fouquiera*, *Opuntia*, *Echinocactus*, *Covillea* and *Parkinsonia*.

The officers of the University of Arizona and of the Arizona Agricultural Experiment Station have taken a lively interest in the project and the Tucson Chamber of Commerce expressed its appreciation of the importance of the enterprise by donating the site, installing a water supply, electric connections and rendering other valuable assistance.

Plans for building have been approved and construction will be begun as soon as the site is prepared. It is expected that the laboratory will be ready for operation about September 1, at which time, Dr. W. A. Cannon, the resident investigator, will take up his duties.

Dr. Arthur Hollick, assistant curator, was absent on leave during the latter part of March, being engaged in the preparation of a report on the geology of the Cretaceous formations of Long Island for the U. S. Geological Survey.

Mr. Percy Wilson, museum aid, returned from Honduras March 18, bringing a large collection of living and prepared specimens of plants from the region near Puerto Sierra and Puerto Cortez.

Dr. N. L. Britton, Director-in-Chief, and Mrs. Britton returned from Cuba on April 4th. During the brief visit made to the island a large collection of herbarium specimens was made principally from the region around Matanzas, and some desirable specimens were brought back for the conservatories. Valuable assistance was rendered by Mr. John Shafer, curator of the herbarium of the Carnegie Museum, Pittsburg. In addition to the great amount of material secured which will be of great value in the continuation of investigations upon the flora of the West Indies Dr. Britton was so fortunate as to secure several rare botanical books not previously in the Library of the Garden.

Volume II. of the Bulletin of the Garden has been completed by the issue of No. 8 under date of March 18. This number contains only a report of the administration of the Garden during the year 1902 and does not include any scientific papers. The total number of species of plants under cultivation during the year amounted to 10,600. The library was increased by the accession of 1,962 volumes and now contains about 13,000 volumes. 67,000

specimens were received by the herbarium and museum. 43 registered investigators were accorded the privileges of the institution for periods of one months or more during the year, in addition to a large number of visiting scientists who made briefer visits for the purpose of consulting the collections. The year has also witnessed great activity in the construction of roads, paths and plantations and in the addition of furniture and equipment to the museums and laboratories.

The total precipitation in the Garden during March, 1903, amounted to 5.96 inches. Maximum temperatures of 54° on the 6th, 70° on the 14th, 65° on the 20th, 68.5° on the 27th were recorded; also minima of 20° on the 2d, 25.5° on the 4th, 29° on the 14th, and 30° on the 29th.

The temperature of the soil at a depth of one foot (30 cm.) as recorded by the Hallock thermograph varied from 44° on the 7th to 48.5° on the 21st and 42° on the 30th.

ACCESSIONS.

ACCESSIONS TO THE LIBRARY FROM FEBRUARY 9 TO MARCH 7.

ARDISSONE, I. *Prospetto delle Ceramiee Italiche.* Pesaro, 1867.

BAILEY, W. W. *Among Rhode Island Wild Flowers.* Ed. 2. Providence, 1896.

BAILEY, W. W. *New England Wild Flowers and their Seasons.* Providence, 1897.

BALLET, JULES. *La Guadeloupe. Renseignements sur l'Histoire, la Flore, la Faune.* Vol. 1. Basse-Terre, 1890–96. 3 vols.

BALSAMO, F. *Iconum Algarum Index.* Neapoli, 1898–99.

BATTANDIER, J. A., et TRABUT, L. *L'Algérie: le Sol et les Habitants, Flore, Faune, Géologie, Anthropologie, Ressources Agricoles et Economiques.* Paris, 1898.

BERTRAM, M. *Die Technik der Gartenkunst.* Berlin, 1902.

BIÉTRIX, ANTOINE. *Le Thé, Botanique et Culture.* Paris, 1892.

BIZZOZERO, GIACOMO. *Flora Veneta Crittogamica.* Padova, 1885. 2 vols.

BLANCO, MANUEL. *Flora de Filipinas.* Manila, 1845.

BOËRY, PASCAL. *Les Plantes Oléagineuses et leurs Produits.* Paris, 1888.

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OF

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EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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JOURNAL

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PROGRAM FOR THE FOURTH ANNUAL MEETING OF THE HORTICULTURAL SOCIETY OF NEW YORK.

The fourth annual meeting of the Horticultural Society of New York will be held at the New York Botanical Garden, Wednesday, May 13, 1903.

Members and their friends leaving Grand Central Station, Harlem Division, by the 1:35 P.M. train for Bronx Park (Botanical Garden) Station will be met at Bronx Park Station by Dr. N. L. Britton.

Members and their friends leaving Grand Central Station by the 2:35 P.M. train will be met at Bronx Park Station by Mr. George V. Nash, Head Gardener New York Botanical Garden, and escorted to the Conservatories.

Leaving the Conservatories at 3:35 the party will walk through the grounds to the Museum Building: the formal meeting will commence in the Lecture Hall of the Museum Building at 4:25 o'clock and will be followed by an illustrated address by Mr. John K. L. M. Farquhar on the "Flowers, Fields and Woods of Japan."

Members and their friends leaving Grand Central Station by the 3:45 P.M. train will arrive at Bronx Park Station in time for the Formal Meeting.

The Council of the Society will meet in the Director's Office, Museum Building, at 3:15 o'clock.

The Museum, Library, Herbarium, and Laboratories in the Museum Building will be open for inspection until 6:30 o'clock.

Trains leave Bronx Park Station for Grand Central Station at 5:32, 6:08 and 6:59. The excursion fare is 25c.

An exhibition will be held in connection with the meeting, in the Hall of the Museum Building immediately adjoining the Lecture Hall; this exhibition will be open from one o'clock until half past six on Wednesday, May 13, and from 10 o'clock until 5 on Thursday, May 14.

All members of the New York Botanical Garden and their friends are hereby cordially invited to attend this meeting of the Horticultural Society.

Invitations are also hereby cordially extended to the members of the New York Florists' Club, the Farmers' Club and Horticultural Section of the American Institute, the American Rose Society and the Torrey Botanical Club.

Schedule of Prizes for Exhibition, Wednesday and Thursday, May 13 and 14.

The following prizes for exhibits open to all competitors are offered by the New York Botanical Garden, to be awarded by the Council of the Horticultural Society.

Cut Flowers, Etc.

Class.		Prize: 1st.	2d.
1	Collection of flowering shrubs and trees	$20	$15
2	Collection of bulbous plants	15	10
3	Collection of wild flowers, named	25	10
4	Collection of alpine and rockery species (plants or flowers or both)	10	5

Plants.

5	Group of crotons (*Codiaeum*)	15	10
6	Group of palms and other foliage plants	50	25
7	Group of foliage and flowering plants	50	25
8	Collection of orchids, each plant a distinct species or variety (no duplicates)	30	15
9	Collection of roses, in pots (not less than 10)	15	10
10	Six calceolarias	10	5

NOVELTY.

11 For the best horticultural novelty in plant, fruit, flower, or vegetable. (That is anything distinct and not previously in general cultivation in America.).....$50

The Horticultural Society of New York offers the following prizes (open to all):

Class.		Prize: 1st.	2d.
12	Collection of ferns.....	$25	$15
13	Collection of succulent plants	25	15
14	Collection of cut orchids	15	10
15	Collection of fresh vegetables	10	5

The Council may also award certificates to meritorious exhibits.

The word collection in this schedule does not signify the greatest number only; quality, rarity, effectiveness and display will also be counted.

The exhibition will be open from one o'clock until half-past six on Wednesday, May 13, and from 10 o'clock until five on Thursday, May 14.

Mr. George Skene will be in charge of the arrangements on the part of the New York Botanical Garden.

Plants and flowers for exhibition should be sent by express, prepaid, addressed "Horticultural Society, Museum Building, New York Botanical Garden, Bronx Park, New York City."

LEONARD BARRON.

Secretary.

136 LIBERTY STREET, N. Y. CITY.

REPORT ON A TRIP TO EASTERN CUBA.

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

Sir: In accordance with your instructions I spent the month of March accompanying Professor Underwood in the botanical exploration of eastern Cuba. I left New York on February 26, going by the Ward Line steamer to Santiago. I was joined in New York by Mr. E. D. W. Holway, of Iowa, who went to Cuba

for the purpose of collecting rusts for distribution in Arthur and Holway's "Uredineae Exsiccati et Icones."

A stop of a few hours at Nassau in the Bahamas gave us a glimpse of the vegetation of these coral islands and enabled us to collect seventy-nine numbers, mostly of flowering plants, but including a few parasitic fungi. We reached Cuba on March 5, stopping at Guantanamo Bay for a few hours in the morning and arrived at Santiago late in the afternoon, where we found Professor Underwood awaiting us. Southern Cuba proved to be exceedingly dry. The usual dry season was at its height and the Fall rains had been scanty so that conditions were drier than at any time for ten years. This made collecting very unsatisfactory. Only fifteen numbers were secured during our stop at Guantanamo Bay and one hundred and ten during three days at Santiago. On the 8th we took the coasting steamer for Baracoa on the north coast near the extreme eastern end of the island, arriving there the next morning. This from the first had been the objective point of the expedition, as the moisture conditions were known to be favorable, and as it was one of the localities visited by Charles Wright during his memorable exploration of the island. Thanks to the hospitality of Mr. Charles Cooper, an American settler, we were able to make our headquarters at his cocoanut ranch, situated seven miles from town at the base of El Yunque Mountain and at an altitude of about 1,800 ft. Owing to the smallness of the mules and the steepness of the trail the entire day was occupied in making these arrangements and transporting our bulky baggage by pack mules, the only possible means of transportation in this really difficult country. We finally arrived safely some time after dark, and after many mishaps, including the rescue of one mule from a ditch where he had rolled with his load of driers. He landed head down and heels up nicely balanced on top of his pack. The location proved to be a very favorable one for our purpose. We remained here eight days and during that time secured over eleven hundred numbers, of which about one third were flowering plants, the remainder being ferns, mosses, liverworts, lichens and fungi. No attempt was made to collect the algae. El

Yunque Mountain is a rectangular mass of limestone, with precipitous sides, reaching a height of about 3,000 ft. The top is only accessible by one rugged trail. At the front are jagged rock peaks, but to the rear is a considerable area of comparatively level land covered with heavy forest. There are numerous deep, moist sinkholes, filled with tree ferns and other moisture-loving trees and plants. These yielded a rich harvest of ferns, liverworts and mosses. The Cooper house is near the base of the cliffs forming the front side of the mountain, and from here the land slopes rapidly down with a succession of sharp ridges and deep ravines to the valley of the Duava River, which empties into the sea not far from Baracoa. The lower levels are comparatively open, with cocoanut groves and many scattered clumps of royal palms. On approaching the mountain, the country becomes densely wooded and the royal palms are fewer. None were observed at an altitude of more than 2,000 ft. About three miles north of El Yunque is a range of high steep hills forming the watershed between the Duava and Toa rivers. The tops of these hills are occupied by an open pine forest that is sharply marked off from the surrounding forest areas. The soil seemed to be hard and gravelly and the conditions were markedly xerophytic. Most of the plants and shrubs of these pine woods were out of season, but a number of interesting specimens were secured.

Owing to the infrequent sailings of the coast steamers, we were obliged to leave Baracoa on March 19, a week earlier than we had intended, going back to Santiago.

On the morning of the 21st we went by rail to Alto Cedro, a construction camp on the Cuba Central Railway at the junction with the branch for Nipe Bay, work on which is being pushed actively. Alto Cedro is in the great forest area that occupies the interior of eastern Cuba. We were told that it is practically unbroken for sixty miles farther to the westward. This forest contains scattered trees of mahogany, and West Indian cedar of great value, and these are being cut and hauled to the railroad for export. The country is comparatively level and in the rainy season it must become almost a swamp. The forest is an almost

impenetrable tangle of vines and bushes. At this season of the year few of the shrubs and trees were in flower, and while we got some interesting things, the botanical possibilities of the place were soon exhausted and we returned to Santiago the following afternoon, having secured 190 numbers. This included a considerable number of fleshy fungi, found on the fallen timber along the railroad right-of-way.

On the 25th we took a sail boat and spent the day landing at various points on Santiago Bay, securing about forty additional numbers. This ended active work, as the country about Santiago was too dry to repay farther effort at collecting. On March 27 Professor Underwood sailed for Jamaica and on the 28th I took the steamer for New York.

Of the sixteen hundred numbers collected during this trip, something over one third were flowering plants, the remainder being ferns and the lower cryptogams. The large number of ferns secured by Professor Underwood will doubtless prove of exceptional interest. The fungi are of much the same general type as those I collected last fall in Jamaica. Polyporaceae and Thelephoraceae are abundant; Hydnaceae are rare. The ground-inhabiting Agaricaceae are almost entirely wanting, though the forest conditions at Baracoa seemed to be exceedingly favorable for them. The kinds growing on rotten wood were fairly well represented. With the exception of *Meliola* and *Asterina*, leaf parasites were rare. Mr. Holway found so few rusts that after three days at Baracoa he decided to go on to Havana by steamer and rail, hoping for better results at some other point.

Owing to the difficulties of travel and transportation, the thorough exploration of eastern Cuba will be anything but an easy task. The results to be obtained are however more than sufficient to justify the necessary effort. A rugged mountainous region lying west of Baracoa is almost absolutely unknown. This being on the wet side of the island could best be explored during the comparatively dry winter and early spring months. The high mountain range near the coast west of Santiago is also practically unknown and promises rich returns. The flora is very different from that on the north side. This had best be visited

in July and August or in November and December at the close of the two rainy periods, but before the effects of drouth become too pronounced. For visiting either of these regions saddle and pack animals would be necessary. As there are no roads and but few trails, progress would be necessarily slow. Two or three months would probably be required for a satisfactory reconnaissance of either of those regions.

F. S. EARLE,
Assistant Curator.

THE JENMAN COLLECTION OF FERNS.

Negotiations have been in progress for nearly a year, looking toward the acquisition for the Herbarium of the New York Botanical Garden of the collections of ferns and fern-allies made in Jamaica and British Guiana by Mr. Jenman. Through the liberality of Mr. D. O. Mills, President of the Garden, they have at last been secured, and have been recently received. The collection includes over 4,000 mounted sheets with a thousand species in sixty different genera. Sufficient has been seen of the collection to realize that it is a valuable addition to our herbarium, not only in the number of type specimens which it contains, but also in the number of duplicates, which will enable us to make several valuable exchanges. The collection includes mostly ferns from Jamaica and British Guiana, with a few from Trinidad and Cuba, and a few North American species obtained by exchange with B. D. Gilbert. The largest number of species is in : *Polypodium*, 135; *Nephrodium*, 106 ; *Acrostichum*, 74 ; *Trichomanes*, 59 ; and *Selaginella*, 53 ; but in the last genus there are a good many species not yet named. The collection also includes some unnamed species of *Isoetes*, *Chara* and *Nitella*. In most cases the labels are fairly complete, giving sufficient data as to place and time of collection, but in some instances these facts are not recorded. In the case of type specimens, a clipping from the original place of publication is usually preserved on the same sheet as the specimen. The specimens are mounted on a thin quality of standard size mounting paper, and equal in bulk about

one sixth of our present fern collection. This amount will be largely reduced when the duplicates are removed, however, for in some cases there are as many as twelve sheets of one species, from the same locality. The collection is accessible for comparison, with the genera alphabetically arranged, and will not be incorporated with our collections until Professor Underwood returns from the West Indies, when he will find it very valuable in determining the large collections of ferns which he is gathering in Jamaica, and elsewhere.

George Samuel Jenman was born in England on August 24, 1845, and died at Georgetown, British Guiana, on February 28, 1902. He spent several years at Kew Gardens in training as a gardener and showed such marked ability that in 1873 he was appointed to the charge of the Botanic Gardens at Castleton, Jamaica, where he served six years. During this period he not only became known through his studies on the sugar-cane, and experiments on its seedlings, but he also found time to make extensive collections of the flowering plants and ferns, sending many new and interesting species to specialists elsewhere, and collecting one of the largest herbaria of Jamaica ferns that has ever been gathered together. Meanwhile he was publishing descriptions in various journals principally in the Journal of Botany, the Gardener's Chronicle, and the Bulletins of the Botanical Gardens of Jamaica. It was at this time that he prepared his "Hand List of the Jamaica Ferns and their allies" published in 1881. In 1879 he was called to organize a Botanical Station in British Guiana, and remained there until his death, building out of the wilderness one of the best of the Tropical Botanical Gardens. He thus acquired a wide and varied experience in tropical agriculture, and at the same time continued his botanical studies, publishing a "Synoptical List of the Ferns of Jamaica," 1870–1899, of five hundred species, and later began a "List of the Ferns of the West Indies and British Guiana," which was not completed at the time of his death. Mr. Hart, of the Trinidad Botanical Gardens, who was publishing this list, will seriously feel his loss. We are fortunate in securing this unique collection of ferns for an American herbarium.

ELIZABETH G. BRITTON.

A LARGE COLLECTION OF CONIFERS FOR THE PINETUM.

At his country place at Stamford, Conn., Mr. Lowell M. Palmer has, for a number of years, been bringing together a large collection of conifers, until he now has one of the richest collections in the country. Learning of the desire of the Garden to establish its pinetum, he generously offered a selection, from this rich assortment, of such species and varieties as were desirable to complement the collections already brought together in the Garden nurseries. These were at our disposal at such time as it was desired to begin work on the laying out of this plantation. This work was undertaken during the present spring, and Mr. Palmer at once presented a collection of about 450 individuals of these popular trees and shrubs, kindly causing them to be delivered on the pinetum site in excellent condition for immediate planting. The greater part of these were of such size as to warrant their installation at once in the pinetum ; the remainder were placed in our nurseries for the present.

Some of the genera more fully represented are : *Juniperus*, the cedars, with 28 species and varieties ; *Picea*, the spruces, with 24 ; *Abies*, the firs, with 18 ; *Pinus*, with 28 ; *Retinispora*, with 24 ; *Taxus*, the yews, with 12 ; *Thuja*, with 18. And in addition to these, the following genera were represented by one or more species : *Cedrus*, *Cephalotaxus*, *Cryptomeria*, *Cupressus*, *Larix*, *Pseudotsuga*, *Ginkgo*, *Sciadopitys*, *Thujopsis*, and *Tsuga*.

So large an addition is most welcome, and greatly increases the value of the pinetum, both from the point of view of the lover of these plants and from that of the student of them. The possibilities for their comparative study are thus greatly increased, and there is much yet to learn of the specific limitations of many species.

GEORGE V. NASH.

NOTES, NEWS AND COMMENT.

Dr. N. L. Britton has been reappointed Botanist of the Society of American Florists and Ornamental Horticulturists for the year 1903, a position he has held since 1901.

Mr. M. A. Howe, Assistant Curator, sailed on May 9 for Porto Rico. He will make an investigation of the algal flora of the coast of that island and will also visit some of the other islands in the West Indies for the purpose of making general collections.

Miss W. J. Robinson, B.S., University of Michigan, 1899, instructor in biology in Vassar College, has been granted a resident research scholarship in the Garden for three months beginning June 15, 1903.

Dr. R. H. Pond, of Sterling, Ill., has been granted a resident research scholarship in the Garden for six months beginning June 1, 1903.

Miss A. M. Vail, Librarian, sailed for Paris, April 22, for the purpose of making some extensive purchases of books for the Garden. Several important contributions for this purpose have been recently received from members of the Garden.

The Woman's Municipal League (Morrisania Local Improvement District Branch) held a meeting at the Museum Building of the New York Botanical Garden on Friday, April 17, at 3:30 P. M., at which the following papers were read: "The duty of the woman in the combat of tuberculosis," by Dr. S. A. Knopf, of the Charity Organization Society; "What the Board of Health is doing to improve sanitary conditions," by Edward F. Hurd, of the Department of Health; "Hygiene in the schools," by Dr. Luther Halsey Guleck, Director of Physical Training, Board of Education.

The new road, connecting the driveways near the Museum Building, with Pelham Avenue, extending past the herbaceous garden, and southerly through the woods, near and along the Bronx River, has just been opened for driving. Work on this road was commenced in the autumn of 1901, and the portion of it within the Garden reservation was finished last fall; the portion extending from the southern edge of the Garden tract to Pelham Avenue was built by the Park Department during the latter part of last year, and finished early in April. The road is of Telford-McAdam construction, 25 feet wide, and by careful study was laid through the woods with the loss of only one or two good trees. It forms a desirable driveway connection be-

tween the grounds of the Garden and the northern end of the Zoölogical Park, and extending as it does through the woods for almost its whole length, adds a very attractive feature to the road system of the Garden. The total length within the Garden grounds is about eighteen hundred feet; the length within the portion of Bronx Park south of the Garden reservation is somewhat greater. Special care has been taken to disturb the undergrowth of the woods as little as possible. The southern end of the Hemlock Forest is in view from this driveway.

Professor F. S. Earle, assistant curator, has been granted leave of absence to carry out some investigations for the Bureau of Plant Industry, U. S. Department of Agriculture in Porto Rico. He sailed on May 9, and will make a general examination of the island for the purpose of determining the principal diseases affecting the agricultural and horticultural products. Professor Earle is expected to resume his duties in the Garden in June.

Mr. S. H. Burnham, museum aid, was tendered the position as botanist to an expedition sent by the California Academy of Sciences to the islands near California in April, but was unable to accept the offer because of the press of work involved in the rearrangement of the collections in the museums.

The following lectures of the spring course are still to be given: May 9, "Illustration of Some Features of the West Indian Flora," by Dr. N. L. Britton; May 16, "The Food Supply of Young Plants," by Prof. F. E. Lloyd; May 30, "The Color Variations of Flowers," by Dr. C. C. Curtis; June 6, "The Streams, Lakes and Flowers of the Upper Delaware, and the Story of the Sundew," by Mr. Cornelius Van Brunt; June 13, "Vegetable Foods," by Dr. H. H. Rusby.

Dr. Theodore Holm, of Washington, D. C., is in residence at the Garden during April and May for the purpose of consulting the herbarium and library.

Dr. J. N. Rose, assistant curator of the herbarium, U. S. National Museum, Washington, D. C., made a brief visit to the Garden during the first week in May for the purpose of completing some work in which he is engaged with Dr. Britton, on the North American Flora, to be published by the Garden.

Dr. Arthur Hollick, assistant curator, has been granted leave of absence to carry out some investigations for the U. S. Geological Survey on the fossil flora of Alaska. The special purpose of the work is to secure material which will afford additional information as to the ancient flora of this region, and which will also throw some additional light on the probable age of the principal geological formations exposed. Dr. Hollick will sail from Seattle on May 25, and will start overland for the headwaters of the Yukon from Skagway. A boat and outfit with helpers will be procured at Dawson from which point the Yukon River will be traversed to its mouth, a distance of about two thousand miles.

At the meeting of the Board of Managers of the Garden, held at the Museum Building April 28, 1903, the action of the Scientific Directors in electing on January 13, Mr. C. F. Cox, and Professor Frederic S. Lee, as additional Scientific Directors, was approved. The Board also approved plans for six sets of cut stone steps for the terrace of the public conservatories, designed by Mr. John R. Brinley, Landscape Engineer of the Garden, and directed that these approved plans be transmitted to the Commissioner of Parks for his approval. The Board also voted a preliminary appropriation, and authorized the Director-in-Chief to invite contributions for a botanical exploration of the Philippine Archipelago, in coöperation with the Bureaus of Agriculture and of Forestry of the Insular Government at Manila. The object of this exploration is to secure for the Conservatories, museums and herbarium, as complete a collection as possible of the plants and plant products of the Philippines. There is at present only a fragmentary representation of this interesting and important flora in the collections of the Garden; it is believed that the survey now authorized will bring out much of novelty and of scientific and economic interest and value. It is hoped that field operations may be commenced this autumn.

The total precipitation in the Garden during April, 1903, amounted to 3.49 inches, of which 2.14 inches fell on the 14th. Maximum temperatures of 69° on the 3d, 65° on the 9th, 63° on the 18th, 66° on the 20th, and 85° on the 29th were observed;

also minima of 25.5° on the 5th, 32° on the 20th, and 38° on the 28th were observed.

The temperature of the soil at a depth of one foot (30 cm.) ranged from 40° on the 3d to 44° on the 18th, 41° on the 16th, 45° on the 25th and 46° on the 30th.

ACCESSIONS.

LIBRARY ACCESSIONS FROM MARCH 8 TO APRIL 18.

ALPINO, PROSPERO. *De Plantis exoticis Libri Duo.* Venetiis, 1627.

ANDREWS, E. F. *Botany all the year round.* New York, 1903.

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ARAGO, B. *Tratado de Jardineria y Floriculturo.* Madrid, 1877.

Atti della Quarta Reunione degle Scienziati Italiani tenuta in Padova nel Settembre del 1843. Padova, 1843.

BACK, GEORGE. *Narrative of the Arctic Land Expedition to the mouth of the Great Fish River and along the shores of the Arctic Ocean in the years 1833, 1834 and 1835.* London, 1836.

BAILEY, FREDK. MANSON. *The Fern World of Australia.* Brisbane, 1881.

BESSER, W. S. *Enumeratio Plantarum hucusque in Volhynia, Podolia, Gub. Kiioviensi, Bessarabia Cis-Tyraica et Circa Odessam collectarum, simul cum observationibus in primitias florae Galiciae Austriaceae.* Vilnae, 1822.

BESSER, W. S. *Primitiae Florae Galicae Austriacae utriusque.* Viennae, 1809. 2 vols.

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COLOMA Y GARCÉS, E. *Manuel del Jardinero Cubano.* Habana 1872. (Purchased by Dr. N. L. Britton at Havana. Exploration Fund.)

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DE TONI, GIO-BATTA E LEVI DAVID. *Flora Algologica della Venezia.* Venezia, 1885–1898.

DUMONT D'URVILLE, J. *Voyage au Pôle Sud et dans l'Océanie sur les Convettes L'Astrolabe at la Zélée.* Paris, 1845–53. 3 vols.

ELLIS, JOHN, AND SOLANDER, DANIEL. *The Natural History of many uncommon and curious Zoophytes, collected from various parts of the globe.* London, 1786.

ENGLER, ADOLF. *Syllabus der Pflanzenfamilien.* Ed. 3. Berlin, 1903.

Fortsetzung des Allgemeinen Teutschen Garten-Magazins. Weimar, 1815–1823. 7 vols.

FRIES, ELIAS. *Novae Symbolae Mycologicae.* Upsaliae, 1851.

FUNCK, HEINRICH CHRISTIAN. *Cryptogamische Gewächse des Fichtelgebirgs.* Leipzig, 1806–38. 42 fascicles.

GAUCHER, LOUIS. *Etude anatomique du Genre Euphorbia L.* Paris, 1898.

Het Nederlandsche Tuinbouwblad. 1884–1897. Rotterdam, 1884–1897. 13 vols.

HEWITT, ROBERT, JR. *Coffee: its history, cultivation and uses.* New York, 1872.

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MARTIUS, KARL FR. PH. VON. *Palmetum Orbignianum.* Paris, 1847.

Maryland Geological Survey. Baltimore, 1902. 4 vols. (Given by Dr. Arthur Hollick.)

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RUPRECHT, F. J. *Symbolae ad historiam et geographiam Plantarum Rossicam.* Petropoli, 1846.

SEEMEN, O. VON. *Salices Japonicae.* Leipzig, 1903.

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SWITZER, STEPHEN. *An Int oduction to a General System of Hydrostaticks and Hydraulicks.* London, 1729. 2 vols.

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U. S. AGRICULTURE, *Report of the Commissioner for the year 1862 and 1884.* 2 vols.

U. S. PATENT OFFICE. *Report of the Commissioner for 1854, 1856 and 1858.* 3 vols.

WATSON, P. W. *Dendrologia Britannica.* London, 1825.

ZANARDINI, G. *Scelta di ficee nuove o piu rare dei mari Meditteraneo ed Adriatio.* Venezia, 1860–76.

PICTURES.

Hortus Elginensis. An oil painting of the old Garden established in 1801 by Dr. David Hosack. (Given by Miss Rebecca Harvey.)

PLANTS.

3 *Musa religiosa.* (By exchange with Department of Parks, Borough of the Bronx).

4 succulents for the conservatories. (Given by Mrs. Thomas.)

1 cactus. (Given by the Tropical Plant & Bulb Co.)

446 conifers for the pinetum. (Given by Mr. Lowell M. Palmer.)

30 orchids from Orizaba, Mexico. (Purchased.)

12 herbaceous plants. (Given by Mr. T. E. Wilcox.)

4 bulbs. (By exchange with the Botanic Garden, Leiden, Holland.)

45 herbaceous perennials. (Purchased from B. F. Bassett & Son.)

2 succulents for the conservatories (Given by Mr. C. DeKalb, Tamazulu, Durango, Mexico.)

19 herbaceous plants. (Given by Dr. Schoeney.)

12 plants for the conservatories. (Given by Mr. J. Crosby Brown.)

19 plants for the conservatories. (Collected by Mr. F. S. Earle in Cuba.)

5 plants for the conservatories. (Given by Mr. Otto Neumann.)

1 *Selaginella elegans.* (Given by Mr. Adam Muller.)

95 herbaceous plants. (Purchased from D. M. Andrews.)

1 Begonia sp. (Given by Mr. Robotham.)

16 bamboos. (Purchased from Messrs. Suzuki & Iida.)

1 plant for the conservatories. (By exchange with the N. Y. Zoölogical Society.)

233 shrubs and herbaceous plants. (By exchange with Baltimore Nursery.)

17 plants for conservatories. (Collected by Dr. N. L. Britton at Miami, Fla.)

3 plants for the conservatories. (Given by Mr. P. H. Rolfs.)

34 succulents for the conservatories. (Purchased from L. R. Abrams.)

5 succulents for the conservatories. (Given by Dr. J. N. Rose.)

165 succulents and other plants for the conservatories. (Purchased from Mr. W. L. Bray.)

65 shrubs. (By exchange with the Royal Gardens, Kew, England.)

34 bromeliads and other plants. (By exchange with the Royal Gardens, Kew, England.)

6 succulents for the conservatories. (By exchange with Mr. Weinberg.)

3 *Cereus Greggii*. (Collected by Dr. D. T. MacDougal.)

29 succulents for the conservatories. (Collected by Dr. D. T. MacDougal in the Grand Cañon and Williams, Ariz.)

27 succulents for the conservatories. (Collected by Dr. D. T. MacDougal at Nogales, Mexico.)

7 plants for the conservatories. (Collected by Dr. D. T. MacDougal at Lost River, Tularosa Desert.)

5 plants for the conservatories. (Collected by Dr. D. T. MacDougal.)

92 orchids for the conservatories. (By exchange with the Bureau of Plant Industry.)

23 plants for the conservatories. (By exchange with the Bureau of Plant Industry.)

2 succulents for the conservatories. (From Mr. S. B. Parish.)

105 plants for the conservatories. (Collected by Mr. Percy Wilson in Honduras.)

172 plants for the conservatories. (Collected by Dr. N. L. Britton in Cuba.)

SEEDS.

62 packets. (Collected by Mr. Percy Wilson in Honduras.)

1 packet. (Given by Mr. C. De Kalb.)

1 packet of *Corydalis* seed. (Given by Mr. H. K. Ludwig.)

71 packets. (By exchange with Smith College.)

49 packets fern spores. (Collected by Prof. L. M. Underwood in Jamaica.)

1 packet seed of *Urena sinuata*. (Collected by Dr. N. L. Britton, at Tampa, Fla.)

57 packets. (Purchased from Mr. B. F. Bush.)

3 packets. (Given by Mr. T. D. A. Cockerell.)

1 packet. (Given by Mr. C. Werckle.)

15 packets. (By exchange with Mt. Holyoke College.)

2 packets. (Collected by Dr. D. T. MacDougal at Torres, Sonora.)

1 packet. (Collected by Dr. D. T. MacDougal in the Grand Cañon, Ariz.)

1 packet of *Neowashingtonia filifera*. (Collected by Dr. D. T. MacDougal at Indio, Cal.)

1 packet palm seed. (Given by Mr. P. H. Rolfs.)

74 packets. (By exchange with the Botanic Garden, at Karlsruhe, Germany.)

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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 and 7, 480 pp., 28 plates, 1901, 1902; No. 8 is in press.

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.]

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

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EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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JOURNAL

OF

The New York Botanical Garden

VOL. IV. June, 1903. No. 42.

REPORT OF THE DIRECTOR-IN-CHIEF UPON EXPLORATION IN CUBA.

TO THE BOARD OF MANAGERS,

Gentlemen: By your permission I was absent from the Garden for the period between March 5 and April 3, 1903, engaged in studying and collecting the flora of west-central Cuba, in the provinces of Matanzas and Havana, and in examining the Botanical Garden of the University of Havana. I was accompanied and assisted by Mrs. Britton and by Mr. J. A. Shafer, Custodian of Botany at the Carnegie Museum, Pittsburg, Pa.

On the way south two days were spent at Tampa, Florida, where a collection of 160 species of plants was made, represented by about 600 herbarium specimens, a number of fruits and other products for the museums, and a box of cacti and other living plants for the conservatories. Arriving at Havana on March 10, a day was spent in searching bookshops, which resulted in the purchase of several volumes desired for our library, in a visit to the university and to the botanical garden, where many interesting plants were observed and noted; as this garden was revisited at the close of our trip, I will defer an account of it. Proceeding to Matanzas on the 11th, that city was made the base of operations for the next two weeks. Matanzas is situated at the head of a beautiful bay and at the mouths of two rivers, the San Juan and the Yumuri; the San Juan flows through a broad and fertile valley for several miles from the bay, but its course

then bends abruptly to the south and its upper valley is narrow and with steep slopes. The Yumuri enters the bay through a deep, narrow gorge, with precipitous sides, which it reaches through another broad valley similar to that of the lower San Juan. Another river, the Canimar, enters the bay of Matanzas some six miles east of the city, winding for several miles among high hills, some with vertical, some with sloping sides, its upper valley being broad and extensively cultivated. The plants of these three river valleys were carefully studied, as well as those of several tributaries and of the intervening uplands, access to different

FIG. 12. Valley of the Yumuri, Matanzas, Cuba, with Royal Palms (*Roystonea regia*).

points being had by walking, by carriage and by boats. Three large boxes of living plants, including orchids, palms, aroids, bromeliads and agaves for the conservatories, together with seeds of many other species were shipped from Matanzas, and collections for the herbarium and museums were made of 572 kinds of plants, aggregating over 2,000 specimens, being a good representation of the spring flora of the region. The underlying rock of the Matanzas region is coral-limestone, both of the hills and of the lowlands.

Leaving Matanzas on March 25, a two hours' wait for a train enabled us to examine the flora of a coral-limestone hill at Empalme, where specimens of twenty-five species not seen in the Matanzas region were secured. Proceeding the same morning to Madruga, in Havana province, that town was made a collecting base for four days. It is situated among hills, nearly on the backbone of the island, the underlying rock being an eruptive over an area of several square miles, apparently surrounded on all sides by the coral-limestones. Sulphur springs, popular for baths, cause Madruga to be visited by Cubans. The flora of this

FIG. 13. Hut, thatched with palm leaves. Coconut palm near center of photograph.

area of eruptive rocks proved to be almost wholly different from that of the coral-limestone soil. In fact, along the contact of the two formations south of Madruga the change in the vegetation is so abrupt as to enable one to determine from a glance at the plants whether he is over limestone or traprock, and we located the contact lime within narrow limits for several hundred yards. Specimens of 185 species were obtained at Madruga, nearly all different from those previously observed by us.

Returning to Havana on March 29, the next day was given to a further search of the bookshops, and to a second visit to the botanical garden of the university. It is situated at the foot of the hill on which the university buildings stand, and is readily reached by trolley cars from the city. On the space of a few acres, Prof. M. Gomez de la Maza, the Director of the Garden, has brought together a very interesting and valuable collection of tropical and subtropical plants. The arrangement of the collection is mainly according to relationships, and the greater number of the plants are labelled with the botanical and Spanish names. I learned much from my studies here and was greatly interested in the description which Dr. de la Maza gave me of his work, which is being carried on without the degree of encouragement and appreciation that it deserves. His facilities for teaching are inadequate and he needs help in all ways. The work that he is doing is important enough to justify fully the granting of what he needs. Professor de la Maza handed me copies of some of his published writings for our library, and also a manuscript. I arranged with him for an exchange and we consulted relative to the further botanical exploration of Cuba.

Cuban horticulture and agriculture naturally interested me greatly. It is evident that the possibilities of the island in these arts are immense, when modern scientific methods shall come to be applied to them.

Leaving Havana on March 30 our return was by way of Miami, Florida, where we spent the day of April 1 in company with Professor P. H. Rolfs, Director of the subtropical laboratory of the United States Department of Agriculture, and had the opportunity of looking over his interesting and important experimentation with hybrid citrous fruits, and with the introduction of useful subtropical plants of other countries into the southern United States. We made an examination of the native flora of the vicinity of Miami, including a visit to the eastern edge of the Everglades, and collected herbarium and museum specimens of about seventy species, a number of them the same as those previously observed about Matanzas, the similarity of the flora being evidently explicable by the fact that the soil of both regions results from the decay of the coral rock.

We arrived in New York on April 3 and all the collections made have been received at the Garden in good order.

Respectfully submitted,

N. L. BRITTON,

Director-in-Chief.

REPORT OF PERCY WILSON ON EXPLORATION IN HONDURAS.

DR. N. L. BRITTON, *Director-in-Chief:*

In accordance with your letter of instructions of January 2, 1903, I proceeded to Honduras, Central America, with Mr. Martin Lippmann, as his guest on his plantation, for the purpose of obtaining museum material, herbarium specimens and living plants, and during my stay on his estate to give him any information desired regarding the cultivation of economic plants. I left New York by rail on January 3, and arrived in New Orleans two days later, where I was met by Mr. Lippmann, who had reached that city several days in advance.

On the morning of January 8, we sailed on the steamer *Breakwater* for Puerto Sierra, a small town situated in the northeastern portion of the Republic. During our voyage several points were touched by the vessel, viz., Belize, British Honduras; Puerto Barrios, Guatemala; Puerto Cortez and Puerto Sierra, Honduras. At the former town a stop of several hours was made, which gave ample time to visit the Botanic Station, in charge of Mr. Eugene Campbell. The chief exports of this town are mahogany (*Swietenia Mahogani*) and logwood (*Haematoxylon Campechianum*), both of which are shipped in large quantities to various European countries. On reaching our destination, headquarters were taken up in a small frame building, until the completion of a palm-leaf house on the plantation. The land obtained by Mr. Lippmann is a large tract containing almost seven hundred acres of virgin forest along the Rio Esperanza, a small stream west of Puerto Sierra.

Before selecting his land he looked over many of the large plantations in the vicinity of town in order that he might acquire a better insight into the cultivation of his new territory. His main object is the cultivation of rubber (*Castilloa elastica*) and chocolate (*Theobroma Cacao*), both of which are frequently met with in the forest; but as it takes a considerable time for these plants to mature, a small strip along the river front was cleared for the cultivation of bananas, so as to obtain early returns.

In preparing land for banana culture it is necessary to have the portions selected carefully gone over by the natives, who use their machettes to remove all underbush and small trees; the ground is then marked out in sections and staked in rows. The suckers (young plants) are obtained from some nearby planter and distributed along each stake, where a hole is made and the plants put into position. The large forest trees which were unmolested during the first clearing are now felled, a few being left for shade. During this operation an excellent opertunity was afforded me for the collection of specimens of many trees, which were left on the ground to decompose. After a plantation has once been established it is only necessary to remove the underbush that springs up in the newly cultivated soil every three or four months. In less than a year from the time of transplanting, the banana plants mature and produce fruit, which is transported on mule back, each animal laden with from five to seven bunches, a total weight of almost four hundred pounds, through streams and over muddy trails; in ox-carts, or on rafts down many of the streams.

On reaching the beach the fruit is carried to a shed and stacked on end, where it remains only a few hours before shipment. At several points along the Honduras coast they are not fortunate enough to have wharves, so it is necessary to handle the fruit in lighters, some of which carry as many as five hundred bunches. On ship-board only first-class fruit is received by the inspectors, bunches bruised in transit being rejected.

Among the forest trees of economic importance are several interesting plants, a large variety of chocolate (*Theobroma Cacao*) attaining a height of thirty feet, and bearing on the trunk near the summit a considerable number of narrow, yellow pods con-

taining many seeds which are surrounded by an acrid pulp. These are sun-dried and made into a thick decoction, which is highly esteemed by the natives. The pods remain on the tree until almost decomposed, when the contents fall to the ground in a state of germination.

The cohune palm (*Attalea Cohune*) is frequently met with in the forest or in the open fields, and is utilized by the natives for building houses, or a single leaf is sometimes used as a sail. The fruit is produced in large bunches and is about the size of a hen's egg. The kernel has a flavor much like that of the cocoa-nut, but is more oily. The trunk of this palm contains a large supply of a watery fluid, which is obtained by cutting the palm down and making a hole near the top, and by raising the basal end the liquor flows into the cavity, and is readily obtained with the aid of a small vessel, thus supplying a cooling drink.

Rubber (*Castilloa elastica*) thrives well in the forest, and its cultivation has lately been taken up to some extent. The young plants are obtained in the forest and planted in the shade of bananas on many of the estates. At first they thrive well beneath the shade, but in two or three years they have outgrown the banana plants and become directly exposed to the sun, when the trees begin to appear sickly and do not yield as much latex as those growing naturally in the forests, where they get both shade and moisture. Much comment is now being made on the discovery of a rubber yielding vine, said to be found in the valleys of the Pijo Mountains. The plant is said to attain a length of one hundred feet, with a trunk at least eight inches in diameter.

Several other trees deserve mention, two of which are highly esteemed for their fruit, the "Sapote" (*Lucuma* sp.) and "Anona del Monte" (*Anona* sp.).

The former is frequently met with on the borders of the forest or in many of the plantations. The fruit is egg-shaped, with a russet rind inclosing a rich, almost salmon-colored pulp, in which are imbedded from one to three large seeds. The latter is a large tree forty feet high and produces a fruit about the size of an orange with a hard rind which when cut has a strong odor of turpentine, and a pulp similar to that of the well-known "Sour Sop" (*Anona muricata*), common in tropical regions.

The lowland flora is well represented by many species of Piperaceae, Bromeliacae, Musaceae and Palmaceae. Some of the latter only reach a height of a few feet, while others, *Attalea Cohune* and *Cocos nucifera*, attain a greater height. A method of husking the cocoanut is performed by the natives, who use the heart wood of the palm for a wedge. This is placed in the ground and sharpened at the top. The nuts are pressed down upon it and with a sharp turn the husk is readily separated; a single native husking many hundreds of nuts in a day.

My work resulted in securing between three and four thousand herbarium specimens, seeds and living plants, most of which have been placed in the museum and propagating houses.

On or about March 8, the revolutionists took possession of the town of Puerto Sierra, when we, as well as most other Americans, left for Puerto Cortez.

I sailed from that town on March 12, and arrived in New York March 19.

Respectfully submitted,

PERCY WILSON,
Administrative Assistant.

RECENT ADDITIONS TO THE PALM AND CYCAD COLLECTIONS.

During the past month a number of additions have been made to these collections. A gift of six large palms and one cycad was received from Mr. Walter Hunnewell, of Wellesley, Mass. Among the palms were two large plants of the flat-leaf palm, *Howea Forsteriana*, a native of Lord Howe Island which lies just east of Australia in about 31° S. lat. This is largely grown for decorative purposes in this country under the more common name of *Kentia Forsteriana*, and is one of our most popular palms for this purpose. The plants referred to above are exceptionally fine specimens, plants so large and in such fine condition being seldom met with. They are about twenty-five feet tall to the tip of the uppermost leaf, one with the trunk about eight feet high

and the other about six feet. They may be found in the large palm house near the entrance to house no. 2. Their long graceful feather-like leaves with drooping segments make an attractive feature in that part of the house.

Another specimen of equal value is a well-grown plant of *Pritchardia Pacifica*, a native of the Fiji Islands. In this the leaves are fan-shaped and of a type entirely different from those of the *Howea*. The young leaves, before they unfold, are densely covered with whitish wool, making a striking contrast with the clear green of the mature leaves. The plant from Mr. Hunnewell has a trunk about four feet tall and a total height of about twelve feet. It will be found in the same house with the *Howeas*, and almost opposite to them, near the entrance to house no. 15.

Another palm of this same collection is a vigorous plant of *Coccothrinax argentea*, a native of Panama. It is one of the thatch palms. In size and general appearance this almost matches another plant of this same species which has been in the collection for some time. The genus *Coccothrinax* is grouped near the south door of the palm house, and conspicuous in this group will be noted these two plants which have a height of about eighteen feet.

Another plant of *Rhopalostylis Baueri* or *Areca Baueri*, as it is sometimes called, makes a pair of these striking palms. It is a native of Norfolk Island. The plant from Mr. Hunnewell has a more strict habit and the pubescence on the petioles lighter in color, but otherwise it much resembles the plant which has been in the collection for some time. This recent addition has a trunk of about four feet and a total height of about thirteen feet. It is in the immediate neighborhood of the *Coccothrinax* referred to above.

One of the new palms, of the genus *Phoenix*, the species at present unknown, came in this collection in a showy specimen. It is a large bushy plant which sends out offshoots freely from the base, and probably does not attain a great height.

Perhaps one of the most valuable plants of the collection, at least from the standpoint of the botanist, is a large example of *Ceratozamia Miqueliana*, a native of Mexico. This is a most ac-

ceptable accession, as we are especially desirous of increasing the collection of cycads with large and well-grown specimens. They are of slow growth, and so large specimens represent many years of waiting. For the purposes of study large and mature plants only are available, as in small plants the characteristic foliage and habit do not appear, nor do such plants produce flowers which are so essential in the classification of these odd members of the vegetable kingdom.

Another gift for the palm house is from Mrs. Byron Sherman, of Morristown, N. J. Among the plants received from this source is a fine one of the curly palm, *Howea Belmoreana*, some eight feet high. This is a native of Lord Howe Island. Another plant in this collection is an unnamed *Phoenix*, which may prove different from anything else in the collection. Two plants of *Cycas revoluta*, the sago palm, were also received, and it is hoped that one of these may prove to be a staminate individual, a great desideratum, as all the other plants in the collection have thus far turned out to be pistillate.

GEORGE V. NASH.

NOTES, NEWS AND COMMENT.

Dr. Theodore Holm, of Washington, D. C., was granted the privileges of a research scholarship during April and May and carried out some work on the Ranunculaceae and on the sedges of the Rocky Mountains as represented in the herbarium.

The New York Library Club held its annual meeting in the Lecture Hall of the Museum on Thursday, May 14. In addition to the business transactions of the club a lecture upon "Flower Structures and their Meaning" was delivered by Mr. Silas H. Berry. The members of the club in attendance also visited the exhibition of the Horticultural Society of New York which was being held in the Museum on the same day, and inspected the plantations and conservatories under the guidance of members of the staff.

Mr. John A. Shafer, custodian of botany at the Carnegie Museum of Pittsburg, returned from Cuba May 7. Mr. Shafer made

a large collection of museum and herbarium material during his two months' work on the island, and spent a few weeks at the Garden after his return, making a study of his material with Dr. Britton. A full set of his collection remains here.

Professor L. M. Underwood returned from an extensive tour of Cuba and Jamaica on May 17. A collection of about three thousand numbers was made in Jamaica, where he remained about three months, besides spending a month in Cuba with Professor Earle, as already noted. About four hundred species of ferns were collected, some of which are known to be new to science. A large number of living plants for the Garden collections were also secured. Dr. Underwood has leave of absence from Columbia University until October 1, and will sail for Europe June 6, to spend the summer in study at Kew, Paris, Berlin and other gardens and museums on the continent.

The total precipitation in the Garden for May, 1903, amounted to .34 inch. During the period of fifty-one days, between April 16 and June 6, the rainfall amounted to only .37 inch, resulting in a severe drouth. The thermometer registered over 85° on the five days ending May 22, with a maximum of 92° on the 20th, which heightened the effects of the deficient water supply. Frost occurred on the 2d, the thermometer registering 31.5°. Other notable low temperatures of 38.5° on the 11th and 40.5° on the 26th were recorded.

The temperature of the soil at the depth of a foot (30 cm.) ranged from 41.5° on the 2d to 48° on the 18th, when it began to fall during the period of highest air temperatures, reaching 40° on the 25th and rising to 43° on the 30th.

The new road connecting the driveway system of the garden with Pelham Avenue, extending past the northern end of the herbaceous garden and southward through the forest, on which work was commenced in 1901, was completed and thrown open for driving this spring; a little work still remains to be done in trimming up the edges, but particular care was taken not to disturb existing undergrowth any more than was absolutely necessary during the construction operations. Plate 14 (see frontispiece) shows this road at the southern boundary of the garden.

The road was built jointly under the direction of Commissioner Eustis of the Department of Parks and of the Garden, and furnishes a most beautiful and attractive drive. The total length is about three-quarters of a mile.

The contract for the erection of the stone arch bridge across the Bronx River near the northern end of the garden, designed by Mr. John R. Brinley, was awarded by the Commissioner of Parks in April, to Mr. Friedrich Koopman. Work was commenced by the contractor on May 26. The contract time is ninety days, so it is hoped that the structure will be completed this autumn. The building of this bridge makes possible the completion of the driveways at the northern end of the garden on which work was begun last fall and has been continued this spring.

The Wild Flower Preservation Society of America has just published a list of its membership for the first year, including 264 names; of these 57 are from New York City. Baltimore has the next largest membership, and a local chapter has been organized. The secretary, Mr. Pollard, has just completed a series of lectures in different cities, including Columbus, Cincinnati, Cleveland and Sandusky, Ohio; Chicago, Crawfordsville and Lafayette, Indiana; and Syracuse, New York. His lecture was entitled "Vanishing Wild Flowers."

A meeting was held in the Museum building of the New York Botanical Garden, on Saturday evening, May 16, at 8 P. M., under the auspices of the Olivia and Caroline Phelps Stokes Fund for the Protection of Native Plants. About 150 persons were present, and Mr. Charles Louis Pollard delivered his lecture on "Vanishing Wild Flowers," illustrated by colored lantern slides of those in need of protection. Gleanings from his extensive correspondence as secretary of the Wild Flower Preservation Society of America were given. It has been learned that the American laurel is being still further devastated for making "brier-wood" pipes. What with Christmas decorations, packing for fruits, and its showy flowers this plant seems destined to an untimely end, unless some stringent measures are taken for its protection.

Mr. J. E. Kirkwood, instructor in botany in Syracuse University, has been granted the degree of doctor of philosophy by Columbia University in recognition of his researches upon the "Embryology of the Cucurbitaceae (squash family)," which were carried out at the Garden during 1899–1902.

The annual exhibition of the Horticultural Society was held in the museum building on Wednesday and Thursday, May 12 and 13, in conjunction with the annual meeting of the society which took place on Wednesday. The most attractive feature of the exhibition was the very rich collection of flowering trees and shrubs contributed by Mr. W. H. S. Wood, of Greenwich, Conn., and arranged by L. A. Martin. The same exhibitor made a special display of modern varieties of lilac which attracted considerable attention from the visitors, and a special certificate was given for this display.

Another feature was the wild flower display of the Bedford Agassiz Association, which filled one side of the hall.

M. C. G. Roebling, of Trenton, N. J., made a display of cut orchids including *Laelia Cattleya* G. S. Ball, a hybrid from *Cattleya labiata Schroederae* and *Laelia Cinnabarina* for which a special certificate was awarded.

In the horticultural novelty class the Botanical Garden offered a prize of $50, which was awarded to Siebrecht & Son for *Phoenix Roebelini*, a plant which has been in cultivation for some years but is not commonly known. It is a dwarf palm of most attractive appearance, graceful in effect and fully merits recognition.

F. Weinburg, Woodside, L. I., sent a collection of succulent plants; Lager & Hurrell, Summit, N. J., made a most instructive display of orchids.

The general plant classes were filled chiefly by Siebrecht & Son who won the leading prizes and contributed very considerable to the richness of the exhibition.

At the annual meeting of the society Mr. John K. M. L. Farquhar, of Boston, Mass., delivered an illustrated lecture on gardening in Japan, based upon his own travels and experiences in that country.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

4 specimens of fungi from tropical America. (Given by Mr. E. D. W. Holway.)

100 specimens, "Kryptogamae exsiccatae VIII." (By exchange with the K. K. Naturhistorisches Hofmuseum, Vienna.)

30 herbarium specimens from New Jersey and New York. (Given by Rev. L. H. Lighthipe.)

171 herbarium specimens from Ontario. (By exchange with Prof. J. Fowler.)

1 museum specimen, vegetable sink broom. (Given by Mr. R. M. Harper.)

98 herbarium specimens from New South Wales. (By exchange with Mr. J. H. Maiden.)

117 specimens from Yucatan. (By exchange with the Field Columbian Museum.)

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

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

68 specimens of fungi from Porto Rico. (By exchange with Mr. A. A. Heller.)

100 specimens, "Fungi Columbiani, Century 18." (Distributed by Mr. E. Bartholomew.)

6 museum specimens of pine cones from North Carolina. (Given by Mr. H. de Raasloff.)

17 herbarium specimens from Long Island. (By exchange with Miss F. A. Mulford.)

140 specimens of marine algae of the Faroës. (By exchange with Dr. F. Borgesen.)

62 specimens of fungi from California. (By exchange with Mr. C. F. Baker.)

25 specimens of fungi from California. (By exchange with Miss Alice Eastwood.)

1 specimen of fungus from Pennsylvania. (Given by Mr. John A. Shafer.)

98 specimens of Rubiaceae from Java. (By exchange with the Buitenzorg Botanical Garden.)

2 specimens of the wood of *Ostrya Knowltonii* from Grand Cañon, Arizona. (Collected by Dr. D. T. MacDougal.)

1 specimen or *Antennaria neglecta* from Illinois. (Given by Dr. J. Schneck.)

30 specimens of Cacti from the southwestern states. (By exchange with Prof. J. W. Toumey.)

38 specimens of fungi from Texas. (By exchange with Prof. S. M. Tracy.)

97 specimens of Bignoniaceae and *Pachira*. (By exchange with the Royal Gardens, Kew.)

400 fungi, "Mycotheca Italica" cent. 1–4. (Distributed by Dr. D. Saccardo.)

1,300 specimens "Fungi Selecti Exsiccati" cent. 62–74. (Distributed by C. Roumeguere.)

18 miscellaneous specimens of fungi. (Given by Mr. E. D. W. Holway.)

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EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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ACCOUNT BY PROFESSOR UNDERWOOD OF EXPLORATIONS IN JAMAICA.

DR. N. L. BRITTON, *Director-in-Chief:*

I present herewith a report on my expedition to Jamaica during the first four months of the present year. I sailed from Philadelphia January 15, and returning, reached that port May 18, taking both voyages with the comfortable ships of the United Fruit Company, to whose courtesy we are greatly indebted for the free transportation of the numerous packages of specimens resulting from the expedition.

After a few days spent in becoming adapted to the change of climate and visiting the gardens at Hope and Castleton, I made my headquarters at Cinchona, where the use of the house and the adjoining buildings was generously placed at my disposal by the local government. Cinchona is located on a spur of the Blue Mountain Range, at an elevation of nearly 5,000 feet, and proved a most advantageous center for the work undertaken. At my first visit three weeks were spent in the mountains with Cinchona as a base, visiting on foot or on mule back, nearly all the more favorable localities accessible: Clyde River valley, Mabus River valley, Morce's Gap, Vinegar Hill, Breakfast Spring, Moody's Gap, New Haven Gap, John Crow peak, Old England, Green River valley, Portland Gap, and one trip to Blue Mountain Peak, the crowning elevation of the range, 7,423 feet above sea level. These excursions extended over a range from 2,000 to 7,000 feet altitude, and included every possible combination of exposure and slope, so that for the purpose of studying the habits,

habitats and distribution of the Jamaica ferns, which was the main object of the expedition, no conditions could have been more favorable. The weather, moreover, was all that could be desired for curing the specimens, being in the midst of the dry season, which this year was exceptionally free from rain. The entire lowland region between Kingston and the foothills below Cinchona was yellow and brown at this season with the parched vegetation, the hills reminding one of California in summer; except in favored localities a somewhat similar condition prevailed well up toward Cinchona, but in the higher altitudes the air became more moist, and while there was little rain, clouds often floated about the mountains and settled like a moist fog, but were soon dispelled.

The path from Cinchona to Morce's Gap, a nearly level stretch of three miles, passes at one point over the dividing ridge between the north and south slopes of the range; within so short a space as fifty feet from this divide the change of vegetation is clearly apparent and you are thrown at once from ordinary forest conditions into the midst of a tropical forest in which tree ferns form a predominant feature and every projecting root, every sheltered bank, and the trunks of the tree ferns themselves are the nesting places of exquisite filmy ferns. Without stepping from the bridle-path one could readily gather one hundred species of ferns in going over these three miles, and mosses and hepatics are in similar profusion.

The Blue Mountain region is historically interesting to a botanist as the region in which Swartz made his early collections over a century ago, and the mosses and liverworts had scarcely been collected since his time. Many of his type specimens of ferns came from this region and the material obtained will possess a greater value from this circumstance.

Toward the end of February I made arrangements to go to Santiago, Cuba, to meet Professor Earle whose report of our collections made in that island during March has already appeared in the May JOURNAL. I have only to add the fact of the extreme difficulty of securing passage between these two islands only ninety miles apart. My passage over was finally made in a

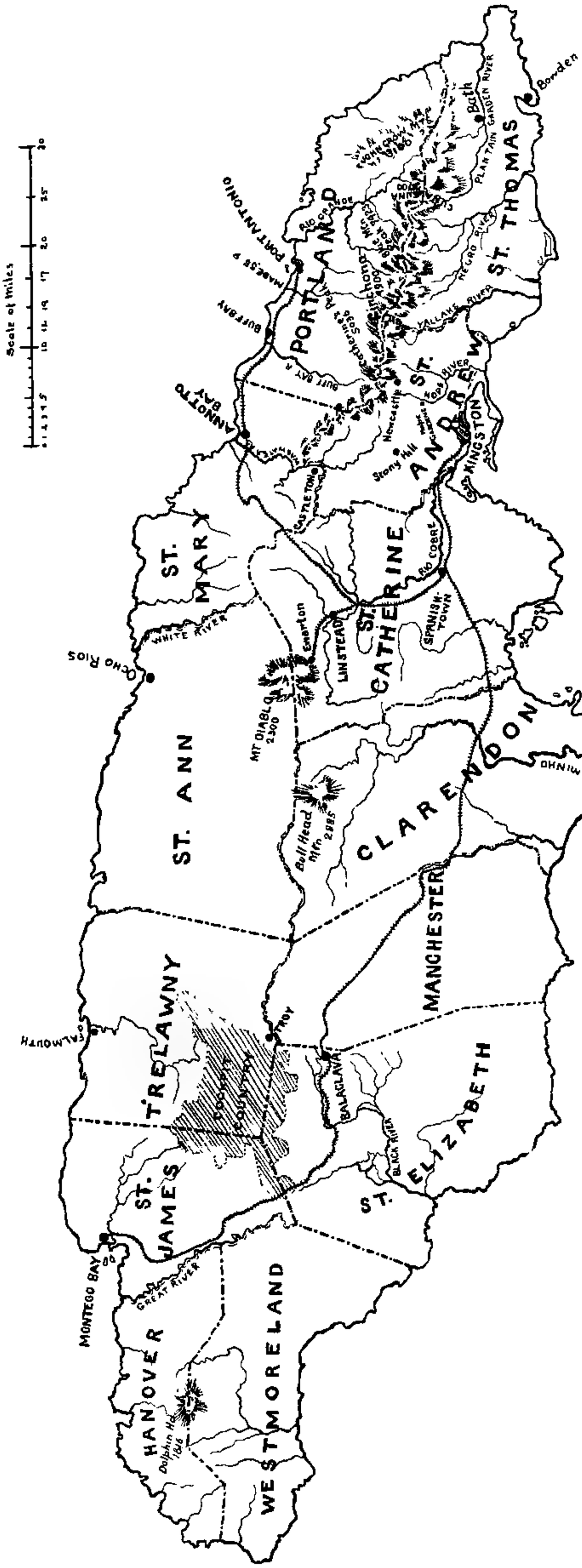

FIG. 14. Map of Jamaica.

schooner in which the filthy accommodations destroyed what might have been a delightful trip and left the voyage a thing to be remembered, whose forgetfulness would be more pleasant. The return voyage by the same means was avoided only by the chance appearance in Santiago harbor of one of the smaller ships of the United Fruit Company, which made the return to Port Antonio in a few hours. The lesson from my experience for future collectors would be to plan expeditions for one island at a time unless some generous friend places a yacht at their disposal for a more general survey of the West Indies, for the same difficulty obtains in intercommunication between any of the islands.

On my return I collected for a day in the vicinity of Port Antonio and made one excursion with Mr. William Harris, the superintendent of the Gardens, to Linstead, Ewarton, and Holly Mount in the Mt. Diablo region near the center of the island.

This region, abounding in limestone rocks, proved very interesting for my purpose and many things which I had as yet seen nowhere else came to light here. Among others was the climbing fern, *Aspidium adscendens*, which is fairly common in this region, often ascending trees to the height of twenty or thirty feet, and resembling in habit and cutting *Polybotrya osmundacea*. In the artificial ponds near Ewarton, a species of *Marsilea* which has been referred to the Brazilian *M. polycarpa* is abundant. Living plants were shipped to the Bronx by packet post. Its peculiar arrangement of sporocarps renders it a most interesting problem for some one who desires an interesting morphological and embryological study. It was my intention to make a second visit to this Diablo range but it was found to be impracticable. Two weeks could be spent profitably by a collector in this region among the mosses and ferns alone, and later in the year the higher flora would repay careful study. Among the novelties noted was a fan palm, apparently undescribed, with a trunk over forty feet in height and not exceeding three inches in diameter at the base. It grows in dense woods, on the jagged limestone characteristic of the region.

On April 9 I was met at Castleton by Mr. William R. Maxon, of the U. S. National Museum, who had expected to be with me

earlier in the season. Castleton Garden is a most delightful plantation, containing a fine collection of palms accumulated largely by the late George S. Jenman, who was superintendent from 1873 to 1879. It was during this period that he made a special study of the Jamaica ferns and accumulated the Jamaica section of his magnificent fern collection recently secured by the Garden. Several days were spent in the vicinity of Castleton about the Ugly, Ginger, and Wag Water rivers in order to explore particularly the region studied most thoroughly by Jenman. In this way we were enabled to understand more clearly Mr. Jenman's statements regarding the frequency and distribution of certain species in his account of the ferns of Jamaica since we could thus study the distribution problem from his standpoint as well as from our own. For the same reason we planned a trip from Castleton to Cinchona extending over a week to include other regions studied by him and explore some newer territory. We spent four days at Tweedside, for the shelter of which we are indebted to the kindness of the owner, Mr. W. B. Hannon, of May Penn, and explored the hill region of that now overgrown plantation. How far ferns become weeds in that region may be seen from the fact that the paths neglected a few years only had grown up to various species of *Dicranopteris* (*olim Gleichenia*) to such an extent as to be impassable except as they were beaten down by our guides throwing themselves bodily upon them, after which we walked sometimes a fourth of a mile or more on the bed of ferns thus made and one to five feet above the path on a substratum more unstable than a spring bed. Tweedside is adjacent to "Second Breakfast Spring" which was also one of Mr. Jenman's favorite resorts. Continuing our itinerary, Moody's Gap and the lower slopes of Mount Moses were explored, and we camped in the road house belonging to the commissioner of public works at Hardware Gap on the carriage road from Buff Bay to Kingston. This region would be well worth more extensive exploration than we could give it; mosses, hepatics and lichens were in the greatest profusion on the moist banks and on the trees and tree ferns. This is the most favorable tree fern region accessible by carriages. In this vicinity we

obtained the extremely rare *Enterosora Fawcettii* for which as for many of the rarities obtained at various points we were indebted to the keen trained eyes of our guide to the Blue Mountain region, David E. Watt, who oversees the government garden at Cinchona. Raised in the vicinity, a rover in the forest from boyhood and familiar with it, for many years an employee at Cinchona, Watt proved a most valuable assistant to us during our two sojourns at Cinchona. Continuing our journey the next night was spent at Silver Hill Gap and the following day in exploring the almost inaccessible ravines of Doll Wood, where many varieties were found, among them *Camptodium pedatum* (Desv.) Fee which grows in abundance under the spray of waterfalls. The tough thick leaves often become thickly encrusted with a calcareous deposit from the constant spray.

We then made a stop of ten days at Cinchona where we had the pleasure of the company of Dr. D. S. Johnson, of Johns Hopkins, and Mr. Shreve, one of his graduate students, who remained at Cinchona two weeks longer than we, making a field study of the Piperaceae and collecting material for embryological study. We explored anew the regions accessible from that center and made a second and more extended visit to Blue Mountain Peak. On this second trip we encountered a most peculiar condition which, to judge from the usual character of the mountain vegetation, cannot be of ordinary occurrence. On the morning after our stay — a clear morning which afforded us a most magnificent view of the country to the north and east of the mountain which we had missed on our former visit — the atmosphere was intensely dry, so much so that the mosses, ferns and lichens with which the trees and rocks are heavily draped were so absolutely desiccated that they crumbled to dust as you took hold of them and the dust produced by grasping the trees in climbing up or down the steep inclines caused excessive irritation of the mucous membrane of the throat, affecting all in the party alike.

The fern flora of the mountain summit is very interesting; *Asplenium Harrisii*, *A. Fawcettii*, a *Dryopteris* which has been erroneously referred to *D. filix-mas* and a *Filix* allied to *F. fragilis* which may be the long lost *Cystopteris Jamaiciensis* Desv. were

among the many rarities that are found on the summit. Three species of tree ferns extend to the very top of the mountain.

After leaving Cinchona we spent several days in the vicinity of Bath, where Wilson, the first island botanist, established botanical gardens during the first half of the last century. Besides making a horseback trip to Cunacuna Pass we were most hospitably entertained at Mansfield, Wilson's old home, by Mr. A. H. Groves and his family, who rendered us every assistance in exploration. The Mansfield property extends back to the foothills of the John Crow range which runs parallel to the eastern end of Jamaica. We pushed back for a distance into these foothills, securing *Anetium citrifolium* which grows on the trunks of the long-thatch palm, besides many other varieties. We learned that there would be no difficulty in securing hunter-guides who are familiar with the John Crow Range, which has bever been explored botanically, and its exploration would well repay a special expedition.

After returning again to Hope Gardens Mr. Maxon visited the Dia Region where Mr. Purdon, of Kingston, had generously offered us the freedom of his house at Holly Mount, while Mr. Harris and myself visited the famous "Cockpit country," being the first botanists to explore that region. Strange stories had come to us of the dangers of this region both before reaching Jamaica and from Jamaica residents who warned us not to visit it. On the old map of Jamaica it is even printed "The Cock Pit country, also known as the region of Look Behind." As we reached Troy, on the edge of the Cockpit country, our doubts, had we had any, disappeared. The region is a vast coral uplift twenty miles or so in either direction, consisting of conical hills with steep sides and with deep pits, or sink-holes between. The rock is jagged and sharp angled and more or less treacherous to run against but there is no more danger in the region either from the country or its inhabitants than in exploring the Jamesville lakes in central New York. The limestone rock, quite similar to that of the Diablo range, is the home of many species of ferns not found in the Blue Mountain region. Since we were the first to explore this region botanically, we collected practically all the

fern species seen, even those of general distribution, an account of which will appear in the general report on the Jamaica ferns, to be prepared jointly by Mr. Maxon and myself.

The results of the expedition may be footed up in 3,000 numbers of herbarium specimens and seven boxes of living ferns and orchids, for which I had recommended a special appropriation to be made. Of the 3,000 herbarium numbers about one half consists of ferns and one fourth hepatics; the remaining fourth is largely mosses, but with two hundred or more lichens, a few algae, one hundred or more fungi, and perhaps as many flowering plants.

Mr. Maxon secured about 1,300 numbers, many of which are of flowering plants; quite a number of the latter were secured in duplicate for which I have arranged an exchange for some of the ferns collected during my first Cinchona residence and not obtained by him.

In all over four hundred species of ferns were collected and studied afield. It was my purpose to make this collection in connection with the Cuban ferns obtained with Professor Earle, the most notable collection ever brought out of the West Indies and I believe I have succeeded in my effort. Duplicates were largely disregarded so that the bulk of the collection is practically unique, except that the 300 species collected with Mr. Maxon are equally represented in his collection in the U. S. National Museum. In securing the larger species care was taken to show, as far as the limits of a series of herbarium sheets could do, the habit and entire character of the plant. In some cases this required as many as five or six sheets to illustrate a single leaf, and in most of the plants collected the appearance of the entire leaf may be easily made out and exhibited on the sheets. In case the root was too large it was kept with the specimen for the sheet, but in many cases the roots have been separately collected for preservation in boxes. In the case of the numerous tree ferns collected, not only has the entire leaf from petiole to apex been preserved in a serial collection, but a specimen of the top of the trunk fifteen to twenty inches long was secured, showing the important characters connected with the armature of the petiole and the leaf scars. This

collection of tree ferns is, I think, unique in its completeness. Plants of the rarer species were collected from various localities, and young stages were taken whenever possible as well as noticeable variants and forms ; so that the results will be summed up in an addition of between 4,000 and 5,000 sheets to the collection. The Cuban ferns, collected jointly with Professor Earle, will include at least 600 sheets more.

The lower cryptogams, particularly the hepatics, will doubtless be found to be extensively duplicated, the same species appearing from several localities ; the hepatic collection, however, will be found to be fairly representative of the regions visited, at least for the more conspicuous forms. Closer collecting will add many of the smaller bark-loving species of *Frullania* and *Lejeunea*.

Not the least important of the results of the expedition was a possible solution of the problem of a suitable location for a tropical laboratory which has long been under consideration by American botanists. At the time of the visit of the committee appointed some years ago to investigate the subject the plant at Cinchona was occupied by the government botanist and was consequently out of the question. Now, the exigiences of the agricultural development of the island are such as necessitates the location of the experimental farm at a lower altitude and the buildings at Cinchona are deserted. A one-story six-room house, three or four low buildings suitable for laboratory work, with two greenhouses of sufficient capacity to conduct experimental work under glass could be had of the Jamaica Government at a nominal rent. Cinchona is nearly a mile above the sea with a delightful climate (the extremes of temperature for the past twenty years being 45° F. and 79° F.), a delightful outlook, and as closely accessible to virgin forest as could be obtained. Within three miles nearly on a level is Morce's Gap whose tropical conditions I have described above ; close to Morce's Gap you make this ascent to John Crow Peak (6,000 ft.), through a forest of tropical luxuriance. Below is Mabess River (3,000 ft.) with similar but lower-level vegetation. At about the same distance from Cinchona (three miles) is New Haven Gap (5,500 ft.) with a similar but higher-altitude flora. Still higher altitudes are accessible at Port-

land Gap and Blue Mountain peak at a distance of eight to ten miles.

There are no human habitations above Cinchona, so that the Clyde River which supplies it with water, is pure and without sources of contamination; a more healthful location could not be found in all the American tropics. There is a tropical laboratory located and built by a botanist (Mr. Thompson), easy of access, delightful in situation, which could furnish accommodations for eight or ten botanists at a time and at a normal cost for living. It ought to be possible to make this available for American students and furnish a second Buitenzorg on this side of the world.

FIG. 15. General view of Cinchona showing rose terraces, clumps of pampas grass and botanist's residence.

In addition to acknowledgments made above I wish here to express my thanks to the Hon. William Fawcett, director of the public gardens and plantations, for the generous use of the herbarium and library, and the freedom of the grounds at Hope Gardens and for the Cinchona house and laboratories. To Mr. William Harris and his family for very many suggestions of fields for work, and for his genuine brotherly solicitude for my comfort and welfare during my entire stay, my warmest thanks are due.

To Mr. Charles Squier, the genial traffic superintendent of the Jamaica Government Railway, we are indebted for the free transportation of the material collected during the exploration.

As you will remember it was my intention to spend a short time in Dominica. The difficulty and loss of time encountered in passing from one island to another, added to the fact that there was more than enough to occupy my time in Jamaica, led to the abandonment of this part of the trip for the present.*

The John Crow Range, still untouched by any botanist, Bull Head, Dolphin Head and the Ocho Rios regions still unvisited by me, the higher portions of Mt. Moses, the Diablo range and the entire Cockpit country on which we barely touched one edge, are all regions that still demand exploration. Some time I hope to collect some of the remaining hundred species of ferns in Jamaica itself. The island is comparatively small, but the details of its botanical features still remain to be exploited.

LUCIEN M. UNDERWOOD.

1 June. 1903.

THE TREE-FERN HOUSE.

In part by gift and by exchange, but mainly through acquisitions made by expeditions to the West Indies, the collection of tree ferns installed in this house has recently been markedly increased in number of specimens so much so that the collection will soon outgrow its present quarters and require more room for its accommodation. The gifts and principal exchanges have been chronicled in the JOURNAL from time to time. The results of the expeditions have not been noted. During the fall of 1901, Dr. Britton, on his return from an exploration of the island of St. Kitts, brought back with him a number of these interesting ferns, and these are now making a vigorous growth. Two of these are

* Dominica is now being explored by Professor Lloyd of Teachers College, who, with Mrs. Lloyd, will spend the summer on that island, aided by a grant from the Herrman Fund of the Council of the Scientific Alliance of New York. When Professor Underwood returns from Europe in the autumn he will therefore probably find a good representation of Dominican ferns to add to his already immense and valuable accumulation of specimens.—N. L. B.

Hemitelia grandifolia and *Alsophila aspera*, the latter doing remarkably well. Another expedition sent out to Porto Rico was successful in securing several other species. The largest addition was made, as might be expected, from the island of Jamaica, that home of the ferns, where many species of tree ferns are to be found, as well as hundreds of others which do not attain the dignity of a tree, but which are, nevertheless, just as attractive in their way. Mr. Earle, of the Garden staff, was instrumental in securing this extensive addition upon his visit to that island last year. Over fifty specimens, with trunks ranging from a few inches to several feet high, were secured in this way. A large number of these are now well established, and many of them are at present gracing the collection at the conservatories.

It may be interesting to note here that in collecting tree ferns and preparing them for shipment it is necessary to cut off all the large fronds, leaving only the immature ones at the top of the stem. The roots are also pretty well trimmed off, and the denuded trunks, looking more like material prepared for firewood than living plants, are then packed in moist moss in boxes. Packed thus they arrive in excellent condition, and almost immediately, upon being planted, begin to send out their long fronds which rapidly and successively increase in length as the plants attain a firmer roothold. Were the fronds left on in shipping, the plants would not only be constantly weakened by the transpiration of moisture, but the fronds would soon decay and this decaying matter would endanger the young undeveloped fronds which are so closely packed in what is called the bud at the apex of the stem.

Probably to a great many people the idea of a fern being called a tree will at first seem odd, for all the many native forms of our own woods and swamps do not attain to this dignity. Even in Florida, where many other tropical ferns occur, no tree ferns are known. The tree ferns occur mainly in tropical regions, although some few are native in temperate climes. They reach their greatest development in South America, some of them growing there high up on the Andes. They are also numerous in the West Indies, and in Mexico and Central America as well but to

FIG. 16. Tree Ferns in Conservatories.

a less extent. The Old World has relatively but few species, perhaps reaching their greatest development in Asia and the Malayan region, with Australia and the adjacent islands, including New Zealand, taking second place; Africa, including Mauritius and other islands, has a smaller representation. It is in tropical America, however, that they are to be found in the greatest profusion, for it is probable that more species occur there than in all the other regions put together. They inhabit, as a rule, mountain ravines.

Their successful culture requires, excepting for a few species, a hot, humid, confined atmosphere and plenty of shade. These conditions being present they will thrive and grow rapidly, and no plants in cultivation are more imposing and graceful than are these, a collection of them always exciting public admiration.

In our collection there are at present about thirty kinds of tree ferns, represented by about one hundred and thirty specimens. It must be remembered that a tree fern is not always tall, for any fern which develops a well-defined aërial trunk comes under that category, even if the trunk is but six to twelve inches high. Many of the *Lomarias*, of which there are a number on one of the side benches in this house, are tree ferns, and are but diminutive examples of their giant relatives in the center of the house.

Among the larger tree ferns in the collection is a specimen of *Alsophila australis*, a native of Australia. This is the most commanding plant in the collection, and looms up well above the others, as shown in the illustration accompanying this article. Another noteworthy plant is an excellent specimen of *Cibotium Schiedei*, a native of Mexico. Its large drooping fronds, with their pendulous pinnae, form a graceful and attractive feature in one corner of the center bed. The base of the petioles is covered with a rank growth of long tow-like hairs. *Dicksonia Antarctica*, from Australia and Tasmania, is represented by several specimens, one a large tree with a climbing plant of the aroid family covering its trunk. Near the large plant of *Alsophila australis*, referred to above, is another tall tree fern, from Porto Rico. This was so long delayed in transit that it received a check and it was several months before it made a start. It is

now doing nicely and promises well. This is *Cyathea arborea*, widely distributed in the West Indies.

There are a number of specimens of *Hemitelia grandifolia* and *Alsophila aspera*, already alluded to, with trunks two to four feet high. The former of these is common to both the West Indies and South America, while the latter is restricted to the West Indies. These particular plants are from the island of St. Kitts. Of an entirely different type of tree fern is *Blechnum Corcovadense*, from Brazil. A large specimen of this is near the *Dicksonia* referred to. Its erect simply pinnate fronds, with the pinnae crisped on the margins, give it quite a different appearance.

While this is alluded to as the tree-fern house, it is not entirely restricted to such ferns. Many other large specimens, but without trunks, are also grown here. Conspicuous among these is a well-grown specimen of *Cibotium Barometz*, from China. This will be found in the southwestern corner, just opposite to the *Lomarias*. It is this species which gave rise to the legend of the Barometz or Scythian Lamb, which, according to Bauhin, in 1650, was found growing attached to the roots of a plant, and was thus supported in a perpendicular position. The animal continued to feed upon the herbage around as far as it could reach, and when this supply of food was exhausted the animal died. It must have required a strong imagination to evolve such a tale, for there is little about the plant to suggest it; it is based, it is said, upon the dried rootstocks. It was not until nearly a century later, however, that this myth was exploded and the truth made known.

Todea barbara, from South Africa and New Zealand, is another fern which can hardly be classed as a tree fern, although its rootstock does sometimes become elongated to some extent. It is a relative of the *Osmundas* of our own swamps and belongs to the same family, the Osmundaceae. *Acrostichum lomarioides*, from tropical America and Florida, is represented by a number of large plants on one of the corner benches. Its tall erect or ascending fronds are simply pinnate. These specimens were secured in the neighborhood of Miami, Florida, where it grows in great profusion in fresh or brackish marshes.

Of the Marattiaceae, another of the fern families, we have two of the genera represented, *Marattia* and *Angiopteris*. These are peculiar in having stipule-like organs at the base of the petiole where it is articulated with the rootstock. The fronds are large, broad and decompound, and are much alike in both genera. They are separated by the form of the receptacle containing the sporangia ; in *Marattia* these are multicellular, while in *Angiopteris* they are unicellular and placed in two-ranked rows. We have a single species of each, *M. fraxinea*, which is native from western Africa to Malaysia and New Zealand, and *A. evecta*, indigenous from India and Japan to Madagascar and Queensland.

Another family represented is the Gleicheniaceae, inhabitants of the warmer parts of both the Old World and the New. One specimen of *Dicranopteris flabellata* came to us a few years ago as a very small plant, which has now grown into a large busy specimen. It is a native of Australia and some of the adjacent islands.

Ferns not only assume tree-like forms, but many of them are also vines, and climb on neighboring vegetation. We have an example of this in our own native *Lygodium palmatum*, the Hartford fern, and I believe the only one indigenous to the country. *Lygodium* belongs to the Schizaeaceae, to which also belongs another of our native ferns, the tiny *Schizaea pusilla*, which occurs abundantly at several places in the pine barrens of New Jersey. On the westerly side of this house will be found two species of *Lygodium* climbing on supports furnished for the purpose, both from the warmer parts of the Old World ; one of these is *L. dichotomum*, the other *L. Japonicum*, the latter frequently found under the name of *L. scandens*, from which it differs materially.

We now come probably to the most curious ferns in this house. These are the stag-horn ferns, so called from the great resemblance of the fronds of several species to the antlers of the stag. These in their native wilds grow attached to trees ; under cultivation they seem to be best grown on peat, this more nearly meeting their natural conditions. There are not many species of this genus, *Alcicornium*, or *Platycerium*, as it is frequently called, some ten or a dozen completing the number. But they are very strange and odd and resemble very little, in general appearance,

the ordinary conception of a fern. They bear two kinds of fronds : one usually stiff and erect, or appressed to the substratum, and sterile ; the other, larger and in most species much resembling stag horns, fertile, bearing the sporangia in masses at the end of the divisions or in their sinuses. These are indigenous to the Old World with one exception, a native of South America. A bench of these will be found in the northwest corner of the house. Six or seven species are represented : two from the western coast of Africa, *A. Angolense*, with its broad wedge-shaped fertile fronds, and *A. Stemmarium*, often known under the name of *A. Aethiopicum*, a much larger and more robust plant with forked fronds ; three from Australia, one, *A. grande*, from the northern part, another *A. Hillii*, from Queensland, and a near relative of the third, the more common in cultivation, from the temperate parts of the island, *A. bifurcatum*, or *Platycerium alcicorne*, as it is commonly called ; the remaining species, *A. Willinckii*, is from Java.

Hanging from the roof of this house, and greatly adding to its attractiveness, are a number of fern baskets, the long fronds hanging down in graceful masses. Among these are *Nephrolepis exaltata*, the sword fern, common in tropical America and in Florida, and their related species, including *N. davallioides*, from Java, and the odd little *N. Duffii*, from the Duke of York Island, with its narrow erect fronds bearing short rounded closely set pinnae in a fashion quite unlike its neighbors. The *Davallias* also lend themselves well to basket culture, the best of these being the common *D. dissecta*, from Java, and the closely related *D. Fijiensis*, with its larger and more plumose fronds, from the Fiji Islands. Baskets of both are suspended from the roof. And last, but not least, is *Phlebodium aureum*, the golden polypody, a native of tropical America and Florida. In the latter region the writer has seen it growing in large masses on the palmetto palm, its stout rootstocks, covered with the golden-brown hairs, from which it derives its common name, sending its roots deep down into the masses of humus collected in the persistent sheathing bases of the old palm leaves. In wet humid hammocks it is frequently found adorning the trunks of this palm..

But a small number of the ferns now brought together can be discussed in this article and a personal visit is necessary to know the collection. To those fern lovers who wish to know more about the tropical relatives of those wild ferns with which they are so familiar in their native haunts, I would say that a visit, and many visits, to this collection would well repay them.

GEORGE V. NASH.

NOTES, NEWS AND COMMENT.

Mr. Stewart L. Burnham, who has been in the service of the Garden as a museum aid since 1900 has resigned his position to become a member of the literary staff of Webster's Dictionary.

Professor Francis Ramaley, of the University of Colorado, Professor J. B. S. Norton, of the Maryland Agricultural College, Dr. E. J. Durand, of Cornell University, Mr. C. L. Pollard, of the U. S. National Museum, Mr. W. R. Maxon, of the U. S. National Museum, Mr. J. F. Cowell, of the Buffalo Botanic Garden, Professor E. M. Wilcox, of Auburn, Alabama, and Mr. C. G. Lloyd, of Cincinnati, have visited the Garden during the last month for the purpose of consulting the library and the collections.

Dr. B. E. Livingston, instructor in plant physiology in the University of Chicago, has been granted a research scholarship in the Garden beginning September 1, 1903.

The total precipitation in the Garden for June, 1903, amounted to 8.28 inches.

Maximum temperatures of 85° on the 3d, 77° on the 9th, 68° on the 21st, and 80.5° on the 20th were recorded; also minima of 44.5° on the 1st, 50° on the 13th, 50.5° on the 17th and 50.5° on the 24th.

The temperature of the soil at a depth of a foot ranged from 41°F. on the 1st, to a maximum of 44.3° on the 12th, from which time a steady decrease ensued until a minimum of 37.5° was reached on the 24th. The temperature in the same locality ranged from 44.5°F. to 55°F. during June, 1902.

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EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

CONTENTS

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Herbaceous Grounds, looking North. July, 1902.

JOURNAL

OF

The New York Botanical Garden

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THE HERBACEOUS GROUNDS.

The accompanying illustration (Plate XVI.) presents a view of this plantation looking north from the elevation at the extreme southern end. One of the prettiest glades in the Garden is devoted to this collection of hardy herbaceous plants; to see it at its best, a visit should be made late in the afternoon when the long-cast shadows of the fringing trees add a charm and repose not found during midday. During this cool hour a much better inspection can be made of the many species here brought together than during the glare of the earlier part of the day.

The tract is divided into two portions by a brook which traverses it from north to south, the area to the east, devoted to the endogenous plants, being about one half of that to the west which contains the exogenous plants. Each side is bordered by a rocky ridge and a fringe of trees, the ground sloping from their bases gradually down into the stream. This varied topography permits of the growing of a large number of species, from the rock-loving and shade-loving forms to those desiring water. These aquatics conform to the sequence, which is that of Engler and Prantl's "Naturliche Pflanzenfamilien" occupying the east or west side of the stream or its lagoons, depending upon whether the plants are exogens or endogens.

In the extreme southern end there is a natural shaded rockery, which has been extended, and in its completed form will make an ideal home for the ferns and their allies, many of which have already been brought together there. Following these in order on the east side of the glade are the grasses, sedges, rushes, lilies, amaryllids and orchids.

On the west side the sequence begins at the northern end and continues to the extreme southern boundary of the Garden. The buckwheat, birthwort, pink, crowfoot and poppy families are in the northern end. These are followed by the mustard, rose, pea, saxifrage and geranium families and their allies ; and in the southern end will be found the phlox, mint, figwort, teasel, bellwort, chicory and sunflower families, the latter occupying a large area. The plants are all arranged in families and these so placed as to indicate the botanical sequence. Related families are thus brought into juxtaposition, thereby permitting of a ready comparison of related forms. This arrangement is of great value to students, and as an educational feature its benefit can hardly be overestimated. Each bed contains a sign indicating the common and botanical names of the family, and smaller labels for each plant are being placed in position as rapidly as possible. These, in addition to the common and botanical name of the plant, give also the native country.

There is always something of interest here, from the earliest days of spring till late in the autumn when frost kills all vegetation, and repeated visits are necessary to appreciate the varied nature of this collection.

GEORGE V. NASH.

NEW PATHS AT THE SOUTHERN END OF THE GARDEN.

Work has been going forward during June and July on the paths at the Southern Boulevard entrance at the southern end of the Garden. The path at the east side of this entrance has been completed, leading northward to the Museum Building and the Hemlock Forest and has been connected by a short path just within this entrance with the path encircling the Herbaceous Grounds previously constructed. The building of the path on the west side of this entrance is progressing. The work along this line has been difficult and tedious on account of rock ledges which had to be excavated to a sufficient depth and replaced by soil between the paths and the driveway so as to make

future planting possible, and considerable grading of both rock and earth still has to be done near the west side of the entrance, but everything is now prepared for the city Department of Highways to obtain the necessary funds and to proceed with the permanent building of the Southern Boulevard from this entrance south to the Zoological Park; as this stretch of road is now travelled weekly by many thousands of people passing southward from the Garden to the Zoological Park and *vice versa*, it seems likely that this improvement will soon be made.

Another entrance from the south at the southern end of the Herbaceous Grounds was finished in July, by connecting the path encircling these grounds with one built by the Park Department through the part of Bronx Park lying south of the Garden on the west side of the Bronx River, leading southward through fields and woods to Pelham Avenue. This path enters the Garden among the plots containing the collection of hardy ferns, which has recently been materially increased by the gift of about two hundred plants representing some ninety kinds, presented by Mr. Lowell M. Palmer, of Stamford, Conn. This "fern entrance" is in a natural thicket of spice-bush (*Benzoin*) shaded by American elm, sweet birch, butternut and red maple.

N. L. Britton.

THE FLOWERING OF A RARE FLORIDA PALM.

On the keys and the mainland of southern Florida a number of palms grow which are found nowhere else. Some of them are confined to the keys, and among these is a large tree, attaining a height of some thirty or forty feet. Rumors of the existence of an undescribed palm in Florida reached the north. Investigation revealed this new palm on Elliott's Key, and at one or two other places, but not in great quantity. It was described by Herr Wendland, a renowned student of the palms, at that time the director of the Herrenhausen Palmgarden at Hanover, Germany, who named it *Pseudophoenix Sargentii*, the generic name suggested by its resemblance to *Phoenix*, the date palm, and the specific name in honor of Professor Sargent, who did much to make it known.

During the fall of 1901, the writer visited the locality on Elliott's Key, but unfortunately, owing to the clearing of the land, the trees were all but exterminated. One poor lone specimen, evidently but the semblance of its former self, was found in the center of a pineapple field, and just about giving up its struggle to maintain an existence. Two other specimens were preserved in the vicinity of a dwelling, and these were the sole survivors.

Before this destruction occurred, however, a number of specimens had been transplanted to a private place at Miami, on the mainland, some thirty miles north of their old home. Through the influence of a friend, permission was secured to remove one of these and ship it north. It was placed in the large palm house at the conservatories, where it still remains. It is extremely difficult to transport and transplant some palms, and this proved to be one of this kind, for it remained in a dormant condition for a year and a half. But finally a new leaf began to unfold, and shortly after a number of flower clusters began to open. These are now developing nicely and promise to mature.

So far as known, this palm has never before flowered in a conservatory, and there is probably no other large specimen, outside of Florida, under cultivation in the world. Young plants, grown from seed, are in several of the European collections, and in some of those in this country, but it will be years before they are large enough to flower. As already remarked, this palm attains a height of thirty or forty feet; the specimen in the conservatories is about twenty feet tall. In shipping it is necessary to cut off nearly all the leaves, so that our specimen as yet presents but a poor resemblance to the palm as it grows in its native wilds. There the trunk is of beautiful symmetry, and is crowned by a rounded mass of leaves of a deep rich green, which much resemble those of the date palm. The leaves are rather stiff and have a clean-cut appearance. There are more graceful palms, but few approach this in the deep green of its leaves.

At the time that this specimen was transported to the Garden, examples of several other species were also secured, and it is hoped that some of these too will eventually flower.

GEORGE V. NASH.

FIG. 17. Breaking ground for Newell Avenue Bridge, May, 1903.

THE "NEWELL AVENUE" BRIDGE.

The beginning of work on this bridge was recorded in the June issue of this Journal, ground having been broken for the abutment on the east bank of the Bronx River on May 26. A photograph taken at that time by Dr. W. A. Cannon is reproduced herewith showing the site, which is near the northern or Williamsbridge end of the Garden. High water in the river during June and the early part of July, greatly delayed the building of the concrete abutments, but they are now (August 1) completed up to the spring lines of the arch and ready to receive the superstructure. As stated in the June Journal, this bridge is designed to carry the main driveway now under construction across the Bronx River; it will also carry a path across on each side of the driveway, which will be about twelve feet above the mean water-level and about eight feet above flood-level.

The site is among alder-thickets in the "North Meadows," and the low-arched bridge will fit easily into the natural landscape. The future planting of its surroundings will be made with a part of the "Salicetum," the collection of willows, to which other moisture-loving trees and shrubs will be added. Some of these have already been set during the past two or three years, and the completion of this bridge and the driveway will soon permit the continuation of planting operations at the northern end of the Garden. (See Fig. 17.)

N. L. BRITTON.

REPORT OF MR. C. L. POLLARD ON THE USE OF A GRANT FROM THE CAROLINE AND OLIVIA PHELPS-STOKES FUND, 1903.

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

Dear Sir: I have the honor to transmit herewith my report of a lecture tour undertaken with the aid of the Caroline and Olivia E. Phelps-Stokes fund for the protection of native plants, the object being to arouse public interest in the matter of plant preservation.

In accordance with the plan for an itinerary approved by the Board of Managers of the Wild Flower Preservation Society of America and indorsed by you, I left Washington on May 3 and visited successively the following cities, lecturing on the topic "Vanishing Wild Flowers," with the aid of my own lantern slides for illustrative purposes. The local institution or organization under whose auspices each lecture was given is mentioned in the right-hand column.

May 4, Columbus, Ohio. Botanical Department, Ohio State University.

May 5, 4 p. m., Cincinnati, Ohio. Mathesis Club.

May 5, 8 p. m., Cincinnati, Ohio. Cincinnati Society of Natural History.

May 5, Crawfordsville, Ind. Botanical Department, Wabash College.

May 7, La Fayette, Ind. Botanical Department, Purdue University.

May 8, Chicago, Ill. Extension Division, University of Chicago.

May 9, Sandusky, Ohio. Department of Biology, Sandusky High School.

May 11, Cleveland, Ohio. Botanical Club.

May 12, Buffalo, N. Y. Buffalo Naturalist's Field Club and Buffalo Academy of Sciences.

May 13, Syracuse, N. Y. Syracuse Botany Club and Syracuse Historical Society.

May 16, New York, N. Y. New York Botanical Garden.

The audiences ranged in number from about 60 to 400, the average being not far from 200. In each city visited the subject was received with every indication of interest, and the press notices were very gratifying. A full supply of the Society's circulars and copies of the Stokes fund prize essays were placed in the hall for distribution in advance of each lecture, and this literature was taken freely by those in attendance. In this way the subject must have been brought to the attention of many individuals besides those who were present at the lectures. Between forty and fifty enrollments of new members for the Wild Flower

Preservation Society were made, and additional enrollments from this source are being received daily. In Syracuse twelve members organized a local chapter immediately after the lecture, and this body will take active measures for the protection of the rare ferns growing in that vicinity.

I think I may say confidently that the cause of plant protection has been benefited by this trip, from the fact that it has been possible to point out the active necessity for it. In general, it is difficult for persons living in the great prairie country of our central western states to realize the dangers that menace wild plants in the East, for there the species usually occur in abundance, and extermination is usually one of the results of clearing the timber and cultivating the land, and is rarely due to the thoughtlessness or vandalism of individuals. The effort was made, accordingly, to impress on the people of the western states the importance of coöperation; while in the East, on the other hand, it was endeavored to point out the actual dangers caused by human agencies, and a personal appeal was directed against indiscriminate flower picking and the purchasing of wild flowers on the streets.

I am convinced that lectures of this type can be delivered with profit in many more of our eastern cities where the need of missionary work is strong. In case the income of the Stokes fund should be again utilized for this purpose, it would give me pleasure to suggest an itinerary based on correspondence with many persons interested in this subject.

Respectfully submitted,

CHARLES LOUIS POLLARD,
Secretary Wild Flower Preservation Society.

THE EXPOSITION OF THE NATIONAL SOCIETY OF HORTICULTURE OF FRANCE.

The National Society of Horticulture of France opened its spring exposition on May 20th on the esplanade of the Cours la Reine in the great glasshouse where were held the horticultural

exhibitions of the Exposition of 1900. For a week or so before the opening the pedestrians on the Pont de l'Alma have watched with curiosity the building and its surrounding grounds, where crowds of workmen were erecting little thatched arbors and installing all kinds of horticultural implements, greenhouses on both a large and small scale, cold frames, garden furniture, garden potteries and sculpture and every conceivable article used in connection with ornamental plant culture.

The Society is an old and influential one, boasting of 3,823 members and its exhibitions are most beautiful as well as interesting and popular, as was attested by the crowds that attended the opening day. It was the first absolutely rainless day Paris had seen for nearly a month, warm and sunny and the large gayly dressed crowd was a typically French one, for in a long afternoon's ramble among the flower beds not a foreign word was heard.

It is impossible to enumerate in such a short space all the exhibits which showed great variety, and especially to a foreigner, a most fertile imagination as to artistic arrangement and composition in the disposition and grouping of the plants.

At the entrance, out of doors, were some charmingly grouped rectangular beds of pansies, the flowers showing all variations of purples and dull browns, many of them three inches in diameter. The pots were sunk in the raised beds and the latter in their turn were bordered with a banked edging of sod, green and fresh, so that it was difficult to believe that they had not always been grown there. Long beds and lines of trained dwarf and trellised fruit trees were in the next section, most interesting and recalling the beautiful espaliers of the old formal gardens.

Near the main building three exhibits attracted much interest, a collection of some 34–40 Japanese dwarf maples, exhibited by Paillet Fils, a miscellaneous collection of dwarfed Japanese plants, the latter not as fine as some collections recently seen in New York and several geometrically arranged beds of alpine plants, shown by the well-known firm of Vilmorin-Andrieux & Cie. It would be impossible to imagine anything more daintily charming than the arrangement of those beautiful frail little plants, with

few exceptions all in full bloom and as fresh as if they were on their mountain homes. They came from all parts of the world and among them were numerous American species which if not actually alpine are generally connected in one's imagination with mountainous regions. *Primulas* without number, *Dodecatheon Media* of several forms, *Sedums*, and numerous small succulents, lovely little *Saxifragas* in full bloom, a curious *Anemone nemorosa* var. *flore pleno*, *Arenaria montana* in dense mats, *Orchis maculata* in several forms, *Orchis latifolia*, *Globularia salicina* and our two familiar *Tiarella cordifolia* and *Houstonia caerulea* blooming side by side. *Tulipa Greigei* and the gorgeous *Incarvillea grandiflora*, *Raimondia pyrenaica* and *Gentianas* made a brave showing and American *Trilliums* with *Cypripedium pubescens* were among Himalayan Cypripediums with tall delicate ferns towering above them. Such low delicate plants as *Sibthorpia Africana*, *S. Europaea* vars. *variegata* and *aurea*, *Fuchsia procumbens*, *Selaginella denticulata* and *Linnaea borealis*, the latter covered with its exquisite fragrant little bells, *Sedums* and other tiny plants were growing in square earthernware boxes, all sunk in the sod-bordered raised sections, the intermediate spaces filled with fresh green mosses, so that the whole beds formed compact closely planted masses. Every plant was clearly and neatly labeled with its Latin name and its native locality. Perhaps one of the most interesting and striking groups of the collection was a mass of Edelweiss (*Leontopodium alpinum*) blooming as cheerfully and looking as much like a beautiful white flannel flower in the heart of Paris as it does on its native heights of the upper Engadine regions.

The floor space of the great glass horticultural hall was sunk in the center and laid out as a large parterre, where in lozenge-shaped beds were some superb exhibits of Vilmorin-Andrieux & Cie, a big collection of massed garden annuals, another of cinerarias, a strange and interesting collection of herbaceous calceolarias and another of *Calceolaria rugosa* in all possible shades of the wonderful dull purples, yellows and browns, so characteristic of that curious flower. The herbaceous calceolarias were very gay, browns, yellows, reds of all shades, orange, forming a gorgeous mass of color.

Around the center beds were borders of hybrid roses, just coming into bloom ; behind them and beyond on the raised side aisles, standard roses and, here and there at the corners of the beds, climbing roses, trained over umbrella-shaped trellises, covered with blooms, white and pink and also many of the well-known Crimson Rambler, the latter trained in several symmetrical and attractive forms.

Here as generally in the exhibition, the pots were sunk in the earth and had every appearance of permanency.

In the second section of the hall were noted some wonderful yellow carnations from the collection of Mme. Ernest Dormenil, another collection of huge carnations exhibited by Charles Beranek, where two especially, Mrs. Martin Smith and Princesse de Galles, superb mammoth flowers were especially commented on. Beyond were massed a collection of cut "Darwin" tulips one hundred varieties, exhibited in glasses, also Parrot Tulips, Narcissus and beds of all kinds of *Iris*, among them a comparatively new one, *Iris atrofusca*, grayish-purple and dull purple streaked with white, a strange, but rather handsome flower. The tuberous begonias were a blaze of color and so numerous that it was impossible to more than glance at them. M. Lebaudy sent from his private collection a great bank of Begonia "Gloire de Lorraine" that filled one side of one of the sections, a rare mass of bright pink. Two long halls were filled with rhododendrons and hardy azaleas, banked high against the walls, very beautiful, but perhaps not as carefully selected individual specimens as those seen in some private American collections. Among them were some interesting novelties.

In smaller side shows were arrangements of cut flowers for all kinds of uses and occasions, from the bridal bouquet to the most fantastic of dinner-table decorations, intermixed with bronze statues and ribbons. Here the rarely good artistic taste of the exposition seemed to fall off and the grouping did not compare to those seen in transatlantic regions. Plans and schemes for gardens were also shown, collections of dried herbs for kitchen and distillery, some herbaria of mosses and lichens, wax flowers, a collection of oil and water-color paintings of flowers, designs

of flowers for jewelry, ornamental iron work, and endless other forms of decorative work, lace and embroidery. Numerous orchid collections were also shown, but though there were individual very fine specimens, the plants were so crowded that as a whole the exhibit was not as successful as some of the other groups. The great glass bells over some of the rarer and frailer species detracted also from the general effect of the arrangement.

On a lower esplanade, nearly on the river level, agricultural implements and vegetables were shown. Of the latter Vilmorin-Andrieux et Cie. made a superb showing. It would be difficult to imagine anything finer than the asparagus, the mushrooms, the many salads, carrots, turnips, celery, cucumber and radishes of all shapes and sizes, superb strawberries and all the varieties of the famed Paris markets.

Numerous colonial products occupied a section by themselves, the principal exhibitors being the Ministère des Colonies, Jardin d'Essai de la Guiane Française, Godefroy-Lebeuf and Vilmorin-Andrieux et Cie., the latter showing a small collection of rubber-producing plants, Eucalyptus and Cinchona and some rice and cotton. A number of tropical fruits were also seen in this section, mangoes, bananas and some especially fine pine-apples.

The exhibition lasted from May 20 to May 25 and another will be held in the fall, where there are usually very fine chrysanthemum and all the late summer flowers and vegetables.

ANNA MURRAY VAIL.

NOTES, NEWS AND COMMENT.

Mr. Geo. V. Nash, head gardener, accompanied by Mr. Harry Baker sailed for Hayti on July 17 for the purpose of making some botanical investigations on that island. Headquarters will be made at a plantation near Cape Haytian by the invitation of Mr. Casse, the superintendent, who has kindly placed numerous facilities at the disposal of the party for making trips into the interior.

Dr. M. A. Howe, assistant curator, returned from Porto Rico on July 12. As a result of several weeks' work on that island a large collection of marine algae was secured, which embraces over 900 numbers.

Mr. John Shafer, custodian in botany in the Carnegie Museum of Pittsburg, spent the latter part of July and the first week in August in the herbarium in study upon the collection made by himself and Dr. Britton in Cuba in March of this year.

Prof. C. V. Piper, of the Washington Agricultural College, at Pullman, Wash., made an extended visit to the Garden during July for the purpose of consulting the type of species from northwestern United States in the herbarium.

Letters received from Dr. Arthur Hollick, who is at present carrying out some palaeobotanical investigations in Alaska for the U. S. Geological Survey, convey the information that he has accomplished 600 miles of the proposed trip down the Yukon river in a canoe and that valuable collections were being accumulated. During a portion of the journey continuous daylight was encountered, the sun setting at 11 P. M., and rising at 1 A. M., the hypothetical night being as light as an ordinary day. Dr. Hollick is expected to return to the Garden in September.

Dr. D. T. MacDougal, Director of the Laboratories, was absent from the Garden from July 2 to the 29th on a trip to Jamaica. A general inspection was made of the public gardens and plantations of the island with especial reference to the nature of the facilities for botanical investigations of all kinds afforded by the buildings and grounds recently offered for rental at Cinchona by the government. Some important material was secured for the museums and an arrangement was made with the Hon. Wm. Fawcett, Director of the Public Gardens and Plantations, for securing a large amount of duplicate herbarium material for the Garden. Dr. MacDougal was accompanied on the trip by his wife and daughter.

The total precipitation in the Garden during July, 1903, amounted to 5.34 inches. Maximum temperatures of 92° on

the 2d, 95° on the 10th, 82° on the 15th, 88° on the 27th and 90° on the 30th were recorded; also minima of 56.5° on the 5th, 64° on the 7th, 55° on the 16th, and 54° on the 25th.

The temperature of the soil at the depth of a foot (30 cm.) ranged from 47° on the 3d to 37.5° on the 19th, rising again to 44° on the 30th.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

477 miscellaneous specimens. (By exchange with the Field Columbian Museum.)

87 specimens from Lake Maxinkuckee, Ind. (Given by the U. S. Commission of Fish and Fisheries.)

2 plates of *Dryopteris cristata* × *marginalis*. (Given by Dr. W. A. Cannon.)

2 specimens of *Phlox amplifolia* from Illinois. (Given by Dr. J. Schneck.)

2 specimens from eastern Pennsylvania. (Given by Prof. C. L. Gruber.)

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

10 specimens of *Crataegus*. (By exchange with the Carnegie Museum, Pittsburg.)

1 specimen of *Aragallus Lambertii* from Texas. (By exchange with the Biltmore Herbarium.)

8 specimens of *Crataegus*. (By exchange with the Biltmore Herbarium.)

2 specimens from Long Island. (Given by Mr. E. P. Bicknell.)

28 specimens from Porto Rico. (By exchange with Lafayette College.)

42 specimens of sedges from Florida. (Given by Mr. A. Fredholm.)

1 specimen of *Cypripedium* from New Mexico. (Given by Dr. M. Grabham.)

30 specimens of North American Lichens. (Distributed by Miss Clara E. Cummings.)

62 specimens from California. (Collected by Mr. A. D. E. Elmer.)

186 specimens of arctic and alpine plants from Norway. (By exchange with the University of Christiania.)

198 specimens from Montana, Idaho and Utah. (By exchange with Oberlin College.)

5 specimens from New Mexico. (Given by Professor T. D. A. Cockerell.)

18 specimens from central New York. (Given by Mr. H. D. House.)

2 specimens from Ontario. (Given by Mr. W. Herriot.)

100 specimens "Economic Fungi." Supplement C. (Edited by G. P. Clinton.)

250 specimens "Ustilagnieen." Fasc. 1–5. (Distributed by Prof. P. Sydow.)

20 specimens "Ohio Fungi." Fasc. 7. (Distributed by Prof. W. A. Kellerman.)

8 museum specimens from Jamaica. (Collected by Dr. D. T. MacDougal.)

100 specimens "Fungi Bavarici Exsiccati." Cent. 7. (Distributed by A. Allescher and J. N. Schnabl.)

100 specimens "Schadliche Pilze unser Kulturgewachse." Fasc. 182. (Distributed by Dr. W. Krieger.)

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EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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VOL. IV. September, 1903. No. 45.

REPORT ON A TRIP TO FRANCE AND HOLLAND BY MISS A. M. VAIL, LIBRARIAN.

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

Sir: In accordance with your instructions dated April 21 directing me to proceed to Paris, France, to attend the auction sale of the botanical library of the late Professor Alexis Jordan, I sailed from New York on April 22. Owing to a very stormy voyage I did not reach London until May 1 and thus was unable to make a trip to the Royal Gardens at Kew as you had requested me to do. I did however make a short call at the Herbarium of the Natural History Museum at South Kensington, where with the kind assistance of the Curator, Mr. James Britten, I was able to consult some books in an endeavor to settle some bibliographic questions.

I reached Paris the next day and the following week was entirely given up to the auction sale, which took place daily at 8 P. M. The books were on view every afternoon and after inspecting them, I made some changes in the list of prospective purchases.

I was able to obtain between four and five hundred volumes and pamphlets, the majority of which are the gift of Mr. Andrew Carnegie, the remainder having been purchased with Garden funds. Among the most interesting of the books procured are copies of *Horae physicae* Berolinensis; Rafinesque, *Specchio delle Scienze;* Brunfels, *Herbarium vivae icones*, 1530–31; Lonicer, *Naturalis historiae opus novum*, 1551; Jacquin, *Hortus botanicus Vindobonensis;* Pallas, *Illustrationes;* Fuchs, *Commentaires*, 1549

(a most curious French translation of the famous *De historia stirpium*); Jordan et Fourreau, *Icones ad Floram Europae;* Schrank and Mayrhoffer, *Flora Monacensis;* Sibthorpe, *Florae Graeca*, the *pièce de résistance* of the sale; *Svensk Botanik;* Grisebach, *Spicilegium Florae Rumelicae et Bithynicae;* Jacquin, *Oxalis monographia iconibus illustrata*, and a number of other large illustrated works. The remainder of the purchase was made up of several serial publications, local European floras, a long list of catalogues of plants of botanic gardens, some horticultural works and other miscellaneous material.

Of the important books of the sale the *Flora Graeca* excited the most interest, both on account of its rarity as well as the exceeding beauty of its 966 colored plates and the exquisite frontispieces of the ten folio volumes.

The *Hortus botanicus Vindobonensis* and the *Flora Monacensis* accorded a second place in the sale are equally sought after and but rarely to be found on the market. The *Hortus Vindobonensis* is said to have been issued in an edition of 162 copies of which the Jordan copy is No. 74.

The business connected with the sale and the negotiations for the storing and subsequent packing and shipping of the books was duly attended to and towards the end of May they were despatched to the Garden.

During my stay of a month in Paris a number of book-shops were visited to procure a long list of desiderata that had been prepared for the purpose and I was able to secure over one hundred more volumes of varied botanical interest, including several North American local floras that do not appear in the bibliographies.

Several visits were also made to the Laboratoire de Botanique of the Muséum d'Histoire Naturelle where I deposited the gift of fossil plants which you had sent by me to that institution. I was received there very kindly by M. Bureau the Conservateur and his associates and I arranged with him a series of future exchanges, both herbarium specimens and fossil plants. Among the former, we were promised some duplicates of the older South American collections which are not represented in the Herbarium

of the Garden. I also executed there the various other commissions you had entrusted me with and was most courteously permitted to examine some types of North American plants preserved in the main herbarium, as well as others in the Michaux Herbarium which is kept separate. A list was also made of all the mosses in the Michaux Herbarium for the use of Mrs. Britton. I was kindly given a note of introduction to M. le Dr. Deniker, the Librarian of the Muséum and arranged with him to receive a series of the *Bulletin* and of the *Annales du Muséum* in exchange of an equivalent series of our publications.

A visit was made to the Natural History Library of M. Adrien Dollfus, the Editor of the *Feuille des Jeunes Naturalistes* and we are fortunate to have secured from him a nearly complete set of his publications in exchange.

Among the many other courtesies received during my stay in Paris, Dr. F. Camus put at my disposal some types of North American mosses from the Herbarium of Michaux for examination by Mrs. Britton, and also promised us exchanges of mosses from various French localities.

Some interesting bibliographical notes were made at the Bibliothèque de l'Institut de France to the Librarian of which Prof. Van Tieghem gave me a note of introduction, as none except members and those accredited by them are admitted. This library contains in the "Fonds Delessert" the collection of botanical books willed to the Institut by the late Benjamin Delessert and among many interesting and rare volumes is an apparently unique copy of the plates of the fourth volume of Ruiz & Pavon's *Flora Peruviana*, a list of which I made for future reference at the Garden. Two copies of the *Flora Graeca* are preserved in the Institut, one of which is bound in green morocco exactly similar to that of the copy purchased at the Jordan sale for the Garden.

After leaving Paris early in June, a short trip was made into Belgium and Holland.

At Antwerp, I searched through several second-hand bookshops and purchased some twenty-five volumes, mainly old

herbals and Dutch horticultural books, among them an interesting copy of the "*Herbarius Kruidboeck in dietsch*" printed in Antwerp in 1509. The Botanic Garden there is small but quite charming, and I had the pleasure of being shown over it by the Director, Dr. H. Van Heurck, through whose personal efforts the Garden was established and maintained until it was acquired from him by the city. It contains many interesting plants and some fine old trees. A *Mandragora* in fruit was exhibited with pride and in the greenhouse a superb Cycad, *Encephalartos Altensteinii*. Dr. Van Heurck also showed me his private laboratory and library and his extensive and valuable collection of microscopes old and new. His collection of diatoms is perhaps one of the largest and represents many years of labor. Dr. Van Heurck requested us to send him American marine Algae in exchange for those he has recently collected in the Channel Islands and adjacent French coast. He also arranged with me for an exchange of Algae with Mr. Jean Chalon of St. Servais, Belgium, who is collaborating with him in his studies of French Marine Algae.

A long visit was paid to the Musée Plantin-Moretus where, through the courtesy of the Conservateur, M. Max Rooses, I was allowed to inspect the Library and many of its natural history books. This famous and unique museum is established in the buildings that were occupied from 1576 to 1876 by the illustrious printer, Christophe Plantin, his son-in-law, Jean Moerendorf (Moretus) and the latter's descendents. In 1876 the city of Antwerp purchased the property with all its printing plant and extensive artistic collections, from the heirs of the Plantin-Moretus family, and now maintains it, in its original condition of combined residence and printing establishment, as a public museum. Christoph Plantin, a Frenchman by birth, head and founder of the famous house, was born some time about 1514, and in 1576 established the printing press that for three centuries bore his name. Through political changes and vicissitudes the establishment was maintained and collections of all kinds, books, pictures, furniture and tapestries were accumulated by its wealthy and prosperous owners. In one of the libraries is preserved a nearly

complete collection of the books that were issued from the Plantin presses and among them priceless copies of the numerous works of De Lobel, of Dodoens, and of Charles de l'Ecluse. The story runs that in 1577 Plantin purchased 800 copies of the *Adversaria Lobelii* that had been printed by Purfoot in London in 1570, as well as the wood blocks from which the cuts had been printed, all for the sum of 1,200 florins. At the auction sale of the effects of Jan van der Loe, the first editor of the "*Herbier de Dodoens*" he also purchased for the sum of 420 florins, the wood blocks that had served for the first editions of that work. In 1581 Plantin published, in a collection of 2,191 woodcuts under the title of "*Plantarum seu stirpium icones*" all the woodcuts that had previously been printed in the works of Dodoens and l'Ecluse or elsewhere. These same wood blocks are exhibited in cases by themselves and according to the statement of the Librarian who showed them to me, they are all intact, not one is missing. Black and often worm eaten as they are they are a most interesting and curious monument to the industry of the great ancestors of botanical writers. A copy of Charles de l'Ecluse, "*Rariorum aliquot stirpium per Hispanias observatorum historia*, 1576," is shown in a glass case and on its wide margins that worthy botanist had written additions and notes with a new and corrected edition in view.

It would be impossible to enumerate all the books, papers and letters of botanical interest that are preserved there. Among them one of the most important is a water color, life size, of the flowers and tubers of the potato. It is dated the 26th of January, 1588. In the early part of 1588, Philippe de Sivry, Governor of the city of Mons in the province of Hainault, sent to Charles de l'Ecluse, then residing at Vienna, two tubers and some seeds of the potato. The following year he sent him a painting of the leaves and the flower, writing him that he had received the new plant from the Papal Legate the year previous, under the name of "*Taratoufli*," that is *Truffes*, from whence the German name *Kartoffel*. L'Ecluse himself gives these details in his "*Rariorum Historia*" (p. lxxx), that was issued from the Plantin press in 1601. The painting exhibited is the original sent by Philippe de Sivry to l'Ecluse, and is the

oldest document that is extant relating to the plant that had just been introduced into Europe.*

Late on the same day I drove out with Madame Ernest Osterrieth to her country place, Le Voshol, near Brasschaet, Province of Antwerp, where I was shown all her plantations and the beautiful pine forest filled with the superb rhododendrons, for which the estate is famed. They were in the height of their flowering season and a sight long to be remembered.

The next stop was at Amsterdam, where the interesting details of the Botanic Garden were explained to me by its eminent director, Professor Hugo de Vries. The garden is not large, but admirably arranged and planted in every way for study. Its most interesting portion is undoubtedly that small section where for the last fifteen years, Professor de Vries has carried on his studies and experiments in the evolution of plant species. This portion of the garden is entirely enclosed in wire netting and its arrangement and order is most admirable. The long series of the now famed *Oenothera Lamarckiana* and its progeny had but recently been installed into summer quarters in the open ground, after having been grown from seed in the glass houses that enclose the experiment ground on two of its sides. The seeds are sown in sterilized soil and so protected and watched that not a weed creeps into the enclosure and the enclosing netting prevents any such incursion from above. The neatness and system and order is little short of perfect as it would of necessity have to be in such close and careful experimentation as that of Professor de Vries. Besides the long rows of numbered *Oenothera* Professor de Vries showed me a collection of plants of *Geranium pratense* from which he is hopeful of interesting results; a small plantation of *Trifolium monophylla* and an unusual strain of 4–6-leaved clovers that are claiming some of his attention.

A few books were purchased in Amsterdam and the following day I took an early train for Haarlem where a short call was made at the great horticultural establishment of Messrs. Krelage,

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* This drawing has been recently reproduced in color as the frontispiece of Roze, Histoire de la Pomme de Terre, Paris, 1898.

Fils. I was received there most kindly by M. Krelage, the present head of the house, who showed me his plantations and bulb storage house. The latter, a new one, and just completed, is 90 meters square and said to be the largest in Holland. M. Krelage consented to send us a complete set of the plant catalogues of his house in exchange for our BULLETIN. His private library is rich in fine old books and he possesses many valuable works on bulb culture, especially a complete collection of those pertaining to the tulip craze in the seventeenth century. Horticulture is the principal industry of Haarlem. To the south and west of the town there are entire fields of hyacinths, tulips, crocus, ranunculus, anemones, narcissus, lilies, iris and other bulbous plants. At the end of April and beginning of May these immense parterres of flowers are an amazing mass of color and well worth a long journey to visit. From 1636–1637 there grew up in Holland a veritable mania for tulip culture. Rare species or those in any way remarkable for beauty of color or form were sold for exorbitant sums. In an official list of the tulips sold at Alkmaar in February, 1637, are found the following prices: a bulb of "Vice roi" 4,200 florins, another 3,000 florins; an "Amiral Liefkens, 1,015 florins; a "Bellaart," 1,520 florins; an "Sjery Katelyn" 2,610 florins, etc. They were usually sold by weight and at the "exchange" where they were dealt with as to-day are stocks and bonds, realized even higher prices. Mere names were sold for enormous sums and the sellers entered into contract to deliver the bulbs at a stated date, whether they actually owned them or not. A single "Semper Augustus" realized the sum of 13,000 florins; 200 grains of the same plant 4,500 florins; 400 grains of an "Amiral Lietkenhoek" over 4,000 florins; an "Amiral Enkhuiyzen" more than 5,000. It is stated that at this time a single Dutch town sold 10 million florins' worth of tulips and a citizen of Amsterdam is cited as having made 6,800 florins, in the space of four months. In 1673 purchasers having refused to pay certain exorbitant prices and the State having decreed that such insensate contracts should be considered illegal, the prices fell immediately and a "Semper Augustus" could then be purchased for 50 florins. A century later hya-

cinth culture assumed the same proportions and in a list of 1734 similar to the tulip list above mentioned, a bulb of "Bleu Passe non plus Ultra" is said to have realized the sum of 1,600 florins.

On the way to Leyden the train passed through miles of bulb fields where owing to the advanced season little was in bloom except the variously colored forms of the Spanish iris. New bulb storage houses can be seen in nearly every little hamlet, for bulb culture, especially tulip culture is again assuming a more and more important rôle in European horticulture, a tendency that is being fostered perseveringly by the Dutch bulb growers.

At Leyden I spent an afternoon and morning with some book dealers, resulting in the Garden acquiring some further eighty volumes, mainly works on East Indian botany and horticulture.

An afternoon was devoted to the Botanic Garden where I had the pleasure of meeting the Director, Professor Janse, and, with Dr. Goethart, the conservateur of the Ryks Herbarium, was fortunate in arranging a series of exchanges of both publications and Dutch East Indian herbarium specimens. Dr. Goethart, besides his duties at the Ryks Herbarium, is the Librarian of the Société Botanique de Leyde and we mutually agreed upon an exchange with that association by which we are to receive their *Kruidkundig Archief* for our BULLETIN. The great herbarium is mainly rich in types of all the older Dutch East Indian collections and is now undergoing an elaborate restoration, rearranging and numbering, under the able direction of Dr. Goethart who is building up a card index of every specimen preserved in the collection. The Botanic Garden is certainly one of the most exquisite and charming in Europe. Some of the trees are superb, notably a weeping beech (*Fagus sylvatica pendula*), which the Conservateur, M. Witte, who showed me through the plantations, told me was 90 years old. The great branches sweep the ground in all directions and are perfect to the very tips. The small Alpine Garden is a gem and at the time of my visit was gay with clumps of the Alpine rose (*Rhododendron ferrugineum*) several dainty Saxifragas, *Dianthus monanus*, *Sedum Fumaria*, *Arabis montana*, and some lovely columbines. At the foot of the rockery in a small crescent-shaped pond, grew some very

effective grasses, water lilies and other aquatics. Some wonderfully fine garden Delphiniums, *Delphinium hybridum Mrs. Creigthon* (dark blue) and *Delphinium hybridum Albert Edward* (light blue), were noted among other ornamental plants. They were fully six feet tall and most effective in the well-cared-for herbaceous borders and plantations. In the Victoria Regia house among a long series of interesting aquatics were some plants of *Eichhornia crassipes* growing in mud or nearly dry soil that were destitute of the bulbous stems that characterize it when it floats on the water.

In one of the stove houses M. Witte exhibited with pride a large collection of tropical Lycopodiums just received from Java, strange exotic forms that are difficult to transport from their native forests.

The following day I returned to the North of France, where I remained till I sailed for New York.

The list of books purchased during my trip is given in the "Accessions" in this number of the JOURNAL.

Respectfully submitted, ANNA MURRAY VAIL.

A NEW APPROPRIATION FOR CONSTRUCTION.

By vote of the Board of Estimate and Apportionment on July 1, confirmed by the Board of Aldermen on August 18, the sum of one hundred thousand dollars becomes available for additional buildings and for the improvement of the grounds. The expenditure of this amount will be expended through the office of the Commissioner of Parks in accordance with plans approved by him and by the Board of Managers of the Garden. It is expected that the following works will be completed by means of this appropriation:

1. A Telford-McAdam driveway forty feet wide from the New York Central Station plaza northwesterly to the upper lake, thence easterly across the fruticetum and Bronx River to the driveway already built at the Bleecker St. entrance near the stable on the eastern side of the Garden. This will include a stone bridge to carry the driveway and two paths across the

Bronx River, and also the approach to the Mosholu Parkway bridge across the Harlem division of the New York Central Railway just west of the Museum building. The completion of this road and of the one now under construction in the northern part of the Garden will nearly finish the driveway system of the grounds as planned except about fifteen hundred feet in the arboretum east of the Bronx River, and one stone bridge.

2. The construction of the path system as planned north and east of the Museum Building and of grading work behind that building.

3. The completion of grading and path building about the public Conservatories and Southern Boulevard entrance.

4. The building of six sets of cut stone steps at the path and driveway approaches to the terrace of the public conservatories.

5. The construction of two large tanks for water plants in the court of the public conservatories.

6. The construction of two commodious public comfort stations.

7. The construction of one small greenhouse to complete the range of propagating houses at the nurseries.

N. L. Britton.

NOTES, NEWS AND COMMENT.

Mr. Joseph W. Alsop, of Avon, Connecticut, has recently donated to the Garden, 4 large specimen plants of the crape myrtle (*Lagerstroemia Indica*); 2 fine orange trees in the full fruit, 1 lemon tree, also in fruit, a large pomegranate bush with double brick red flowers, a fine specimen of the edible fig, and some other interesting plants, which form a valuable addition to the collection.

Dr. N. L. Britton, Director-in-Chief, accompanied by Mrs. Britton and Mr. Percy Wilson, museum aid, have gone to Cuba to make some investigations of the flora of a region in the province of Santa Clara.

Prof. H. H. Hume, of the Florida Agricultural College, spent a few days at the Garden during August in consultation of the Library.

Mr. C. L. Shear, of the Bureau of Plant Industry, Washington, D. C., has been granted a research scholarship in the Garden beginning November 1.

The total precipitation in the Garden for August, 1903, amounted to 5.94 inches. Maximum temperatures of 79° on the 3d, 83.5° on the 10th, 86° on the 23d, and 89° on the 25th, were recorded; also minima of 48° on the 8th, 52.5° on the 13th, 56° on the 18th, and 54° on the 29th.

LIBRARY ACCESSIONS.

LIST OF BOOKS PRESENTED BY ANDREW CARNEGIE, ESQ., MAY, 1903.

ALLIONI, C. *Stirpium praecipuarum littoris et agri Nicaeensis enumeratio methodica.* Parisiis, 1757.

Annales de Flore et de Pomone. Vols. 1–15. Paris, 1831–46. 15 vols.

Archives de Flore. Wissembourg, 1854–69.

Archives de la Flora de France et d'Allemagne. Bitche, 1842–48.

ARDOINO, H. *Catalogus des plantes vasculaires des environs de Menton et de Monaco.* Turin, 1862.

ARRONDEAU, E. T. *Flore Toulousaine.* Toulouse, 1854.

Association française pour l'avancement des sciences, 1–22, 1872–93. 31 vols.

BALBIS, GIOVANNI BATTISTA. *Catalogus plantarum horti botanici Taurinensis.* Taurini, 1804.

BALBIS, GIOVANNI BATTISTA. *Enumeratio plantarum officinalium horti botanici Taurinensis Augustae Gallorium imperatricis Josephinae.* Taurini, 1805.

BALBIS, GIOVANNI BATTISTA. *Horti Academici Taurinensis stirpium minus cognitarum aut forte novarum icones et descriptiones.* Taurini, 1810.

BALBIS, GIOVANNI BATTISTA. *Miscellanea Botanica.* Taurini, 1804–6.

BALBIS, GIOVANNI BATTISTA. *Synopsis plantarum horti botanici Taurinensis.* Taurini, 1801.

BASTARD, T. *Notice sur les végétaux les plus interessans du Jardin des Plantes d'Angers.* Angers, 1810.

BERKENKAMP, W. A. *Catalogus plantarum horti botanici Coloniensis.* Coloniae Agrippinae, 1816.

BESNOU & LACHÊNÉE. *Catalogue raisonné des plantes vasculaires de l'Arrondissement de Cherbourg.* Cherbourg, 1862.

BESSER, W. S. J. G. *Primitiae Florae Galiciae Austriaceae utriusque.* Vienna, 1809. 2 vols.

BLANCHE & MALBRANCHE. *Catalogue des plantes cellulaires et vasculaires de la Seine-Inférieure.* Rouen, 1864.

BOERHAAVE, HERMANN. *Index alter plantarum quae in Horto Academico Lugduno-Batavo aluntur.* Lugduni-Batavorum, 1727. 2 vols.

BONNET, G. *Jardin Botanique de Lyon, Catalogue No. 2.* Lyon, 1860.

BOREAU, A. *Notes sur quelques espèces de plantes Françaises.* Angers, 1844.

BOREAU, A. *Notice sur les plantes recueillies en Corse par E. Revelière.* Angers, 1857–59.

BOREAU, A. *Programme de la flore du Centre de la France.* Nevers, 1835.

BROUARD. *Catalogue des plantes du Département de l'Eure.* Evreux, 1820.

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EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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JOURNAL

OF

The New York Botanical Garden

VOL. IV. October, 1903. No. 46.

WILLIAM EARL DODGE.

By the death of Mr. Dodge, on the 9th of August last, the New York Botanical Garden lost one of its most devoted members and most generous patrons, while the Board of Managers, the officers and staff, were deprived of a wise and ever willing advisor, a true friend and greatly esteemed associate. He was one of the original incorporators named in the Charter of 1894, was a member of the Board of Managers from its organization in 1895, and served continuously on the Executive Committee and, at times, on the Finance Committee. But, in addition to his formal and official duties, he voluntarily assumed personal relations with almost every phase of the Garden's work and took pleasure in closely watching its development in detail, often driving to the Garden from his Riverdale home to confer with the Director and his assistants, encouraging them by his approval and aiding them with valuable counsel. Never was his advice sought in vain and never was an opinion given that was not worth following.

A liberal subscriber to the original Endowment Fund, he still sought frequent opportunities of contributing to the Garden's various undertakings and always did so in a way to indicate that he considered it a privilege to assist in the promotion of research and the enlargement of knowledge. He fully appreciated the preëminent importance of the scientific and educational work carried on by the Garden and saw clearly the value of its collections and the necessity for steadily building them up. Realizing from the first that the most satisfactory way of acquiring knowl-

edge of new plants and their habitats and, at the same time, of making desirable additions to the Conservatories, the Museum and the Herbarium, was by means of original explorations in regions of which the floras were little known or unstudied, he made special gifts to the Exploration Fund for the expenses of expeditions to the West Indies, Central America and the Philippine Islands, as well as to the Rocky Mountain districts of our own country. He was also the donor of the twenty-five microscopes which are set up in the Museum and which have been an effective means of popular instruction.

Mr. Dodge's lively interest in the Garden's enterprises was only one manifestation of a general and genuine fondness for Nature, which showed itself in other directions by his connection with the N. Y. Zoölogical Park, and with the American Museum of Natural History, as a trustee and vice-president, and by his membership in the Torrey Botanical Club, the Linnaean Society and the N. Y. Academy of Sciences. Perhaps it would be even more accurate to say that Mr. Dodge's sympathy with scientific activities was part of a still greater interest in everything intended for the happiness and welfare of mankind, for his heart beat warmly and his hand was extended cordially towards every movement that aimed at the education of men's minds, the refinement of their tastes or the elevation of their morals. He was himself a noble example of the gentleman of broad knowledge, deep cultivation and high ideals, a useful citizen, a lovable man.

C. F. Cox.

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 in October and November.

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 5:28 P. M. Excursion fare, twenty-five cents.

Opportunity will be given for inspection of the Museums, Laboratories, Library and Herbarium, the large 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 Building of the Garden, Bronx Park, on Saturday afternoons, at 4:30 o'clock, as follows:

October 3. "The Botanical Exploration of the West Indies," by Dr. N. L. Britton.

October 10. "Some Aspects of Tropical Agriculture," by Prof. F. S. Earle.

October 17. "Some Features of Jamaican Vegetation," by Prof. L. M. Underwood.

October 24. "Features of the Land and Marine Flora of Porto Rico," by Dr. M. A. Howe.

October 31. "Explorations in Hayti, the Negro Republic," by Mr. G. V. Nash.

November 7. "Mountains and Forests of Dominica," by Prof. F. E. Lloyd.

November 14. "Beverages of Vegetable Origin," by Prof. 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 5:57 P. M.

REPORT ON A TRIP TO PORTO RICO BY DR. M. A. HOWE, ASSISTANT CURATOR.

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

Dear Sir: I beg to present herewith a brief report upon a recent collecting trip to Porto Rico.

The voyage was undertaken on May 9, and San Juan was reached on the evening of May 13; the return trip was begun on July 7, so that nearly eight weeks were spent on the island. My time while there was given almost exclusively to the collection and study of the marine algae, though the opportunity was improved to obtain photographs of various subjects of more general botanical interest. The northern, eastern and southern

shores of the island were visited. My first and longest stop was made on the northern coast, at Santurce, a suburb of San Juan. The shore about San Juan offers a great variety of physical conditions, including coral reefs, surf-beaten littoral rocks, sand-beaches, nearly enclosed bays and lagoons, and mangrove swamps, and the region yields a correspondingly large number of species of sea-plants. I devoted four weeks to making collections here and then came away without having seen all of the promising coast line within easy reach of the capital. A com-

FIG. 18. The black mangrove (*Avicennia*), Ponce.

parison of the marine flora of this locality with that of the parts of the island subsequently visited appeared to justify the spending of a comparatively large proportion of my time at this point. The warmth of the sea-water about Porto Rico made possible a mode of collecting, which in former experiences, even in Florida, Bermuda and California, I have been able to employ only to a limited extent; this may be briefly characterized as the "bathing-suit method." The sea is so warm that one may easily work in

it every day for three or four hours at a time without ill effects. No dredging was attempted, beyond what could be done from a boat with a long-handled rake. The brisk almost constant trade-winds keep the surface of the sea considerably agitated a large part of the time, and the water in general is not so delightfully clear as in Bermuda and about the Florida Keys.

From San Juan, I went by boat to Aguadilla on the western coast. The rocky shore extending northward from this town to

FIG. 19. A coralline seaweed (*Amphiroa Tribulus*) from Guánica.

Point Borinquen, the northwestern corner of the island, and beyond, made a good collecting ground and eight days were spent in this vicinity. The marine flora here closely resembles that of the San Juan region, though less diversified. One day was devoted to collecting about Rincón and Point Jiguero, the westernmost part of the island.

My next stopping-place was at Ponce on the south coast, which was reached by steamer from Aguadilla. Only three or four days were spent at Ponce, as the immediate vicinity did not seem es-

pecially favorable for my line of work. From Ponce I proceeded by rail westward to Guánica, which also is on the southern shore of the island. Guánica harbor is one of the three or four well-enclosed bays of the island and is of historical interest in that it was the landing-place of General Miles' invading army in July, 1898. Three or four million dollars of American capital has been invested in the sugar industry here, the Guánica Centrale including in its plant a newly built factory of the largest capacity of any on the island, cane lands, tributary railroads and wharf. I wish to acknowledge with gratitude the kindness of the officers of the Guánica Centrale in freely placing at my service a conve-

FIG. 20. Trunk of the silk-cotton tree (*Ceiba pentandra*), Ponce.

nient and commodious work room in the chemical laboratory connected with the factory and in offering numerous other helpful courtesies. The harbor of Guánica and the neighboring shores yielded several species which I had not found elsewhere, and with the exception of the vicinity of San Juan, this region offers more of interest to the collector of marine algae than any other which I was able to visit in Porto Rico. I regret that one week was all the time I could spend there.

The return to San Juan was made overland by stage and rail by way of Mayagüez, Aguadilla and Camuy. A stop of two days was made at Mayagüez and the Agricultural Experiment Station now located there was visited. The shores about Mayagüez are almost wholly of sand and offer very little in the line of algae.

The visit to the island resulted in the collection of about 900 numbers of marine algae, many of which are represented by a good series of duplicates. Half of the numbers are represented both by dried specimens and by material preserved in fluids. Many of the specimens will make valuable additions to the ex-

FIG. 21. Fruit of the sea-grape (*Coccolobis Uvifera*), San Juan.

hibit in the public museum. The collection is of special interest from the systematic and geographical standpoint, as the marine flora of Porto Rico is quite imperfectly known. The only paper that has ever been published treating exclusively of the marine algae of Porto Rico is, I believe, one by Dr. F. Hauck. This was printed in 1888 and enumerates 92 species collected by Paul Sintenis, the well-known German botanical traveler, who was in Porto Rico from September, 1884, to June, 1887. Botanists who had visited Porto Rico previously seem to have given almost no

attention to the sea plants. Since then, smaller collections have been made for the Garden by Mr. A. A. Heller and by Mr. Percy Wilson, but these remain practically unstudied. It will therefore not be surprising if the study of the Porto Rico collections now in possession of the Garden should reveal considerable of novelty, yet it may be doubted if there is so large an element that is peculiar to individual islands of the West Indies in the case of the marine algae as there has been found to be in the case of the land plants, for the seaweeds, growing in the medium which surrounds and connects the islands, are naturally much less isolated than the plants which are confined to the land.

Another visit to Porto Rico, in the winter season, would probably supplement our present collections in such a way as to form a basis for a tolerably complete catalogue of the marine algae of the island.

Respectfully submitted,

MARSHALL A. HOWE.

VEGETABLE FOODS.*

The object of this lecture is to consider the fundamental and characteristic distinctions between vegetable and animal foods.

It may be that at some future time the human race, in general, will come to regard the slaughter of domestic animals for food very much as we now regard the use of human flesh for the same purpose. While it is not my intention to enter into a discussion of this question, yet many of the facts to be considered have a direct bearing upon its principles, which must therefore be referred to. It is worth while to say in advance that physiology teaches us quite clearly that the human race is not adapted, at present, for exclusive subsistence upon either the animal or vegetable foods at our command; and that, if we were forced to depend wholly upon either, we could not do so as well upon the vegetable as upon the animal class. This, however, proves

* Abstract of lecture delivered at the New York Botanical Garden, June 13, 1903.

nothing, in view of the great power of adaptation of the human system. The higher the position of a living being in the scale of existence, the greater its power of adaptability. Man, being the highest of animals, and all his physical powers being multiplied many times by the application of intelligence, possesses such power in surpassing degree, and there is practically no limit to his abilities in regard to the ultimate selection of food. Moreover, the task of modifying the present qualities of his foods to meet special conditions is, as will be explained further on, still more feasible. All that we can conclude, *a priori*, is that while mankind may become fitted in the future for the practice of vegetarianism, much remains to be done before that time in the way of preparing foods for our use and ourselves for making use of them.

We must first consider that there are no foods in use which are wholly nourishing. Each consists of different parts, having different effects upon or destinations in the body. Some are entirely neütral, acting merely as waste. Others are digested, absorbed and assimilated, and these constitute the nutrients proper. Some may act so as to interfere with this digestion of the nutrients, being thus negatively or indirectly harmful. Others still may be directly and actively injurious by producing poisonous effects. In considering the absolute and relative utility of any food, each of these classes of constituents must be fully considered. It is evident that we must not only ascertain the nature and effects of each constituent of any food, but we must also ascertain its percentage amount.

We note next that the nutrients themselves are of quite different kinds, producing different effects, building up different tissues and possessing very different degrees of nutritive value. Manifestly, our first necessity is to classify the nutritive elements of foods. These elements are divided into three general classes, namely, the inorganics, the organic non-nitrogenized and the organic nitrogenized, concerning each of which a few facts must be stated. The inorganic nutrients of human vegetable foods have been very little studied as to their special effects, and their nutritive rôle is probably much more interesting and important than is

generally believed. Of the three classes of organic constituents, all are doubtless more or less interchangeable as to their effects, yet the non-nitrogenized are in general regarded as fat-makers and they contribute most of the carbon which is consumed by oxidation. They are therefore known as the carbonaceous or respiratory foods, or fat-formers. They comprise two classes, the fats or fixed oils and the carbohydrates, which latter the system is capable of converting into fat. Of the latter, the more important are sugar, of which there are several varieties, differing markedly in their digestive and nutritive properties, and starch, all forms of which are practically identical in this respect. Inulin is a substance very closely related to sugar, the nutritive properties of which have received practically no attention. There are good reasons to believe them very valuable. Those familiar with the delicious qualities of either the Jerusalem or the globe artichoke, or of salsify, have some acquaintance with inulin. Pure cellulose is also a carbohydrate nutrient when in a condition available to the digestive functions, but it is usually not so. All those substances, as stated, are readily convertible by digestion and assimilation into fat. This fat, if not required, is stored as a reserve food (besides sustaining numerous other uses) for a longer or shorter period and then consumed. Obviously, the fat contained in food can be used without the preliminary labor of digestion and conversion, with the attendant waste. As a food constituent, therefore, it must be much more valuable than the carbohydrates, which require such conversion, and practical physiologists have reckoned it as 2,4 times as valuable. Therefore, if the percentage of fat in a food be multiplied by 2.4 and the product added to the total carbohydrates, it gives us the total value, in carbohydrate units, of the carbonaceous, respiratory or fat-forming nutrients of that food. The ratio which this sum bears to the albuminoids, that is, the number of carbohydrate units for each albuminoid unit, constitutes what is called the nutritive ratio of the food. The method is fully illustrated in the following table of the more important foods and fodders of the bean family, the foods of which possess the highest nutritive ratios :

NUTRITIVE COMPOSITION OF SOME IMPORTANT HUMAN AND STOCK FOODS OF THE LEGUMINOSAE.

	Albuminoids.	*Fat.*	*Carbohydrates.*	*Nutritive Ratio.*
		Food-stuffs.		
Peas	22	2	52	1:2 9
Beans	25	1.6	46	1:2.7
Lentils	25	1.35	55	1:2.4
Soy-beans	35	17.6	6	1:1.2
Peanuts	26	47	24	1:4
		Fodders.		
Red clover hay	13.5	3	37	1:5
Pea-vines	14	2.6	34	1:4
Bean-vines	28	2.5	58	1:2.3
Alfalfa	16	2.5	32	1:2.8
Vetch-hay	20	2.3	29	1:2.3
Lupine-hay	17	2.2	31	1:3.4

Thus, the smaller the relative number of carbonaceous units, the higher the nutritive ratio, for the greater the relative amount of albuminous or nitrogenous content. Since the latter is a far higher form of nutrient than the former, a high nutritive ratio is a great desideratum in foods, other things being equal. It must be borne in mind, however, that the nutritive ratio does not give the amount of nutritive value of the food, but only the kind of value; because if 100 pounds of food contained but one pound of albuminoid and four pounds of carbohydrate, its ratio of 1 : 4 would be the same as though it had 10 pounds of albuminoid and 40 pounds of carbohydrate, yet the latter would be ten times as valuable as the former. For this reason the feeding value must also be determined by taking some arbitrary value per pound for the carbohydrates and for the albuminoids, multiplying by the respective amounts and adding the products. Both of these elements have to be carefully computed in food-studies. The animal system, when left free, makes its own calculations as to both nutritive amount and nutritive ratio. We crave certain things required to maintain both the nutritive ratio and the amount of total nutrition. When, however, calculations have to be made in advance, as in preparing for voyages or expeditions, or for the feeding of armies, or even of domestic animals, it becomes necessary to determine the proper mixture for producing

certain net results. We find it possible to secure such a net result by various mixtures, and some of them are much more economical at certain times than at others; so that the facts stated become the basis for an important branch of economics.

Our discussion thus far has dealt only with the actual nutritive constituents in the food, as determined by chemical examination. We must next consider that this calculation does not necessarily give us a correct idea, nor even an approximate idea, of the benefit derived by the system from consuming the food under consideration. In the case of animal foods it usually does so, at least approximately, but not in that of vegetable foods, and this brings us to the first general distinction between the two classes. In animal foods the nutrients are mostly conditioned for immediate digestion when they reach the proper place in the human body; in the vegetable foods most of them are not so. In both cases the principal nutrients are enclosed, in minute particles, in cavities enclosed by membranes. These membranes must be broken up or dissolved off, so as to free the contents, before the latter can be reached by the digestive juices. In the animal foods these membranes are of nitrogenized or albuminous material; in the vegetable foods they are of cellulose, a carbohydrate material. Albuminous material is chiefly digested in the stomach, so the membranes enclosing the animal nutrients are there dissolved and the contents freed. Some of these contents are adapted to stomach digestion and the stomach juices at once attack them and perform this portion of the work. The others are passed on into the intestine for digestion later. Cellulose, on the other hand, is chiefly digested in the intestine, partially, slowly and with difficulty in the stomach. Part of the substance enclosed by the cellulose walls of vegetables properly require stomach digestion, but this is prevented, as stated, by the cellulose walls. It has, therefore, to be passed on into the intestine. Digestion is prolongéd, laborious and commonly imperfect, and fermentation is very likely to occur.

From these conditions results one of the fundamental facts upon which the discussion of vegetarianism must be based; that vegetable foods require a different line of treatment from animal foods.

This treatment, too, must be different in the case of different foods of the same class. The treatment which removes the cellulose may injure the contents of one but not of another, so that each food must be individually studied. Where these facts are totally neglected, as in the case of savages who consume coarse vegetable food in the raw condition, the abdomen commonly becomes permanently enlarged and distorted.

In speaking of the indigestibility of the carbohydrate covering to the vegetable cell contents, I have assumed them to be in the most favorable condition for digestion, that of consisting of pure cellulose, little or not at all thickened.

A typical illustration of such a food is the potato. Yet in this most favorable example, digestion is so difficult that fatal results from indiscreet feeding are of the most common occurrence. The stomachs of infants which have died in convulsions are often found to contain pieces of undigested potato, usually imperfectly cooked, though often perfectly cooked, but eaten without the thorough mashing required to break up the mass, and partly, at least, disintegrate the cell-walls.

We must now consider certain changes which occur in cell-walls which tend very greatly to increase the comparatively moderate degree of indigestibility illustrated in the potato. Among the various functions performed by the tissues of plants, that of affording mechanical strength, is highly important. This quality is secured by the thickening of the cell-walls, sometimes to so great an extent that it fills up most, or even all, of the cell-cavity. This added material is almost always a different kind of substance from the original cellulose, and of a far less digestible character. For example, the surface-tissues of the plant must protect those within from the escape of any of their gases or fluids, except as naturally provided for by special openings; also from the access of injurious fluids from without. Such a power is secured by the thickening of the cell-walls by substances called *cutin* and *suberin*, both highly impervious and highly insoluble. The second named is the substance which forms cork. The highly indigestible character of such substances is apparent. The inner tissues, requiring strength and toughness, as in the formation of

the wood of large trees, have their thick cell-walls formed largely of lignin, so that the indigestibility of wood-tissue is apparent. It is true that digestion, even of wood, is not wholly impossible. For experimental purposes, wood sawdust has been soaked, baked and ground, and these operations successively repeated, until a large part of it has been converted into a digestible starch-like substance. Yet the idea of the general consumption of cork or wood is ludicrous. In a wild state this "woody" condition of our vegetable foods is far greater than under cultivation, and in fact one of the prime objects of cultivation is to render tough vegetables tender. Housekeepers are well-acquainted with the tough or stringy character of vegetables which have been imperfectly cultivated. While we speak of this in common language as "improving their tenderness" and are apt to think of it only as to its effects upon palatibility, it is in reality in the highest degree efficacious in increasing digestibility and net nutritive value—and all this, though it strikes the ordinary individual only as a change in the general characters of the bulk or mass, relates really to the structure and composition of the cell-wall, a condition which is perfectly apparent and calculable by microscopical methods of inspection. Hence the importance to those who have any intention of seriously considering vegetarianism of being trained to microscopical, as well as to chemical methods of research.

We can only appreciate at its full value the practical importance of these changes in the cell-wall when we know of the radical modifications which they render necessary in the computation of the feeding value above referred to. Those reference works which have taken account only of the chemical composition of the foods of which they treat have been found in practice to possess relatively little value. It long since became apparent that much of the nutrient matter thus estimated was entirely unavailable to the systems of the animals consuming them, as they passed undigested out of the body, in the form of waste. It then became necessary to institute a series of experiments entirely new in kind, and necessitating a degree of patience, attention and vigilance previously unknown in this line of research. The ani-

mals experimented upon had to be weighed to a fraction, subjected to conditions maintained with the utmost uniformity, fed and watered with scientific accuracy as to the amount as well as the kind of food and drink, and the effects noted at intervals by fresh weighings and careful determinations of the animals' condition. As a result of these observations, a set of new tables of the nutritive ratio and feeding value of foods was established, and the results registered under the term "Digestible nutrients" instead of merely "Nutrients," as before. This branch of investigation was developed chiefly by Mr. John Lawes, of England, and his labors were so highly appreciated that he was knighted in recognition thereof. It is now to be noted, in all comparative tables, that the *nutrients* and the *digestible nutrients* of a given food are often at wide variance one with another. Not only have the different foods been contrasted in this new direction, but the value of the same food has been carefully compared under different conditions, as to the age of the plant, flowering, or fruiting, soil, climate and other circumstances.

It is to be observed that the injurious effects upon the nutritive values of foods resulting from the changes described above are of an indirect character only. That is, they do not impart to the foods any harmful properties, but serve merely to interfere with or reduce their usefulness. A totally different class of effects, imparting properties distinctly injurious, or at least objectionable to the animal system, depend upon provisions made by the plants for protecting their nutrients against decomposition or against consumption by animals. It is ever to be borne in mind that vegetable nutrients are substances manufactured by the plant, at a great expenditure of vital energy, for its own consumption or for that of its progeny. Even those which are classed as "for immediate consumption" must persist for a longer or shorter period; and by far the greater portion of those available for use by man belong to the "reserved storage" class and are intended to be preserved for the plant's own use for one or more years. This long duration involves dangers of various kinds. Decay, resulting from the attacks of germs of various classes, is prevented by the manufacture and storage with the

nutrients of various antiseptic products which are usually disagreeable in taste and sometimes actually poisonous. For protection against animals, far more active constituents, capable of acting as fatal poisons, are frequently manufactured and stored. Many of the most highly nutritious of vegetable products, theoretically considered, are altogether unrecognized as animal foods, merely because of the presence in them of such poisonous constituents.

As illustrations of such substances I may cite nux vomica seeds, rich in fat and albuminous materials, yet not edible because of the poisonous strychnine associated with them; calabar bean, which is as nutritious as the ordinary kidney bean, yet its poisonous alkaloids causing a man or other animal to drop as though struck by lightning very soon after partaking freely of it; the jalap tuber, as nutritious as the ordinary sweet potato, yet an emetico-cathartic poison by virtue of the irritating resin that it contains.

A far more interesting class of cases are those of cultivated foods, which, though now free from poisonous properties, possess them in greater or less degree in their natural condition.

Indeed, some of the most important foods in use still exhibit traces of these poisonous properties, and in some foods these traces may, under exceptional circumstances, become serious in amount.

For example, the cassava root, from which tapioca is obtained, one of the most important of tropical foods, contains a substance which yields hydrocyanic (prussic) acid, probably the most deadly of all poisons. In the wild state, this poison is excessive in amount, but the sweet variety under cultivation loses nearly all of it. So delicious a fruit as the watermelon shows in its distinct diuretic effects the presence of traces of poisonous substances similar to those of many poisonous species of its family, and the properties of the cucumber suggest those of the poisonous luffas, momordicas, etc. The bitter variety of quinoa, a staple food of the Peruvians, must be carefully washed through several waters before being cooked. Even the highest forms of vegetable food known to us, peas and beans, contain a peculiarly poisonous sub-

stance, capable of producing serious effects when they are eaten too freely and continuously. These injurious effects are oftenest seen in stock animals, but are not unknown in man. So serious were they during the sixteenth century that Germany and some other countries actually passed laws forbidding the use of peas and beans.

Two methods are open to us for combating these injurious effects. The first is by so treating the foods in question that the harmful constituents are actually removed in preparing them for use, as is done in the fermentation of cassava and of the bitter yams already referred to. A very notable instance of this is the method just introduced in Germany for the utilization of the nutritive constituents of the common horse chestnut by the removal of its poisonous constituent.

The second method, and much the better one, is the improvement of natural products by selection and cultivation so as to get them into the habit of ceasing to manufacture their peculiar poisons, as has been done with many of those named above. This subject is probably the most interesting of all those touched upon in the present lecture. Most of our cultivated foods are related to violently poisonous, but otherwise very similar natural products and some of them appear to have descended directly from the latter. Thus the melons, pumpkins, squashes and cucumbers are related with the poisonous colocynth, *Elaterium* and *Luffa*. The sweet potato is closely related to jalap, turpeth and similar tuberous roots, the yam to various deadly species of *Dioscorea*, the asparagus and onion to squill and hellebore, the potato and tomato to belladonna and henbane.

This shows us then two specific directions in which cultivation may greatly improve those foods in present use or supply us with new foods derived from natural plant products not now fit for use; first by increasing their palatibility and digestibility, second by gradually freeing them from objectionable or injurious constituents. Doubtless it is not too much to say, as I have once before remarked on this platform, that if we could know that one or two centuries hence all the sources of vegetable foods now grown upon were to be totally lost to us we should be able in the

meantime to replace them pretty well by other very similar ones from sources not now regarded as worthy of attention. Is it then not equally probable that among the latter class we may be enabled to find some superior for the purpose of the vegetarian to any now in use? It is in the investigation of such subjects, that properly equipped botanical gardens can find a great field of usefulness. The periods of time required and the labor and expense involved are so great as almost to preclude a reasonable probability of individual effort being sustained to the point of success, whereas such efforts are exactly adapted to the organization of institutions such as these.

The popular idea of a botanical garden as a place for mere amusement, for the culture of plants beautiful to the eye, or for the accumulation of objects of casual, or even of educational interest alone, constitutes but a low conception of its real functions. The research department of a botanic garden should receive the deepest attention from its promoters and the highest resources at their command. Such a view, I may say, is taken by the managers and directors of this institution and it is our aim to secure assistants in the various departments who are imbued with these ideas to the extent of interesting themselves in subjects aside from the perfunctory discharge of their duty. We only wish that we might imbue the public, who in one way or another constitute the real supporters of the establishment, with similar ideas so that they would inquire into the numerous well-manned departments of research which are here maintained and those of them who are able to contribute liberally of their means toward the maintenance of these departments and the better support of those who are devoting their lives toward these most important and even necessary public interests.

H. H. RUSBY.

NOTES, NEWS AND COMMENT.

The Garden has recently received, from the Jardin des Plantes of Paris, in exchange for a collection of fossil plants from the Dakota group of Kansas, a collection of European fossil plants

consisting of about eighty specimens, comprising about forty-five species from eighteen different localities. The specimens represent Triassic, Jurassic and Tertiary horizons which were but sparingly represented in the museum and form a valuable addition to the palaeobotanical series.

Professor W. L. Bray, of the University of Texas, consulted the collections in the Garden for several days early in September for the purpose of completing some work in connection with his phytogeographical study of the "sotol" region in the western part of Texas. Dr. Bray also devoted some attention to the completion of some anatomical investigations of stomata of certain types of xerophytic plants of the above district.

Mr. R. S. Williams has been appointed collector for the Garden in the Philippines and sailed for Manila from Seattle, September 19. Mr. Williams will probably extend his explorations over several months and will attempt to reach localities hitherto unvisited by botanists.

Dr. N. L. Britton and Mrs. Britton accompanied by Mr. Percy Wilson spent a month in the provinces of Matanzas and Santa Clara in Cuba making explorations and collections, returning on September 20. Among other notable plants secured on this trip four fine specimens of the interesting umbrella palm were shipped to the Garden, and have since made the journey safely.

Professor F. E. Lloyd and Mrs. Lloyd returned from a two months' exploration tour in Dominica early in September. Over nine hundred numbers of herbarium specimens were secured and a number of photographs of the vegetation of the island.

Mr. Geo. V. Nash, accompanied by Mr. Harry Baker made some explorations in Hayti during July and August. The collections of plants, preserved and living, accumulated on this trip was very large, and in addition a fine series of photographs representing some of the more important features of the vegetation of the island were made.

Dr. Arthur Hollick who was in Alaska for the U. S. Geological Survey during the summer made a trip overland from Skagway to Whitehorse, Yukon Territory, from whence he proceeded by steamer to Dawson. At the latter point an outfit consisting

of a canoe, tents, and camping equipment was made up, with which he, with two assistants, proceeded down the Yukon River to Anvik a distance of a thousand miles. The trip was made between June 15 and August 12, in less than 60 days. The geological exposures along the banks of the river were examined and an effort was made to determine the exact stratigraphic relations of the rocks by means of the fossil remains of plants. Specimens were collected from 38 localities amounting to nearly a ton in weight, which were safely forwarded to Washington for further study. This material makes the largest paleobotanical collection ever secured from Alaska. Dr. Hollick resumed his duties in the Garden early in September.

The total precipitation in the Garden during the month of September amounted to 3.6 inches. Maximum temperatures of 83° on the 3d, 85° on the 13th, 89° on the 14th and 81° on the 22d, were observed; also minima of 48° on the 7th, 54° on the 12th, 45.5° on the 19th, 38.5° on the 25th and 37.5° on the 29th.

ACCESSIONS.

LIBRARY ACCESSIONS FROM AUGUST 1 TO SEPTEMBER 23.

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EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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REPORT ON CUBAN EXPLORATION.

(Presented October 20, 1903, and ordered printed.)

TO THE SCIENTIFIC DIRECTORS.

Gentlemen: By permission of Mr. D. O. Mills, President of the Board of Managers, I visited the island of Cuba during parts of August and September, for the purpose of continuing the botanical survey begun in March, at which time I made observations and collections in the provinces of Matanzas and Havana, assisted by Mrs. Britton and by Mr. J. A. Shafer, custodian of Botany at the Carnegie Museum of Pittsburg, Pennsylvania, while at the same time the Province of Santiago was being explored by Professors Underwood and Earle: after my return, the work was carried on during April by Mr. Shafer in the provinces of Havana and Pinar del Rio.

I left New York on August 23 accompanied by Mrs. Britton, and by Mr. Percy Wilson, my Administrative Assistant, proceeding by rail to Tampa, Florida, where a day's waiting for a steamer to Havana enabled us to make an interesting collection of museum and herbarium specimens and a few living plants, specimens of 88 different species being there secured on August 25. A half-day's delay between trains at Jacksonville, on the morning of the 24th enabled us to collect a basketful of living plants and museum material. Reaching Havana on August 27, we proceeded the same day to Matanzas, and the work of exploration was taken up in the vicinity of that city the next morning and continued there and at Cardenas until September 2, traversing much of the same ground as was studied in March, for the especial purposes

of obtaining fruits and seeds of plants found only in flower during the previous visit and of observing the summer vegetation in relation to that of the spring.

The region about Sagua la grande, in the Province of Santa Clara was explored from September 2 to September 7 and this was the most easterly point reached on the trip. A very interesting flora was found here, and specimens were taken of about one hundred species not seen by us in the vicinity of Matanzas.

Returning to Matanzas, three days were spent in examining some ground not previously visited by us. We reached Havana on September 11, and devoted two days to a study of the plants in the Botanical Garden of the University under the guidance of Professor M. Gomez de la Maza, who kindly permitted us to bring from there a considerable number of seeds, bulbs and cuttings of plants desirable for our conservatory collections together with some museum and herbarium specimens. While at Havana a visit was made to the hills about Rincon, a few miles south of the city and specimens were there obtained of a few species not elsewhere seen by us.

Altogether, specimens were obtained on the trip of 611 species. The exploration work of the past year has laid the foundation for a botanical survey of Cuba, and the results obtained fully justify its continuance as opportunity is afforded.

Respectfully submitted,

N. L. BRITTON,

Director-in-Chief.

REPORT OF A BOTANICAL EXPEDITION TO THE ISLAND OF DOMINICA, B. W. I.

TO DR. N. L. BRITTON, DIRECTOR IN CHIEF:

I beg leave herewith to submit an account of my botanical expedition to the island of Dominica, British West Indies, during the past summer.

Accompanied by Mrs. Lloyd, I left New York by the steamer Caribbee, June 13. The detention of the boat at various points

of call made it possible to go ashore at St. Thomas, St. Croix and Guadaloupe, *en route*, and in this way it was possible to get a glimpse at the vegetation of these islands. St. Thomas and the adjacent archipelago are distinctly xerophytic, as also is St. Croix, as compared with the more southerly of the Leeward,

FIG. 22. Avenue of "Sablier" trees, or Sandbox trees (*Hura crepitans*) in Point a Pitré, Guadalope.

and of the Windward Islands. This is distinctly indicated by the prevalence of cacti and the viviparous agave or century plant which are found farther south only in those limited areas in the various islands where lessened rainfall coupled with peculiarities of the soil, produces desert or dry savannah conditions. Nevis, and the southern part of St. Kitts, reproduce these

conditions, which, as I shall show, are found only over a very circumscribed area in Dominica. Guadaloupe, on the other hand, is an island which, on account of its extent, rainfall and varied topography, presents a most inviting appearance — one which foretells that rich vegetation of the tropics which it is a great privilege for every botanist to see. I would suggest that this island offers a splendid field for collection and study, and I am sure, from the hearty reception we received at the hands of the government official at Basse Terre, M. Hubert Ancelin, that every encouragement would be received to carry on such investigation. At Point a Pitré, is to be seen a double row of fine sablier or sandbox trees (Fig. 22.)

Our arrival at Roseau, the chief town of Dominica, at 12:30 a. m., June 23, in the pitchy blackness of the tropical midnight, gave us little opportunity to do more than grope for quarters. On the following day, an exception to the rule in being free from rain, we took an opportunity to visit the region in the southerly end of the island known as Soufrière, the crater of an immense extinct volcano. The whole basin, which opens on the west to the sea, constitutes the plantation of Mr. Jabez Bellott, to whose courtesy and hospitality both at this time, and on a subsequent and more prolonged visit, I am greatly indebted. On this occasion we visited chiefly the vicinity of the hot sulphur springs which are to be found some distance up the side of the mountain to the east of the village of Soufrière. Here we made some collections, including specimens of the algae which thrive in the hot waters of the springs.

The following day Mrs. Lloyd and I visited the Botanical Station and Garden, and made ourselves acquainted with Mr. Joseph Jones, the director, to whose courtesy I had already been kindly recommended by Sir Daniel Morris. Roseau can boast of a very delightful and useful botanical station, the product of Mr. Jones' efficient administration. From Mr. Jones I received many valuable suggestions for my work in the island. For this, and for his generosity in sending living plants to me for our collections, and for many other courtesies, I wish to express my thanks.

A few more days were spent in getting some knowledge of ways and means, and in reconnaisance in the vicinity of Roseau, which lies at the mouth of the Roseau valley, at the head of which, on a "flat" at some 1,500 feet altitude lies the scattered native village of Laudat, which was the center of our work of the ten days from June 29 to July 10.

The flats on which Laudat is situated, lie at the base of one

FIG. 23. Papaw tree (*Carica Papaya*) in a garden, Soufrière.

of the chief mountains of the island, Mont Micotrin, otherwise known as the Lake Mountain, or by the creoles of the region as Mont Macaque. I ascended this peak, which has an altitude of about 3,000 feet, on June 30, in the company of Matson Rolle, a most intelligent and efficient guide, upon whom I learned to depend with every confidence.

On this day I received my first real lessons in two directions —in tropical vegetation and in tropical meteorology. The climb was a steep one, first through high forest with an abundant ground and epiphytic vegetation. Here, for the first time, I saw the wonderful "blue fern," a coarse but peculiarly colored "filmy" fern eight to twelve inches high. This species grows on the ground in dark, moist situations, and is perhaps the most striking single plant I have seen in Dominica. The color is an opaque, dark blue-green, suggestive of certain copper compounds, which, however, is seen only by reflected light. With transmitted light one sees but a rich, dark chlorophyl green. When the plant is dried the blue is lost, and is replaced by a dirty green.

On the higher steeps one climbs on a slippery clay, densely set with tree ferns, and a various shrubby and herbaceous vegetation which, on a rainy day, offers a redundancy of proof that there are many adaptations in tropical plants for holding water. It is here in the cool cloud-swept region that one finds, in greatest abundance, the beautiful filmy ferns growing in almost every situation. The most abundant tree fern of this locality is known locally as "fougere piquant," so called on account of its armature of sharp black prickles. These are, on older plants, usually hidden by a growth of liverworts, mosses, and filmy ferns, with the result that one often seizes hold of what appears to be a kindly support for the weary climber, with the obvious result.

On nearing the summit one meets a tangle of shrubbery and small trees that form a dense tangle on which one must climb to reach the summit. These mosses, liverworts, filmies and numerous small epiphytes completely clothe the stems and branches of the larger growth. And here, at least in the summer season, it rains almost continuously.

On July 2 we returned to Roseau to meet Sir Daniel Morris, who made a brief visit to the island on that day. On the day following, I called on His Honor Mr. H. Hesketh Bell, the Administrator of Dominica, who very kindly gave me further suggestions for the survey of the island. On this occasion Mr. Bell offered to add to the collections of the New York Botanical Garden a col-

lection of Dominican woods especially prepared to illustrate their grain features. The offer was accepted by you, and I was informed by Mr. Bell before leaving Roseau that the collection is now being made under his direction, and will be received in due

FIG. 24. Clump of "Roseau" grass (*Arundo* sp.) near Roseau.

time. This gentleman, I may add, has been very gracious in extending his hospitality to Mrs. Lloyd and myself.

Returning to Laudat on July 4, after seeing the American colors at the masthead over the Consulate, I continued my work there till July 10, a period of almost incessant rain. It was entirely impossible to dry papers except over glowing charcoal in a small "coal pot." This occupied from four to six hours

daily, and was done entirely by Mrs. Lloyd in the constricted quarters of a small cabin. Without her help at this time and during the summer, I could not have preserved the collections. During these few days, I visited the Fresh Water Lake, near the divide between the windward and leeward slopes of the island, and thought, erroneously I believe, to be a crater lake; and the Boiling Lake, of which no doubt obtains as to its real character. It was here that two persons recently lost their lives from poisoning by the gas which emanated from the cauldron. Matson Rolle, my guide, was the third member of the party; by no fault of his, however, did the accident occur. The vegetation of the huge crater, in which this lake and other geysers and hot-springs are found, is composed chiefly of grasses, sedges, *Lycopodium cernuum* (or a closely related species), with a large admixture of smaller species.

After our return to Roseau, I went for a several days' visit to the Soufrière region. Here I collected at Morne Rouge, P'tit Colibri, Palmiste, along the shore to Scott's Head, known locally by the more picturesque name of Cachacrou, and on the steep southern slopes between this promontory and Morne Rouge. I was enabled to cover so much territory wholly because of Mr. Jabez Bellot's kindness in furnishing horses, and accompanying me personally most of the time, in addition to giving me the hospitality of his house.

The strand vegetation at this point, namely Soufrière, is, as I later found, typical for the whole island. The beach is of coarse gravel, steep and narrow. The only strand vegetation is a narrow strip above tide composed of a row of *Coccolobis Uvifera*, "sea-grape," trees with scarcely any additional plants. At points on the windward coast, in the bays, a species of *Terminalia* is an additional sometimes abundant element. Here, however, sandy beaches may be found, when also lianas (Leguminosae and Convolvulaceae), including the tropical, circumterrestrial *Ipomaca Pes-caprae*, form a more varied aspect. At best, however, the strand flora is by no means rich.

On July 22, after a few days spent in visiting the plantations of Dr. H. A. Alford Nicholls, Mr. James F. Johnson and Mr.

George Johnson, in or near the Roseau Valley, I went to Hampstead, on the invitation of Mr. James Collins Macintyre, the owner of the estate by that name. To reach Hampstead I took passage in the convenient coasting steamer 'Yare' to Portsmouth, a small town on the shores of the most extended alluvial area in Dominica, and devoted to cane cultivation. From Portsmouth one travels to Hampstead by pony.

Although my opportunities here were curtailed by an attack of 'fever' — so known generically, there being no need, apparently, of a specific denomination—I was enabled to lay in a goodly number of plants, good fortune which is due entirely to the keen interest in and full appreciation of my mission by Mr. Macintyre. He placed at my disposal intelligent and experienced guides, while Mrs. Macintyre provided me with other necessaries.

Hampstead lies on the northeast of Dominica, and from there can be seen a long reach of gradually sloping country extending from the coast to Mt. Diablotin (4,747 feet), the highest peak. This country is deeply cut by ravines, and is by no means the easy country to traverse that it seems, though still much easier than most of the island. July 23 was spent botanizing up one of these streams with the hope of reaching the foot of Diablotin. This, however, it was impossible to do for lack of time. The strand flora at Hampstead was examined carefully in the company of my host. The next day, July 24, I was forced to suspend operations on account of fever, and submit to the commands of Mrs. Macintyre. On the 25th I was forced by illness to return to Roseau, which was the more to be regretted because Mr. Macintyre had planned, for my benefit, a three days' collecting trip to Mt. Diablotin, in his company, which of course, I was unfortunately compelled to give up.

After several days' inaction, Mrs. Lloyd and I went to Rosalie, an estate belonging to Messrs. James F. and George S. Johnson. Through the kindness of these genial gentlemen we had the comforts of a large, cool house, and many expressions of hospitality in other ways; and it was due largely to this circumstance that I recovered from the attack of fever. This was, however, only one of many occasions on which Mr. James F. Johnson showed his

generosity, and I wish to express my hearty thanks to him, to Mrs. Johnson, and to his brother, Mr. George Johnson, for their unfailing interest and generosity.

While at Rosalie, which lies on the windward coast, opposite Roseau, I was able to take a run up the Rosalie Valley to the divide, which I had reached from Laudat, so that in this way I traversed the diameter of the island from Roseau to Rosalie. In addition to this I made only very brief excursions in the immediate vicinity. I was, however, able to examine with some care the strand vegetation here, and see, at close quarters, the very striking modelling of the vegetation on the windward exposures due to the constant and severe action of the prevailing wind. The forms taken by the forest cover are almost grotesque, as *e. g.* when the winds sweep up a steep narrow valley and at its head spread out in various directions against the mountain slopes above. In looking at these wind-swept areas the impression received is of a low dense brushy vegetation, lying closely appressed to the ground, whereas it is really a forest, the cover of which is thus molded.

While at Rosalie we experienced the hurricane of the night of August 8–9, which did severe damage in Martinique, and by no means little destruction in Dominica. We suffered no especial discomfort, although much damage was done on this, and much more on neighboring estates to the south.

We returned to Roseau on August 10, and for several days I did only a little work in the immediate vicinity of Roseau, since it was anticipated that the steamer on which we were to return to New York might call at any hour. Telegraphic communication from Dominica was destroyed, and we were in total ignorance of the outside world.

On the 14th and 15th I made an excursion into the interior of the island to the region of the Trois Pitons, along a road, recently improved by the government, the Imperial Road. I went as far as "Sylvania" the estate of the Administrator, Mr. Bell. From this point I got again into deep forest, and here I found that many trees as well as great numbers of branches had been blown down by the hurricane. This gave me a splendid chance to

collect specimens of many species of trees which otherwise I had missed.

On August 18, having received news of the movements of the steamer, we took the opportunity made by its further delay, to visit Martinique and St. Lucia. It was, of course, a rare ex-

FIG. 25. Talipot Palm (*Corypha umbraculifera*) in the Library Garden at Roseau. This palm dies after flowering.

perience to see the results of the lamentable destruction of St. Pierre. We were especially interested, moreover, in noticing the signs of a new vegetation on the slopes of Mont Pelée, and I would here suggest the great value of taking an early opportunity to study the incipient growths of this region. Such an opportunity is rare, and should by all means be pursued.

At St. Lucia, with only a very brief period of daylight, we were able only to visit the Botanical Station, under the guidance of a very courteous resident of that island, Mr. Arnott, and Mr. R. C. Mallet, whose kind offer to escort me to the Agricultural School, and a large sugar estate, I was unable to accept for lack of time. We returned to Roseau on August 21, and the following day I went, on Mr. James C. Macintyre's invitation, to Batalie, an estate twelve miles north of Roseau on the leeward. Batalie lies adjacent to the Grand Savannah, where, on account of a light rainfall * and shallow soil, grassy desert conditions prevail. The vegetation, in addition to the wiry grasses, and other low herbs, consists of scattered small trees, including a species of the Mimosoideae with delicately fragrant, pink flowers which scent the air. Cacti are also to be found.

I was met at Batalie by Mr. T. H. Shillingford of Colihaut, where I was entertained at his residence. With his help I found suitable guides to help me in carrying out an ascent of Mt. Diablotin, for which peak I started on the following day, the 24th, leaving Colihaut by canoe at 5 a. m., and reaching, from Du Blanc, a convenient point at the foot of the mountain in the afternoon. Here we made "ajupa" — that is, built a lean-to of saplings. The natives make such an affair quickly with no other tool than a cutlass. They bind the parts together with lianas, floor it with saplings laid side by side, and wall, roof and carpet it with palm leaves. One realizes the richness of the tropical forest when he sees the generosity with which palms are cut down and used thus; and even more so, when one sees a 60-foot cabbage palm felled, and the terminal bud cut out to be sold at a market ten miles away, whence it must be "headed," † for the paltry sum of eight cents (fourpence, English). This circumstance casts a side light as well upon economic conditions in Dominica.

The following day, in a pouring rain, we started for the sum-

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* The precipitation at Batalie has varied, during the years from 1890 to 1902, from 80.05 inches to 35. 78 inches annually, the average for 12 years being 59.51, the lowest for any part of Dominica.

† Carried on the head.

mit which, after much cutting, we reached in four hours. As we were surrounded by clouds, we could not get a glimpse of the surrounding country. I made a good haul of plants, however, including many ferns I had not seen before. Starting downward at about 10 a. m. we reached the ajupa at 12. Packing up, we proceeded rapidly down to the coast, and from Du Blanc I went by canoe to Roseau, landing there at 8 p. m., the last half hour's journey in a violent thunder storm. This closed my work on Dominica. I collected in all about 2,000 specimens, representing over 900 species. In addition to this, I obtained a good stock of material for my studies in the embryology of the Rubiaceae, and some additional embryological and anatomical material. I brought back also a number of examples of Carib and native workmanship consisting of baskets and of ropes of various species of Mahaut.

On my return, I had the great pleasure of meeting Dr. H. A. Alford Nicholls, just returned from Canada, who has done so much, as the successor of the late Dr. Imray, in furthering the agricultural interests of Dominica. Dr. Nicholls generously expressed his willingness to aid the New York Botanical Garden in any way possible to him, and for this I extended informal thanks.

A few days later, after receiving many evidences of hospitality and good will from our friends at Roseau, we sailed by the steamer "Parima," reaching New York on September 7.

FRANCIS E. LLOYD.

REPORT ON EXPLORATION IN HAYTI.*

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

Dear Sir: I submit herewith a report upon my recent visit to the Republic of Hayti, for the purpose of securing seeds and living plants, and herbarium and museum material. The trip occupied the interval between the 25th of July and the 13th of September, inclusive. I was accompanied by Harry F. Baker, as assistant.

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* This work was made possible by assistance kindly given by Mr. Geo. H. Perkins and by Mr. J. S. Schiff. — N. L. B.

We left New York on the steamship "Athos," of the Atlas Line, arriving at Cap Haïtien on the 30th, where we were met by Mr. A. E. Cassé, upon the arrival of the steamer. His reception was most cordial, and he made us feel at once at home. We remained with him at the Cape until the following Saturday, the guests of his friend, Mr. Dévé, a gentleman long resident in Hayti, and to whom I am much indebted, not only for his kindly hospitality, but for many courteous acts which made the stay at the Cape most pleasant.

On Saturday morning, August 1, we left early by private motor boat for Les Plantations d'Haïti, located at Bayeux, along the coast about eighteen miles west of Cap Haïtien. This plantation is owned by Mr. F. Herrmann, of Brussels, Belgium, a gentleman in sympathy with the object of our expedition. It was with the permission and concurrence of Mr. Herrmann, that we were invited to be the guests of the plantation by Mr. Cassé during our stay. Mr. Cassé is the horticultural director, and it is due to his able management that the estate has assumed, in the short space of a little over two years, the advanced condition it now presents. Nearly one thousand acres are embraced in the plantation, which is largely given over to the cultivation of cocoa and rubber, with bananas freely planted for immediate and temporary shade.

Mr. Cassé, personally, did everything in his power to further our plans. He is imbued with the true scientific spirit, and was thoroughly in sympathy with our desires and aims. Horses and mules, without the best of which nothing can be accomplished, laborers and guides were obtained for us, and upon many of the journeys he personally conducted our party, giving us the advantage of his intimate knowledge of the country and its people. The motor boat, previously referred to, was placed at my disposal. At the plantation everything was done for us that comfort could suggest, and I feel that much of the success of the expedition was due to his active participation in it.

The region visited is, I believe, the least accessible in the republic. It embraces a portion of the mountainous country on the northern side of the island, a region rarely visited by white

men, with the exception of the French priests and a few stray Syrians who penetrate into these mountains for the purposes of trade. It is one vast mass of mountains, range after range following each other in endless succession, their general trend being that of the length of the island. The altitude of the highest peak visited was about 3,500 feet. The sides of the mountains are very steep, in some cases nearly perpendicular. The valleys are, in consequence, deep and narrow, and the roads, if they may be dignified by such a title, are circuitous in the extreme, zigzaging along the mountain sides and around the bases of hills, so

FIG. 26. Market at Pilate, a village in the mountains.

that to attain a given distance in a straight line generally requires covering a distance three times as great. The mountains are for the most part heavily timbered, and in many cases along the north coast run right down into the sea.

Through many of the valleys, rivers and streams rush, constantly fed and augmented by many brooks which drain the steep

mountain sides, but, strange to say, waterfalls are rather scarce, but few having been seen by our party. Our visit was made during the dry season, so that many of the smaller streams were indicated by dry river beds only, and some of the rivers had but a small volume of water. I was informed, however, that during the wet season, from October to January, these become veritable torrents which are impassable. I can readily understand this, for the banks, by their undermined and stony condition, give ample evidence of the passage of vast quantities of water at some time.

I have before referred to the roads, but they cannot be called such in our acceptation of the term. In the low lands near the coast, and in the neighborhood of some of the villages and cities, they may attain to the dignity of a road, but the so-called roads in the mountains, many of them, are terrible, and can only be traversed on horseback. These trails, for such they are, zigzag along steep mountain sides, and along ridges with precipitous sides on either hand, where a misstep on the part of the horse would be fatal. The surface is extremely uneven, large boulders, loose stones, slippery clay banks with corrugated furrowed surfaces, and mud sloughs are everywhere, these difficulties frequently occurring in the steepest parts of the trail. To add to the difficulties of travel, all streams must be forded, as there are no bridges. At the time of our visit this was not a severe performance, though sometimes a tedious one, from the frequency of its repetition. I remember in one instance fording the same stream sixteen times in a short ride of twelve miles.

The republic has a population estimated at about 1,300,000. Of these about 90,000 are in Port-au-Prince and Cap Haïtien, leaving about 1,210,000 for the smaller towns and the mountains. It is truly called the black republic, for one rarely sees mulattoes. The white man, of course, is in a very small minority, and it was rather a unique experience, this traveling in a country where the negro is the dominant factor, and where the white man is dependent on him for protection of life and limb. This protection is necessary for safe travel, as they are suspicious of foreigners, and especially of Americans, and can only be secured with proper credentials. In the first place, entrance to the country

can only be obtained by means of a passport properly viséed by the Haytian Consul-General in New York. After securing entrance to the land, little could be accomplished in the interior without letters of recommendation. Mr. Geffrard Cesvet, the Consul-General here, kindly gave me before departure a letter of

FIG. 27. Low woodland near the coast, showing the effect of wind upon the trees.

this nature to Gen. Turenne Jean-Gilles, governor of the departments of the north and northwest, setting forth the purposes of the expedition. Immediately upon arrival at Cap Haïtien I pre-

sented this letter to the general, accompanied by Dr. Livingston, the American Consul, who did everything during our stay to facilitate our plans. This general gave me other letters to the generals in the various divisions under his control. These letters procured for us every consideration and facility during the journeys in the mountains. We were under military protection everywhere in the region controlled by General Jean-Gilles. But once did we get out of his domain; this was at Marmelade, and it was here we met with the only threatened trouble. We had no letters of introduction, and unfortunately had even left our passports at the plantation. We were received with great suspicion by the general in charge, and coldly treated. In fact, we met with a decided rebuff, and it was only by putting on a bold front and showing him we had no fear that we escaped difficulty. The mass of the people in the mountains are good-natured and child-like, and feared us rather than we them.

These mountain people are generous, and will freely give what they have, but their accommodations, both in the matter of food and sleeping arrangements, are hardly such as would be acceptable to the white man, even though willing to rough it. If it were not for the priest to be found in every village, I fear the lot of the white sojourner there would be a hard one. These priests are educated Frenchmen, have comfortable homes, and their living is of the best the land affords. Through the kindness of the priest at Port Margot, a good friend of Mr. Cassé, we were furnished with letters of introduction to these priests in the interior, and right heartily were we welcomed by them. We and our pack train and servants, making usually six or seven men and as many animals, were received by them; we were entertained as their guests, and upon our departure we were given a God-speed, and an earnest invitation to come again.

This description of the country and its people will make apparent to you some of the difficulties of collecting in Hayti, but to me they were an added zest in exploring a region, the flora of which is so little known. One must be in the saddle all day, repeatedly mounting and dismounting, if he expects to get even a fair representation of the flora. Some days we covered forty

or fifty miles in this way, up and down mountains, and through valleys and across many fords, starting often at four in the morning and not reaching our destination until five or six in the evening. It is hardly necessary to say that we were tired on arrival, ready for supper and an early bed.

The diversified character of the country has given rise to an equally diversified flora. Along the shore the usual strand flora is found, conspicuous among the plants here being the sea-grape

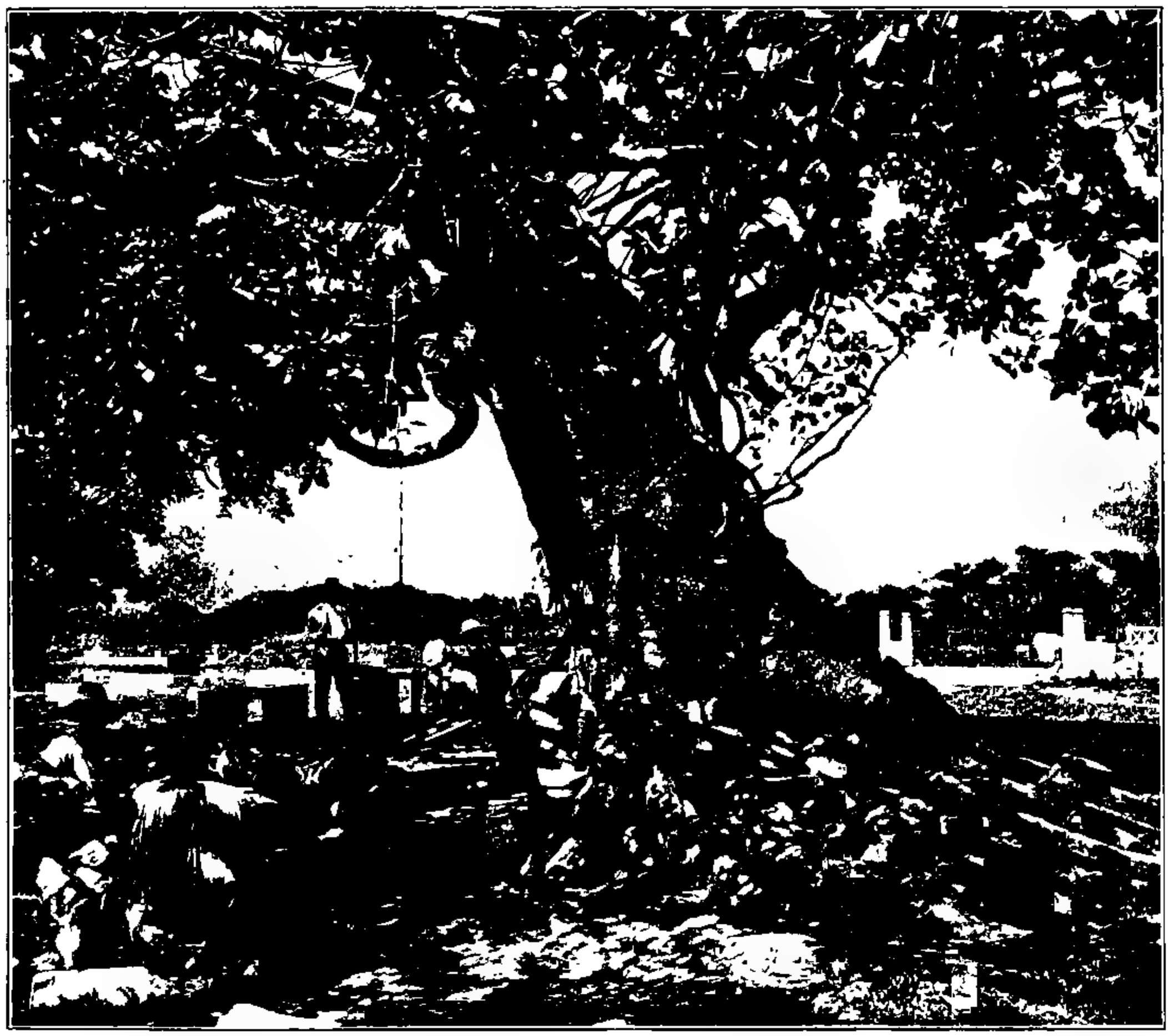

FIG. 28. A *Clusia* growing on a *Ficus*, which it has all but destroyed.

(*Coccolobis Uvifera*), *Ipomoea Pes-caprae*, the mangrove (*Rhizophora Mangle*), a species of *Hymenocallis*, and many other seaside plants. Back of this belt comes the tract of low woodland which gradually merges into the low hills. A species of *Clusia*, several of *Ficus*, logwood, and many others are here common.

But as we ascended the mountains the flora changed rapidly, and the whole vegetation took on a different aspect. At a

height of about 2,000 feet tree-ferns began to make their appearance, and a few scattering filmy ferns, but it was not until an elevation of about 3,500 feet was attained that tree-ferns and ferns in general became plentiful. At this elevation the mountains are covered with clouds in the afternoon, and everything is dripping with moisture in the ravines, the home of the filmy ferns, hepatics and many mosses.

The most marked change in the character of the vegetation occurred at Marmelade, at an elevation of about 3,000 feet. At this place we first saw the pine forest, which, I was informed, covers thousands of acres in the interior. To come suddenly upon this region, after one had been riding for many hours through a tropical vegetation, was quite startling. It was hard to realize that one was still in a tropical land. In the scattered growth of the trees, the appearance of this pine forest much resembled the pineland of our own southern states, but here the pines cover the mountain sides, and the landscape does not present the flat character that becomes so monotonous in the southern pineland of our country. The undergrowth, at least the portion visited by us at Marmelade, was extremely dense, and travel through it was a tiresome and tedious process. This undergrowth is made up largely of small trees and shrubs. Conspicuous among these were many melastomads and woody composites; and a species of agave, unfortunately out of flower at the time of our visit, was common. Living plants of this agave were successfully transported and are now doing well in our collections.

The air at Marmelade is quite different, being much cooler and more bracing than that of the lowlands. The lower temperature here also permits of the growing of potatoes, excellent specimens of which we sampled. Other vegetables of a temperate climate are likewise raised, as are also peaches.

I was particularly impressed with the agricultural possibilities of the country. Coffee and cocoa are grown to a considerable extent, but much more could be done in this line. Delicious bananas are found everywhere, but only enough are grown for home consumption. Not one is exported, although there are

thousands of acres of lowland adapted to the cultivation of this fruit which finds so ready a sale in the New York market, distant less than 1,300 miles, and nearly twenty-four hours nearer than is Jamaica, from which so much fruit is exported. An added

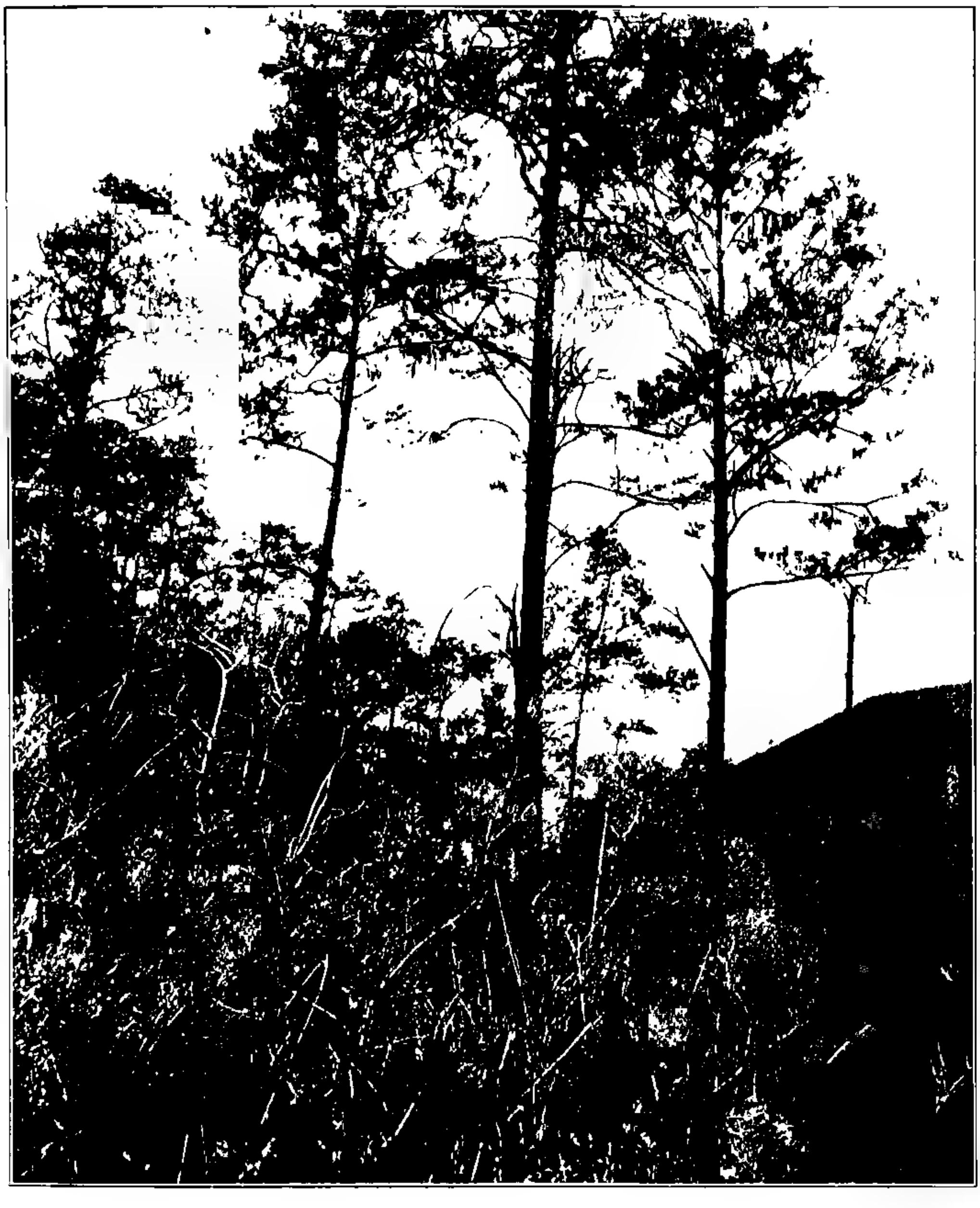

FIG. 29. Pinewoods at Marmelade, showing the thick character of the undergrowth.

inducement to engage in agriculture is the cheapness of labor, laborers being procurable for 20 cents a day, and as many of them as are desired. At present only slow steamers touch at Haytian

ports on the north side, requiring five or six days to cover the distance, but fast steamers must soon follow the establishment of fruit culture on a large scale. Sugar cane is grown in considerable quantity, but much of it is transformed into rum, or tafia, a poor quality of rum, and much indulged in by the poorer people. Some rice is cultivated, and many of the tropical fruits, such as the mango, orange, avocado pear, bread-fruit and limes are grown to some extent, or occur in a half wild condition.

I believe the only serious attempt by a white man at agriculture in the country on a large scale is at Bayeux, and the experiment is being watched with considerable interest by others. Of course the inability of the foreigner to acquire title to land must militate against the investment of outside capital, but if that restriction be once removed, Hayti, as an agricultural country, with its natural advantage of position and almost immunity from cyclones, must draw investors and advance rapidly. Many acres of valuable cabinet woods, now going to waste, would be an added inducement.

As a result of the expedition over one thousand numbers for the herbarium, represented by about two thousand specimens, were secured; about fifty packets of seed and one hundred specimens of living plants; a collection of sixty-six species of woods, in trunk sections eighteen inches long and from four to twelve inches in diameter, numbered to correspond to a suite of herbarium specimens made from the trees — a list of the local names under the same numbers was also obtained; and a series of one hundred and forty photographs, depicting some of the features of the island, its vegetation, people and economic conditions. I believe no previous collection of woods has been brought from the island, and the collection of photographs from the interior is perhaps unique. I found botany a neglected science, and few appreciated what we were doing.

The extremely diversified nature of the country must indicate an interesting flora, and one probably rich in endemic species. Only a small portion of the mountains in the north were reached by us, and much more remains to be done even there at some other season of the year, preferably February and March. The

xerophytic region of Gonaïves will yield, I am sure, rich results, and the pineland areas were but touched on their outer fringe; the vast savannah in the center of the island must have its peculiar flora; the hills about the salt lakes in the south, one of them below the level of the sea, are reported to be the home of cacti, and need exploration; the southern coast with its high mountains, some reported to be nine to ten thousand feet high, and with the dry conditions common to the southern side of the island, still remain unknown; and the continuation of this last region in the long narrow peninsula which extends far to the westward, surrounded with a sea atmosphere, cannot but yield rich results. These are but features open to exploration in the Republic of Hayti. The whole of the sister Republic of Santa Domingo, the interior of which is reported to be even less known than is that of Hayti, remains, at least to the botanist, a terra incognita, and awaits the explorer. I trust it may be possible to continue our explorations in this island, which, I feel sure, will yield more new material than any of the other islands of the West Indies, not only from the fact of the extreme diversity of its surface, but also because, botanically, it is a virgin field.

Respectfully submitted,

GEORGE V. NASH.

FLORA OF THE SOUTHEASTERN UNITED STATES.

The completion of the great work which Dr. John K. Small, Curator of the Museums and Herbarium of the Garden, has been prosecuting during the last ten years, marks an epoch in the investigation of the wild plants of the southeastern United States. It forms an octavo volume of xii + 1,370 closely printed pages, in which there are descriptions of 6,364 species, 1,494 genera, 236 families and 62 orders, including all the known flowering-plants, ferns, and fern allies of the portion of the United States south of the northern boundaries of North Carolina, Tennessee, Arkansas, and the Indian Territory, as far west as the one hundredth meridian. The specimens which have provided the material for this gigantic study are nearly all included

in the herbarium of the Garden, and in the herbarium of Columbia University deposited at the Garden, and it is safe to say that not less than fifty thousand specimens in all have been examined in the course of the investigation. Many thousand of these have been collected by Dr. Small himself in various parts of the area, so that he has an intimate knowledge of the plants in life as well as in the herbarium. A great many have been cultivated at the Garden, either out doors or under glass, and the work has gone forward simultaneously with the building up of the Garden collections in all departments.

Dr. Small took up the study of the plants of the Southern States, realizing that the flora of the region was very imperfectly known, and during its progress every opportunity has been taken advantage of to carry on exploration in that field and to secure for the Garden collections specimens obtained by all botanical collectors who have visited the region; much material has also been contributed by resident botanists in the south. Several hundred species new to science, many of them of great botanical interest, have been disclosed. The descriptions of many others have been made more accurate than those furnished by preceding writers and more satisfactory generic limits have in many cases been established, so that the work is a grand contribution to science.

Both Dr. Small and the Garden are to be congratulated on the successful completion of this important work, which must remain for many years as the standard text-book upon the flora of the southeastern United States.

N. L. Britton.

NOTES, NEWS AND COMMENT.

Mr. L. Cockayne, of Christ Church, New Zealand, one of the most valued correspondents of the Garden, who has contributed to our collections in many ways, has recently been awarded the degree of Doctor of Philosophy, *honoris causa*, by the University of Munich.

Sir Daniel Morris, Imperial Commissioner of Agriculture for

the West Indies addressed the Botanical Convention at the Museum on Wednesday, October 21, on the subject of "The Cultivation and History of Sugar Cane." Sugar cane is perhaps the most important economic plant of the tropics, and the methods of improvement and standardization of selected varieties were explained at length by the speaker. The discussion is of added interest because of the marked success which has attended the efforts of the Department of Agriculture for the British West Indies in the development of methods of treatment adapted to present conditions. Sugar cane is unknown in the wild state, but has been disseminated westward from India.

A number of accessions have been made during the past month to the palm collection. Two specimens of the large California palm, *Neowashingtonia robusta*, were presented by Mr. C. M. Hyde. These are very fine plants, the largest of this species in the collection. From Miss Geraldyn Redmond have been received four palms, one of them an excellent specimen of the date palm, *Phoenix dactylifera*. A large specimen of *Acanthorhiza aculeata* was presented by Miss Mary S. Ames. This plant, in its tub, stands about twenty feet high. The large and peculiar spines on its trunk give it an unusual appearance. The largest plant received was one of *Cocos plumosa* which was acquired by exchange with the Department of Parks, Borough of Manhattan. This is a magnificent palm, measuring about fifty feet from the base of its trunk, where it has a diameter of about two feet, to the apex of the uppermost leaf. It was planted out in the conservatory at Central Park, but becoming too large for that structure, was offered to the Garden. The problem of moving it was a complicated one, owing to its being planted out, but this was satisfactorily solved, and the palm now occupies a commanding position in the large palm house.

Dr. J. K. Small, curator of the museums, is making some explorations and collections in southern Florida, with headquarters at Miami, Florida.

The total precipitation in the Garden during October, 1903 amounted to 8.98 inches. Of this 6.87 fell in 24 hours ending at 11 a. m. on the 9th.

Maximum temperatures of 76° on the 3d, 74° on the 5th, 70° on the 14th, 69.5° on the 20th and 72° on the 31st were recorded: also minima of 37.5° on the 1st, 50.5° on the 10th, 38° on the 19th, 30.5° on the 19th and 32.5° on the 29th. The latest frost in the spring of this year occurred on May 2, and as may be seen from the above the earliest autumnal frost was on October 19, thus giving a theoretical growing season of 170 days. The period between frosts in 1902 was 168 days.

The Hallock soil thermograph was readjusted and installed to record temperatures at a depth of 6 inches in the soil, on October 2. The soil at the above depth has varied between 60.8 (16° C.) on the above date and 40 (4.5° C.) on the 27th.

ACCESSIONS.

PLANTS.

6 plants for the conservatories. (By exchange with the Department of Parks, Borough of the Bronx.)

39 plants from Dominica. (Secured by Prof. F. E. Lloyd.)

30 plants for the herbaceous grounds. (Collected by Dr. N. L. Britton, at Sparrow bush, N. Y.)

6 plants of *Musa textilis*. (By exchange with the Bureau of Plant Industry, Washington.)

77 plants, succulents, for the conservatories. (By exchange with Dr. J. N. Rose, National Museum.)

217 succulents for the conservatories. (By exchange with Mr. F. Weinberg.)

34 plants for the herbaceous grounds. (Collected by Dr. J. K. Small in Pennsylvania.)

4 plants for the conservatories. (Given by Mr. C. DeKalb, Mohave, Cal.)

81 plants for the conservatories. (By exchange with Messrs. Siebrecht & Sons.)

7 plants for the conservatories. (By exchange with Mr. Adam Müller.)

4 plants from the Aleutian Islands. (Given by Dr. A. Hollick.)

81 plants for the conservatories. (Collected by Mr. George V. Nash in Hayti.)

10 plants for the conservatories. (Collected by Dr. N. L. Britton at Tampa, Fla.)

32 plants from Cuba. (Collected by Dr. N. L. Britton.)

68 plants for the conservatories. (Secured by Dr. N. L. Britton from the Botanic Garden at Havana, Cuba.)

2 plants for the conservatories. (Collected by Mr. J. A. Shafer in Cuba.)

1 orchid from Porto Rico. (Collected by Prof. F. S. Earle.)

238 plants from Jamaica. (Secured by Prof. L. M. Underwood.)

16 plants for the conservatories. (Given by Mr. Walter Hunnewell.)

3 plants for the conservatories. (Given by Miss Mary T. Bryce.)

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EDITOR

DANIEL TREMBLY MACDOUGAL

Director of the Laboratories

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JOURNAL

OF

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VOL. IV. December, 1903. No. 48

THE ROSE MALLOWS.

The large pink-flowered rose mallow, which grows wild in swamps, and is especially abundant near the coast from Massachusetts to Florida and Louisiana, was described by Linnaeus under the name of *Hibiscus Moscheutos*, the name by which it has since been known ; Linnaeus thought there were two related species, and described the other one as *Hibiscus palustris*, but it has long been understood that the two plants which he had in mind are but forms of the common pink-flowered species. This plant has been under cultivation for a long time, and is one of the most beautiful and desirable of large hardy perennials, growing quite as well in ordinary soil as it does in its natural habitat in swamps, and flowering freely in August and September.

Quite recently there has been brought into cultivation a plant which in foliage very closely resembles the *Hibiscus Moscheutos*, but it has a large white flower with a deep crimson center, and has thus been known to gardeners as *Hibiscus Moscheutos albus*, under which name we received plants from the firm of Pitcher & Manda in 1896. It has also been called the crimson-eyed *Hibiscus*.

Owing to the circumstance that the pink-flowered plant has been reported as sometimes bearing white flowers, this crimson-eyed species has hitherto been regarded as a form or variety of *Hibiscus Moscheutos*, but observations made during the past three years on the two growing side by side in our herbaceous garden, seem to indicate that they are specifically distinct.

Hibiscus Moscheutos has the pink flowers as above noted, a

nearly globular, blunt pod, and its calyx-lobes are triangular-ovate, about as broad as long. The crimson-eyed one has an ovoid pod with a long point, and its calyx-segments are triangular-lanceolate, nearly twice as long as broad. I propose that it shall bear the botanical name HIBISCUS OCULIROSEUS, inasmuch as the name *albus*, which the gardeners have applied to it, cannot be maintained on account of the *Hibiscus albus*, an East Indian species, previously named by Wallich.

The plant was introduced into cultivation by Mr. Wm. F. Bassett, of Hammonton, N. J., and the circumstances of its discovery are recorded in the following extracts from a letter written by him to Mr. Geo. V. Nash:

"Replying to your queries, I found the first plant of our Hibiscus Crimson Eye in a triangular marsh, with the N. J. & Seashore Railroad on one side and public roads on the other two, a little below Absecon Railroad Station, some years ago (probably 20 or more years, I made no record, and do not recollect). As you may know, *Hibiscus Moscheutos* makes roots from the new stems and I pulled two of these while in flower and cut bark and wrapped the roots, bringing them home in my travelling bag. They were planted at some distance from any others and very unexpectedly I found them to come true from seed and we have raised and sold a great many thousands of them. Some three or four years since, in an excursion to Tuckahoe we found that a large per cent. of the *Hibiscus Moscheutos* which were growing in the marshes there (perhaps one half) were of the same color as our Crimson Eye but most of them had smaller flowers. For some years after I first got up a stock of it I found no sale for it but my oldest son by persistent advertising succeeded in creating a demand and it is now one of the standard hardy plants with increasing sale."

The accompanying plates illustrate the differences in pods and calyx of the two species. (See Plates XVII. and XVIII.)

N. L. BRITTON.

NOTES, NEWS AND COMMENT.

The contract for the completion of the range of propagating houses at the nurseries on the east side of the Garden, together with a series of propagating pits, was awarded by the Commissioner of Parks to Hitchings & Co. on November 12. This contemplates the construction of one additional greenhouse about 100 feet long and 20 feet wide, which will be most useful because the work in this department has been steadily increasing, and the present accommodations have proved to be too limited. Construction has been begun, and it is believed that the work will be completed by next April. The amount of the contract is $7,593.

A contract for the construction of six sets of cut stone steps at the terrace on which the public conservatories stand, the terrace having recently been completed, and also for two steel-concrete tanks in the court of the public conservatories, to provide space for the growing of aquatics, was awarded by the Commissioner of Parks on November 19 to Godoni & Gallanti, for the sum of $16,598. The execution of this work will complete all construction planned at, and on, the conservatory terrace. The contract time is ninety consecutive working days. It is hoped that work may be begun before the end of the year, but the winter will probably prevent its completion before next July. The tanks are especially designed for the growing of tender and half-hardy aquatics, one of them being supplied with a system of heating pipes, connected with that of the conservatories.

The path building operations about the southern entrance to the Garden at the Southern Boulevard, referred to in the August Journal, have now been completed, and provide ample space for the circulation of crowds. Grading work in connection with these paths and the preparation of that part of the Garden for planting, has been going forward steadily while the paths were being built, and may be completed early in the spring.

Work was commenced on a contract of the Department of Parks with Mr. R. C. Hunt, for the construction of the abut-

ments, and the filling between them, to carry the driveway and path system of the Mosholu Parkway into the Garden at a point immediately opposite the northwest end of the Museum Building. This begins a most important and necessary improvement, for when finished it will provide an unbroken driveway from the Spuyten Duyvil Parkway to Van Cortlandt Park, the Mosholu Parkway, the Garden grounds in Bronx Park, the Pelham Parkway into and through Pelham Park, and will demonstrate the enormous extent and great beauty of the park system of the Borough. Funds available for expenditure by the Commissioner of Parks will enable him to carry out the planned improvements for the Mosholu Parkway, nearly or quite all the way from the Garden to Van Cortlandt Park, and to complete the approaches across the Harlem Division of the New York Central Railway and Webster Avenue, which the plans call for. A large amount of this work may be completed during 1904. This connection of the Garden with the Mosholu Parkway was one of the first works recommended by the managers of the Garden to the Park Department.

The completions of the driveways and paths from the Museum Building southward to the entrance at the Southern Boulevard and the approach to the elevated railway, have made it possible during the autumn, to plant a large number of trees along these roads, seeking to shade them as rapidly as possible. Some forty different kinds of trees have been used in this planting. The screen of shrubs between the long path just completed and the traffic road has been planted for about one half its planned length and may be completed in the spring.

Looking forward to the completion of the bridge connection with the Mosholu Parkway, work has been commenced, in coöperation with the Park Commissioner, in the construction of the driveway approaches to it, and in that of the main driveway from the station of the Harlem Division of the New York Central Railway to this bridge, and thence around the western end of the upper lake eastward across the fruticetum and the Bronx River to the Bleecker Street entrance near the stable, on the east side

of the Garden. Specifications and plans for the bridge to carry this driveway over the valley of the river have been prepared by Mr. Brinley, and it is hoped that a contract for its construction may be let by the Park Department by about the end of the year. It is a satisfaction to be able to announce that work is now going forward on all the uncompleted driveway system planned for the Garden, except a portion about one thousand feet long, through the arboretum on the east side of the Bronx.

Work on the bridge which is to carry the main driveway over the Bronx River near the Newell Avenue entrance at the northern end of the Garden has been slowly progressing since its commencement in May, but it is now approaching completion and it is expected that both the bridge and the grading for the driveway will be finished before the end of the year.

Dr. C. F. Millspaugh, Curator, Department of Botany in the Field Columbian Museum of Chicago, spent two weeks at the Garden during November in the study of the collections from the West Indies.

Mr. W. R. Maxon, of the U. S. National Museum, is in residence at the Garden, making a study of the ferns of Jamaica in consultation with Professor L. M. Underwood.

Mr. John Shafer, formerly custodian of botany at the Carnegie Museum of Pittsburg, has been appointed custodian of the Museum at the Garden, and took up his new duties on November 15.

Bulletin No. 9 of the Garden was issued under date of November 11. This number is devoted entirely to scientific contributions and contains four papers. The first "New or Noteworthy American Crassulaceae," by Dr. N. L. Britton and Dr. J. N. Rose, of the U. S. National Museum is a revision of the family in question that has been carried on under exceptionally favorable circumstances. Dr. Rose has made trips to Mexico for the purpose of adding to the extensive collections of material previously obtained by him, and the majority of the species have been cultivated in the New York Botanical Garden or the Botanic Garden at Washington. Nearly every species has been examined in the living

condition by one or the other of the authors. It was found necessary to found several new genera and species in order to bring the family into rational arrangement. The other papers, "The Flora of the Matawan Formation" (Crosswick Clays), by Mr. Edward M. Berry; "Bolivian Mosses," Part I., by Mr. R. S. Williams, and "The Dimensional Relations of Compound Leaves," by Mr. Chas. Zeleny, also set forth important results in the various subjects considered.

The total precipitation in the Garden during November, 1903, amounted to 1.32 inches.

Maximum temperatures of 73° on the 4th, 62° on the 9th, 58° on the 13th, 64° on the 17th and 47° on the 23d were recorded: also minima of 28° on the 6th, 30° on the 15th, 18° on the 21st, 12° on the 27th.

The temperature of the soil as recorded by the Hallock thermograph has ranged from 52° on the 4th to 34° on the 30th.

ACCESSIONS.

LIBRARY ACCESSIONS FROM SEPTEMBER 23 TO NOVEMBER 14.

AMERICAN MUSEUM OF NATURAL HISTORY. *Bulletin.* Vols. 1–9; 15–17. New York, 1881–1902. 12 vols. (By exchange.)

BEHRENS, H. *Anleitung zur Mikrochemischen Analyse.* Ed. 2. Hamburg, 1899.

BERTOLONI, ANTONIO. *Rariorum plantarum Ituliae decas tertia.* Pisis, 1810.

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DUBARD, MARCEL & EBERHARDT, PHILIPPE. *Le Ricin, botanique, culture industrie et commerce.* Paris, 1902. (Given by the authors.)

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EBERHARDT, PHILIPPE. *Influence de l'air sec et de l'air humide sur la form et la structure des végétaux.* Paris, 1903. (Given by the author.)

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FAIRCHILD, HERMAN LEROY. *A History of the New York Academy of Sciences.* New York, 1887. (Given by Mrs. N. L. Britton.)

FRANCIS, J. G. *Beach Rambles.* London, 1866. (Given by Dr. Arthur Hollick.)

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GAY, J. *Monographie des genres Xeranthemum et Chardinia.* Paris, 1827. (By exchange.)

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GOFF, E. S. *Principles of Plant Culture.* Madison, Wis., 1897. (Given by Prof. F. S. Earle.)

HABANA. *Anales de la Real Academia de Ciencias Medicas, Fisicas y Naturales.* Habana, 1864–1902. 38 vols.

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JUNGERMANN, LUDWIG. *Catalogus Plantarum quae in horto medico Altdorphino reperiuntur.* Altdorphi, 1635.

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MONTOMAHON, C. DE. *Cours d'Histoire Naturelle.* Paris, 1869. (Given by Dr. N. L. Britton.)

NEW YORK CITY — DEPARTMENT OF PARKS. *Report for the year 1902.* New York, 1903. (Given by Dr. N. L. Britton.)

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PORCHER, FRANCIS PEYRE. *Resources of the Southern Fields and Forests.* Charleston, 1869. (Given by Miss A. M. Vail.)

SAUVALLE, FRANCISCO A. *Flora Cubana.* Havana, 1868.

SURINGAR, W. F. R. & SURINGAR, J. VALCKENIER. *Illustrations du genre Melocactus.* Leide, 1897–1903.

THONNER, FR. *Flore analytique de l' Europe.* Paris, 1903.

Tromsφ Museum Aarshefter. Vols. 1–23. Tromsφ, 1878–1900. 23 vols. (By exchange.)

TSCHIRCH, A. *Angewandte Pflanzenanatomie.* Vol. 1. Wien, 1889.

WATERS, CAMPBELL E. *Ferns. A Manual for the Northeastern States.* New York, 1903. (Given by Dr. N. L. Britton.)

WHETHAM, WILLIAM C. D. *Treatise on the Theory of Solution including the Phenomena of Electrolysis.* Cambridge, 1902.

PLANTS.

12 plants for conservatories. (Given by Miss Geraldyn Redmond.)
11 plants for the succulent collections. (By exchange with Dr. J. N. Rose.)
158 plants for conservatories. (By exchange with Mr. Adam Müller.)
1 palm, *Acanthorhiza aculeata*. (Given by Miss Mary S. Ames.)
5 trees of *Pseudolarix Kaempferi*. (Purchased)
42 plants for the herbaceous grounds. (Purchased.)
17 plants for the hardy collections. (Collected by Dr. N. L. Britton at Stockbridge, Mass.)
1 vine of *Tecoma* sp. (Given by Mr. Wm. Hunter.)
1 plant of *Ficus* sp. (Given by Mr. Isaac Maclay.)
316 trees and shrubs. (By exchange with the New York Zoölogical Society.)
47 plants for the conservatories. (By exchange with Mr. F. Weinberg.)
5 trees of *Pterocarya stenoptera*. (By exchange with the Bureau of Plant Industry.)
3 tree ferns. (By exchange with the Royal Botanic Gardens, Ceylon.)
5 plants for the conservatories. (By exchange with the Department of Parks, Borough of Manhattan.)
7 plants for the conservatories from Miami, Fla. (Collected by Dr. J. K. Small.)
4 plants for the conservatories. (Given by Mr. Walker Means.)
1 plant for herbaceous grounds. (Given by Dr. T. E. Wilcox.)
6 agaves for the conservatories. (Given by Mr. Wm. Allen.)
16 plants. (Given by Mr. J. L. Childs.)
274 plants for the herbaceous grounds. (Given by Mrs. Henry Holt.)
194 ferns for the herbaceous grounds. (Given by Mr. Lowell M. Palmer.)
1 plant from Monterey, Cal. (Given by Mr. G. E. Barre.)
1 plant of *Cypripedium Veganum* from Beulah, N. Mex. (Given by Mr. T. D. A. Cockerell.)
1 *Stylophyllum Orcuttii*. (Given by Mr. C. R. Orcutt.)
12 plants of *Thrinax Morrisii*. (Given by Sir Daniel Morris.)
12 plants for the conservatories. (By exchange with St. John's College.)
1 *Inodes palmetto*. (By exchange with the Buffalo Botanic Garden.)
2 plants of *Neowashingtonia robusta*. (Given by Mr. C. M. Hyde.)
1 plant. (Given by Dr. H. H. Rusby.)
31 orchids for the conservatories. (By exchange with Mr. Oakes Ames.)
1 plant from Costa Rica. (Given by Mr. C. Wercklé.)
1 *Nephrolepis Bostoniensis*. (Given by Mrs. J. B. Trevor.)
16 plants for the conservatories. (Given by Mr. Lowell M. Palmer.)
478 hardy shrubs. (Given by Mr. Lowell M. Palmer.)
8 shrubs. (By exchange with Department of Parks, Borough of the Bronx.)
1 bulb from Bermuda. (Given by Mrs. H. L. Britton.)

SEEDS.

144 packets of hardy herbaceous plants. (By exchange with the Botanic Garden, Upsala, Sweden.)
2 packets from the Philippine Islands. (By exchange with the Bureau of Agriculture, Philippine Islands.)

2 packets from Porto Rico. (Given by Mr. O. W. Barrett.)
3 packets from Miama, Fla. (Given by Mr. P. H. Rolfs.)
3 packets from Cuba. (Collected by Prof. L. M. Underwood.)
1 packet from Jamaica. (Collected by Prof. L. M. Underwood.)
11 packets from Georgia. (Given by Mr. R. M. Harper.)
185 packets. (By exchange with the Botanic Garden, Zurich.)
125 packets from Hungary.
458 packets. (By exchange with the Botanic Garden, Leiden, Holland.)
2 packets from Mexico. (Given by Dr. E. Palmer.)
6 packets from New Mexico. (Given by Mr. T. D. A. Cockerell.)
2 packets from Miami, Fla. (Collected by Dr. J. K. Small.)

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Hibiscus Moscheutos Linnaeus.

Hibiscus oculiroseus Britton.

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