

BROOKLYN BOTANIC GARDEN RECORD

VOL. XIX

JANUARY, 1930

NO. 1

DELECTUS SEMINUM

BROOKLYN

1929



PUBLISHED BIMONTHLY
AT LANCASTER, PA.
BY THE BROOKLYN INSTITUTE OF ARTS AND SCIENCES
BROOKLYN, N. Y.

Entered as second-class matter in the post-office at Lancaster, Pa., under act of August 24, 1912.

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LIST OF SEEDS OFFERED IN EXCHANGE

These seeds, collected during 1929, are offered to botanic gardens and to other regular correspondents; also, in limited quantities, to members of the Brooklyn Botanic Garden. They are not offered for sale.

Applications for seeds must be received **not later than** February 28, 1930.

PTERIDOPHYTA

Lycopodiaceae

Lycopodium
lucidulum

DICOTYLEDONES

Aizoaceae 84

Mesembryanthemum
cordifolium
Tetragonia
expansa

Amarantaceae 79

Celosia
argentea
Gomphrena
globosa

Apocynaceae 247

Apocynum
androsaemifolium
cannabinum

Araliaceae 227

Aralia
hispidula
nudicaulis
racemosa

Balsaminaceae 168

Impatiens
Balsamina
biflora
Roylei

Basellaceae 86a

Basella
rubra var. alba

- Boraginaceae 252**
Nonnea
rosea
- Campanulaceae 276**
Campanula
alliariaefolia
carpatica
carpatica var. *alba*
punctata
rotundifolia
versicolor
Platycodon
grandiflorum
grandiflorum var. *album*
Symphandra
Hofmannii
- Capparidaceae 107**
Cleome
spinosa
spinosa (white form)
Polanisia
trachysperma
- Caprifoliaceae 271**
Linnaea
borealis var. *americana*
Viburnum
cassinoides
Opulus var. *americanum*
- Caryophyllaceae 87**
Arenaria
graminifolia
montana
Saxifraga
Cerastium
Biebersteinii
Dianthus
atrorubens
Carthusianorum
deltoides
Knappii
tymphresteus
Gypsophila
fratensis
- perfoliata*
repens
repens var. *monstrosa*
repens var. *rosea*
- Lychnis*
chalcedonica
Coronaria
Flos-Jovis
Viscaria var. *splendens*
- Saponaria*
Vaccaria
- Silene*
Armeria
alpestris
ciliata
Friwaldskyana
Zawadskii
- Cistaceae 193**
Helianthemum
canum
- Chenopodiaceae 78**
Chenopodium
virgatum
Hablitzia
tannoides
Kochia
arenaria
hyssopifolia
- Compositae 280**
Achillea
ageratifolia
nana
tomentosa
Ageratum
conyzoides
Arctotis
grandis
Aster
alpinus
alpinus var. *albus*
alpinus var. *speciosus*
Amellus
diplostephioides
Farreri

novii-belgii
 subcoeruleus
 Brachycome
 iberidifolia
 Callistephus
 hortensis
 Carduus
 Kernerii
 Cenia
 turbinata
 Cephalophora
 aromatica
 Chrysanthemum
 Parthenium
 Coreopsis
 bicolor var. nigra
 palmata
 verticillata
 Cosmos
 bipinnatus
 Dahlia
 Merckii
 Emilia
 flammea
 Eriophyllum
 caespitosum
 Gaillardia
 aristata
 lanceolata
 Galactites
 tomentosa
 Gymnolomia
 multiflora
 Helichrysum
 bracteatum
 Iva
 xanthifolia
 Layia
 platyglossa
 Leontopodium
 alpinum
 Liatris
 punctata
 Lonas
 inodora

Madia
 elegans
 Senecio
 sonchifolia
 Silphium
 perfoliatum
 Solidago
 Cutleri
 missouriensis
 Stokesia
 laevis var. alba
 Tagetes
 signata
 Vittadenia
 australis
 Volutarella
 Lippii
 Zinnia
 verticillata

Convolvulaceae 249

Convolvulus
 tricolor

Cornaceae 229

Cornus
 canadensis

Crassulaceae 115

Sedum
 acre
 Aizoon
 Sempervivum
 violaceum

Cruciferae 105

Alyssum
 calycinum
 montanum
 saxatile
 Aubrietta
 deltoidea
 Berteroa
 incana
 Brassica
 campestris

- Chorispora
 tenella
 Draba
 fladnizensis
 rupestris
 stellata
 tomentosa
 Eruca
 sativa
 Heliophila
 amplexicaulis
 Iberis
 amara
 pinnata
 sempervirens
 Malcolmia
 maritima
 Notoceras
 canariense
 Syrenia
 siliculosa
 Dipsacaceae 274
 Scabiosa
 atropurpurea
 caucasica
 Euphorbiaceae 147
 Euphorbia
 marginata
 Fumariaceae 104a
 Corydalis
 lutea
 Dicentra
 eximia
 formosa
 Gentianaceae 246
 Gentiana
 crjnta
 Freymsiana
 Geraniaceae 129
 Geranium
 sanguineum var. lancas-
 triense
 Globulariaceae 265
 Globularia
 Wilkommii
 Hydrophyllaceae 251
 Hydrophyllum
 canadense
 Illecebraceae 86a
 Corrigiola
 littoralis
 Herniaria
 glabra
 Paronychia
 dichotoma
 Labiatae 254
 Micromeria
 croatica
 Ocimum
 Basilicum
 Salvia
 azurea var. grandiflora
 Leguminosae 128
 Cytisus
 albus
 albus var. roseus
 scoparius
 Genista
 sagittalis
 Linaceae 132
 Linum
 angustifolium
 flavum
 grandiflorum
 maritimum
 perenne
 usitatissimum
 Lobeliaceae 276a
 Lobelia
 cardinalis
 Dortmanna
 Erinus
 inflata
 syphilitica

Lythraceae 216

- Cuphea
 lanceolata
 procumbens

Malvaceae 175

- Callirhoë
 involucrata
 Malva
 crispa

Nyctaginaceae 80

- Mirabilis
 divaricata (dwarf yellow)
 Jalapa (red)
 Jalapa (pale pink)
 Jalapa (white)

Nymphaeaceae 88

- Nymphaea
 advena

Onagraceae 224

- Circaea
 alpina
 Clarkia
 pulchella
 Epilobium
 adenocaulon
 nummularifolium var.
 nerteroides

- Godetia
 purpurea
 Oenothera
 fruticosa

Oxalidaceae 130

- Oxalis
 rufa
 stricta

Papaveraceae 104

- Argemone
 mexicana
 Papaver
 Heldreichii
 lateritium

- nudicaule
 orientale
 Rhoeas " Shirley "

Plumbaginaceae 328

- Acantholimon
 glumaceum
 Armeria
 juncea
 vulgaris
 vulgaris var. Lauchiana
 Ceratostigma
 plumbaginoides

Polygonaceae 77

- Atraphaxis
 lanceolata
 Eriogonum
 umbellatum
 Polygonum
 orientale

Portulacaceae 85

- Portulaca
 grandiflora
 marginata
 Talinum
 calycinum
 patens

Primulaceae 237

- Cyclamen
 europaeum
 hederaefolium
 Androsace
 sarmentosa
 Lysimachia
 terrestris
 Primula
 japonica

Pyrolaceae 231

- Chimaphila
 umbellata
 Pyrola
 rotundifolia

Ranunculaceae 91

- Actaea
 alba
 rubra
- Anemone
 Pulsatilla var. alba
 Pulsatilla var. rubra
- Aquilegia
 alpina
 chrysantha var. nana
- Clematis
 integrifolia
- Coptis
 trifolia
- Delphinium
 Consolida
 grandiflorum
- Nigella
 hispanica
- Ranunculus
 constantinopolitanus
- Thalictrum
 minus
 polygamum
- Trollius
 asiaticus
 europaeus
 laxus

Resedaceae 108

- Astrocarpus
 sesamoides

Rosaceae 126

- Alchemilla
 splendens
 vulgaris
- Duchesnea
 indica
- Potentilla
 chrysantha
 grandiflora
 Hopwoodiana
 nepalensis
 nevadensis
 Nuttallii

- rupestris
 viscosa

- Rubus
 odoratus

Rubiaceae 270

- Asperula
 cynanchica
- Mitchella
 repens
- Sherardia
 arvensis

Rutaceae 137

- Dictamnus
 albus
 albus var. rubra

Saxifragaceae 117

- Heuchera
 hispida
- Saxifraga
 decipiens
 leucanthemifolia
 Macnabiana
- Tiarella
 cordifolia

Scrophulariaceae 257

- Antirrhinum
 Asarina
 maurandioides
- Chelone
 glabra
- Digitalis
 ambigua
 lutea
- Linaria
 maroccana
 reticulata
- Mimulus
 moschatus
- Pentstemon
 Scouleri
 unilateralis

Veronica
 austriaca
 longifolia
 spicata var. rosea
 Teucrium
 Teucrium var. prostrata
 virginica

Umbelliferae 228

Osmorhiza
 longistylis

Urticaceae 65

Thelygonum
 Cynocrambe

Valerianaceae 273

Centranthus
 macrosiphon
 Fedia
 Cornucopiae
 Valerianella
 coronata

Verbenaceae 253

Verbena
 venosa

Zygophyllaceae 135

Tribulus
 terrestris

MONOCOTYLEDONES

Araceae 323

Arisaema
 triphyllum

Liliaceae 338

Allium
 recurvatum

Chionodoxa
 Luciliae
 sardensis

Clintonia
 borealis

Maianthemum
 canadense

Medeola
 virginiana

Polygonatum
 biflorum

commutatum

Smilacina
 racemosa

Streptopus
 roseus

Trillium
 erectum
 undulatum

Tulipa
 dasystemon

Sparganiaceae 310

Sparganium
 eurycarpum

Orchidaceae 350

Epipactis
 pubescens

SEEDS COLLECTED IN NEW JERSEY

BY MR. LORENTZ CANTOR

Benzoin
 aestivale
 Hamamelis
 virginiana
 Ilex
 verticillata

Nyssa
 sylvatica
 Viburnum
 acerifolium
 Vitis
 aestivalis

SEEDS COLLECTED IN NEWFOUNDLAND
BY MISS BELLE BURR

Aronia	Myosotis
atropurpurea	laxa
Aster	Potentilla
nemoralis	tridentata
Blephilia	Pyrola
ciliata	secunda
Clintonia	Ribes
borealis	oxyacanthoides
Cornus	Rubus
canadensis	Chamaemorus
Drosera	Sanguisorba
rotundifolia	canadensis
Empetrum	Sarracenia
nigrum	purpurea
Epilobium	Solidago
angustifolium	uliginosa
Iris	Trientalis
setosa var. canadensis	americana
versicolor	Vaccinium
Linnaea	oxycoccus
borealis var. americana	Viburnum
	cassinoides

SEEDS COLLECTED IN MONTANA, DETERMINED
BY DR. D. B. SWINGLE

Aquilegia	Drymocallis
flavescens	arguta
Balsamorhiza	Erythronium
sagittata	obtusatum
Bossekia	Frasera
parviflora	speciosa
Chamaenerion	Heracleum
angustifolium	lanatum
Clematis	Iris
Douglasii	missouriensis
ligusticifolia	Liatris
occidentalis	punctata
Corallorrhiza	Linum
striata	Lewisii
Delphinium	Lonicera
cuculatum	utahensis
Disporum	Mimulus
trachycarpum	Lewisii

Polygonatum commutatum	Sphacralcea rivularis
Rudbeckia laciniata	Sorbus scopolina
Sieversia ciliata	Zygadenus venenosus

SEEDS COLLECTED NEAR JUNEAU, ALASKA

BY MR. J. P. ANDERSON

Achillea lanulosa	Kalmia polifolia var. microphylla
Actaea arguta	Loisleuria procumbens
Aconitum Chamissonianum	Luetkea pectinata
Andromeda polifolia	Lupinus nootkatensis
Anemone narcissiflora	Maianthemum escholtzianum
Arabis hirsuta	Prinula cuneifolia
Aruncus acuminatus	Rhinanthus Crista-galli
Cassiope stelleriana	Rubus stellatus
Coptis asplenifolia	Sanguisorba sitchensis
Coruus canadensis	Sibbaldia procumbens
Drosera rotundifolia	Streptopus roscus
Empetrum nigrum	Tellima grandiflora
Fritillaria kamtschaticensis	Tiarella trifoliata
Geranium erianthum	Vaccinium caespitosum
Heuchera glabra	uliginosum
Hieracium gracile	Vitis-Idaea
Iris setosa	Valeriana sitchensis

Address requests for seeds to

SEED EXCHANGE,
Brooklyn Botanic Garden,
1000 Washington Ave.,
Brooklyn, N. Y.,
U. S. A.

INTERNATIONAL SEED EXCHANGE

The following list of 145 botanical institutions includes those from which we have received seed lists in recent years. We would appreciate receiving information about other institutions publishing seed lists, especially about those situated outside of Europe.

NORTH AMERICA

Bermuda	United States
Paget East	Boyce Thompson Institute
Canada	New Haven, Conn.
Ottawa, Ont.	Lexington, Mass.
Vancouver, B. C.	Ann Arbor, Mich.
Hawaii	East Lansing, Mich.
Honolulu	Lisle, Ill.

SOUTH AMERICA

Uruguay
 Montevideo

EUROPE

Portugal	Pavia
Coimbra	Pisa
Lisbon	Rome
Spain	Siena
Madrid	Torino
Valencia	Ventimiglia
Italy	France
Cagliari	Bordeaux
Genoa	Brignoles
Modena	Caen
Palermo	Dijon
Parma	Lyon

Marseille	Giessen
Metz	Göttingen
Montpellier	Hamburg
Nancy	Heidelberg
Nantes	Kiel
Nogent-sur-Vernisson	Kassel
Paris	Königsberg
Rouen	Marburg
Talence	München
Toulouse	Münden
England	Proskau
Cambridge	Rostock
Chelsea	Tübingen
Kew	Denmark
Leicester	Copenhagen
London (John Innes Hort. Inst.)	Norway
Newcastle-upon-Tyne	Oslo
Oxford	Sweden
Scotland	Gothenburg
Edinburgh	Lund
Glasgow	Stockholm
Irish Free State	Upsala
Glasnevin	Switzerland
Trinity College	Basel
Holland	Bern
Amsterdam	Geneva
Baarn	Lausanne
Delft	Zürich
Groningen	Czechoslovakia
Leiden	Brno
Utrecht	Prag (2)
Wageningen	Pruhonice
Belgium	Roudnice
Antwerp	Tabor
Liège	Poland
Bruxelles	Cracow
Germany	Lwow
Berlin-Dahlem	Poznan
Bonn	Vilno
Bremen	Warsaw
Breslau	Estonia
Darmstadt	Dorpat
Dresden	Latvia
Erlangen	Riga
Frankfurt	Lithuania
	Kaunas

Russia (U.S.S.R.)	Innsbruck
Dalnij	Linz
Gorky	Wien
Kieff	Hungary
Leningrad (2)	Budapest
Moscow	Jugoslavia
Nikita	Belgrade
Odessa	Zagreb
Sartow	Bulgaria
Tiflis	Sofia (2)
Woronesh	Roumania
Austria	Bucharest
Graz	Cernauti
Hatzendorf	Cluj

AFRICA

Alger	Giza, Egypt
Cape Town	Tunis
Eala, Cougo	

ASIA

Japan	Armenia
Sapporo	Erivan
Tokyo	Java
India	Buitenzorg
Bengalore	China
Indo-China	Echo, Manchuria
Saigon	Central Asia
	Taschkent

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GENERAL INFORMATION

MEMBERSHIP.—All persons who are interested in the objects and maintenance of the Brooklyn Botanic Garden are eligible for membership. Members enjoy special privileges. Annual Membership, \$10 yearly; Sustaining Membership, \$25 yearly; Life Membership, \$500. Full information concerning membership may be had by addressing *The Director, Brooklyn Botanic Garden, Brooklyn, N. Y.* Telephone, 6173 Prospect.

THE BOTANIC GARDEN is open free to the public daily from 8 a.m. until dusk; on Sundays and Holidays open at 10 a.m.

ENTRANCES.—On Flatbush Avenue, near Empire Boulevard (Malbone Street), and near Mt. Prospect Reservoir; on Washington Avenue, south of Eastern Parkway and near Empire Boulevard; on Eastern Parkway, west of the Museum Building.

The street entrance to the Laboratory Building is at 1000 Washington Avenue, opposite Montgomery Street.

To ASSIST MEMBERS and others in studying the collections the services of a docent may be obtained. This service is free of charge to *members of the Botanic Garden*; to others there is a charge of 50 cents per person. Arrangements must be made by application to the Curator of Public Instruction at least one week in advance. No parties of less than six adults will be conducted.

To REACH THE GARDEN take Broadway (B.M.T.) Subway to Prospect Park Station; Interborough Subway to Eastern Parkway-Brooklyn Museum Station; Flatbush Avenue trolley to Empire Boulevard; Franklin Avenue, Lorimer Street, and Tompkins Avenue trolleys to Washington Avenue; St. John's Place trolley to Sterling Place and Washington Avenue; Union Street and Vanderbilt Avenue trolleys to Prospect Park Plaza and Union Street.

PUBLICATIONS
OF THE
BROOKLYN BOTANIC GARDEN

RECORD. Established, January, 1912. An administrative periodical issued quarterly (1912-1928); bimonthly beginning with 1929. Contains, among other things, the *Annual Report* of the director and heads of departments, special reports, announcements of courses of instruction, seed list, guides, miscellaneous papers, and notes concerning Garden progress and events. Free to members of the Garden. To others \$1.50 a year, 25 cents a number. Circulates in 41 countries.

MEMOIRS. Established, July, 1918. Published irregularly. Circulates in 47 countries.

Volume I. *Dedication Papers*: comprising 33 scientific papers presented at the dedication of the laboratory building and plant houses, April 19-21, 1917. 521 pages. Price \$3.50, plus postage.

Volume II. The vegetation of Long Island. Part I, The vegetation of Montauk: A study of grassland and forest. By Norman Taylor, June 11, 1923. 108 pages. Price \$1.00, plus postage.

Volume III. Vegetation of Mount Desert Island, Maine, and its environment. By Barrington Moore and Norman Taylor, June 10, 1927. 151 pages. Price \$1.60.

CONTRIBUTIONS. Established, April 1, 1911. Papers originally published in periodicals, reissued as "separates," without change of paging, and numbered consecutively. This series includes occasional papers, as well as those embodying the results of research done at the Garden, or by members of its staff or students. Twenty-five numbers constitute one volume. Price 25 cents each, \$5.00 a volume. Circulates in 34 countries.

53. *Mutation, adaptation to temperature differences, and geographical distribution in plants.* 12 pages. 1928.

54. *The vegetation of the Allegany State Park.* 121 pages. 1928.

55. *Physiologic races of bunt of wheat.* 14 pages. 1928.

56. *The inheritance of resistance of oat hybrids to loose and covered smut.* 48 pages. 1928.

LEAFLETS. Established, April 10, 1913. Published weekly or biweekly during April, May, June, September, and October. The purpose of the *Leaflets* is primarily to give announcements concerning flowering and other plant activities to be seen in the Garden near the date of issue, and to give popular, elementary information about plant life for teachers and others. Free to members of the Garden. To others, fifty cents a series. Single numbers 5 cents each. Circulates in 28 countries.

GUIDES to the collections, buildings, and grounds. Price based upon cost of publication. Issued as numbers of the *Record*; see above.

Guide No. 2. Gardens within a Garden; A general guide to the grounds. Views and folded map. Published, May, 1929. (Brooklyn Bot. Gard. Record, 18²: 153-188.) Price, 25 cents.

Guide No. 3. The story of our maize: A chronicle of corn. Illustrated. Published, December, 1929. (Brooklyn Bot. Gard. Record, 18²: 283-307.) Price, 25 cents.

SEED LIST. (*Delectus Seminum*) Established, December, 1914. Since 1925 issued each year in the January number of the *Record*. Circulation includes 143 botanic gardens and institutions located in 42 countries.

AMERICAN JOURNAL OF BOTANY. Established, January, 1914. Published, in cooperation with the **BOTANICAL SOCIETY OF AMERICA**, monthly, except during August and September. Subscription, \$7.00 a year. Circulates in 48 countries.

ECOLOGY. Established, January, 1920. Published quarterly in cooperation with the **ECOLOGICAL SOCIETY OF AMERICA**. Subscription, \$4.00 a year. Circulates in 48 countries.

GENETICS. Established, January, 1916. Bimonthly. Subscription, \$6.00 a year. Circulates in 37 countries.

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MARCH, 1930

NO. 2

NINETEENTH ANNUAL REPORT OF THE BROOKLYN BOTANIC GARDEN 1929



PUBLISHED SEMONTHLY
AT PRINCE AND LEMON STS., LANCASTER, PA.
BY THE BROOKLYN INSTITUTE OF ARTS AND SCIENCES
BROOKLYN, N. Y.

Entered as second-class matter in the post-office at Lancaster, Pa., under act of August 24, 1912.

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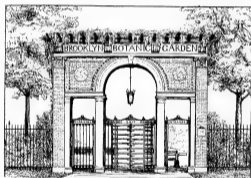
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MAUDE E. VORIS, *Assistant Secretary*
NORMA STOFFEL BANTA, *Office Assistant*
MARIE-LOUISE HUBBARD, A.M., *Secretary to the Director*
FRANK STOLL, *Registrar and Custodian*
WILLIAM H. DURKIN, *Membership Secretary*
LAURA M. BREWSTER, *Stenographer*
L. CONSTANCE PURVIS, B.A., *Stenographer*
RUTH M. TATE, *Stenographer*
HILDA VILKOMERSON, *Stenographer*
EVELYN M. WILLIAMS, *Stenographer*

† On leave of absence.

* Resigned, March 31, 1930.

NINETEENTH ANNUAL REPORT
OF THE
BROOKLYN BOTANIC
GARDEN

1929



"For the advancement of botanical science and knowledge, and the prosecution of original researches therein and in kindred subjects."—*Laws of New York, 1897, Chapter 509. An Act providing for the establishment of a Botanic Garden in the city of Brooklyn.*

BROOKLYN, N. Y.
MARCH, 1930

LANCASTER PRESS, INC.
LANCASTER, PA.



FIG. 1. Richard Young Gate, South Flatbush Avenue Entrance. Opened to the public January 1, 1930. (6887.) Cf. Fig. 2.

NINETEENTH ANNUAL REPORT

OF THE

BROOKLYN BOTANIC GARDEN

1929¹

REPORT OF THE DIRECTOR

TO THE BOTANIC GARDEN GOVERNING COMMITTEE:

I have the honor to present herewith the nineteenth annual report of the Brooklyn Botanic Garden, covering the year 1929.

What a Botanic Garden is Not

In his book, *L'art des jardins* (Chapter seven), M. Edouard André, a French landscape architect, gives a classification of public parks and gardens. Dividing public gardens into *Pleasure Gardens* and *Utility Gardens*, he places botanic gardens in the latter class. We do not imagine, for a moment, that M. André overlooks the fact that pleasure is useful and even essential to healthy living; but what strikes one is that he clearly recognizes the utility or usefulness of botanic gardens, though excluding them from the class of gardens developed and maintained primarily for pleasure or recreation.²

One might think that this matter would no longer need to be explained. In some quarters, to be sure, it does not; but just what a botanic garden is, and in what ways it serves human needs—individual, educational, recreational, civic—is still not a matter of universal understanding. Botanic garden administrators still

¹ BROOKLYN BOTANIC GARDEN RECORD, Vol. XIX, No. 2. March, 1929.

² M. André, of course, is here using the term botanic garden in its narrow sense as referring to a garden or park area planted in accordance with botanical considerations. In the Brooklyn Botanic Garden RECORD for May, 1929, the broader conception of a botanic garden as a scientific and educational institution was elaborated.

meet the question, "*Qui bono?*", not only from those who are hardly in a position to understand the true answer, but also from those who sympathetically and sincerely wish to know. They must also give convincing answers annually when public officials, entrusted with public money, are asked to make appropriations commensurate in amount with what the trustees and staff know to be the value and uses of botanic gardens, the extent to which the public needs them, and how largely it is responding to the opportunities which the garden affords.

In previous reports and elsewhere we have taken occasion to suggest what a botanic garden is. Certain experiences suggest that it may not be amiss to state what a botanic garden is not. This may, perhaps, be done most tersely by listing a few of the requests, received during the past year and previously, to which we have, of course, been obliged to give negative answers.

Unusual Requests

1. For the installation of apparatus to provide outdoor radio concerts.
2. For boys to play marbles in the Garden.
3. For the use of the grounds to stage a pageant.
4. For a cricket team to use the esplanade as a cricket field.
5. For the construction of a bridle path through the Garden.
6. For permission to hold Maypole dances on the lawn.
7. For the staging of a motion picture in the Japanese Garden.
8. To set aside a portion of the Garden as a playground.
9. For permission to erect a large tent for the purpose of holding a military exhibit.
10. To hold a kermess in the Garden for the purpose of raising funds for another organization.

The list could be prolonged. All of these requests show that those who made them had never understood what a botanic garden essentially is: Not a park, not a playground, not a potential building site, not a mere open space waiting to be put to some use.

Every year it is necessary for us to explain to several well-meaning people that a botanic garden, like a museum, is a scientific and educational institution; that its grounds constitute, in fact, an outdoors museum of living plants, and that, while it

may serve incidentally some of the purposes of a park, it is not planned nor administered with that object in view, but with the aim of stimulating and fostering a knowledge and love of plant life on the part of the public. Everything that does not contribute to this end tends to defeat its purpose as a botanic garden. It is really surprising how often it is necessary to explain this fact to visitors and to correspondents who suggest uses of the grounds, like those mentioned above, wholly foreign to the purposes of a botanic garden.

We realize, of course, that thousands of the more than one million persons who visit the Garden annually come to enjoy the place merely as they would a park; such persons are more than welcome. The Garden is glad to serve the community in every way that does not interfere with its main purpose of botanical education; but apparently it is still a perennial necessity to emphasize the fact that a botanic garden is not *merely* a park, and that the use of its grounds in that way must always remain secondary to its main purpose as an outdoors museum of plant life.

Important Gifts

Among the larger gifts for 1929 may be mentioned the following:

1. *Woven wood fence to enclose the Japanese Garden.* Perhaps no more urgent need has been met than this. No part of the Botanic Garden has suffered more than the Japanese Garden by the tendency of certain elements of the public to use it as a picnic- or play-ground. A Japanese Garden is, above all things, intended to be a place of quiet, where one would go, as to an art gallery, to enjoy the beauty of the place, or to a temple or shrine for meditation and quiet. This purpose, of course, is completely defeated if the Garden is dominated by boys playing tag or by adults behaving in equally unseemly manner. The only way to prevent this is by being able to control entrance to the Japanese Garden apart from entrance to the Botanic Garden as a whole, and by having the Garden open only when it is possible to have it properly supervised by guards. This has been made possible by the new fence, to the gratification of the majority of our visitors and the relief and satisfaction of the administration.



FIG. 2. Old South Flatbush Avenue Entrance, now the site of the Richard Young Gate. June 1, 1928. (6468.)
Cf. Fig. 1

The fence, erected in May, is of chestnut poles, imported from France, and the donor prefers to remain anonymous. We have not, in a long time, had a gift that was more urgently needed.

2. *Two new bridges* are the gift of a member of the Botanic Garden Governing Committee, Mr. Alfred W. Jenkins, in memory of his mother Mrs. James M. Jenkins. Like the Hills Boulder Bridge (presented by Mrs. John Hills in 1928), they were designed by our consulting landscape architect, Mr. Harold A. Caparn, and are constructed of glacial boulders, with concrete arches concealed by stone work. One of them, up-stream from the Hills Bridge, replaces an old wooden bridge, intended as a temporary structure when built fifteen years ago (in 1914), and which had become quite unsafe and beyond repair. The other is down-stream from the Hills Bridge. Both bridges add materially to the beauty of the Garden.

3. *Garden seats*, also designed by Mr. Caparn, and erected by our own force of men, have been installed on three sides of the Esplanade, as follows:

One seat, in the center of the walk at the north end of the Esplanade, was presented by The Garden Teachers Association of the Brooklyn Botanic Garden. This was the first one given, and was constructed in May. Ten seats, five on each side, are, like the new bridges, the gift of Mr. Alfred W. Jenkins. Their construction was completed in September.

The twelfth seat is in the name of Dr. and Mrs. Charles G. Purdy, the gift being posthumous as to Mrs. Purdy and accepted as in her memory. This seat, also completed in September, stands at the north end of the Esplanade, facing the west walk.

The ends of the seats are of artificial stone, the seats proper and the backs being of wood.

On November 30, a gift of \$300.00 was received from Mr. Edward C. Blum (the president of our board) and Mrs. Blum to provide two more seats in the vicinity of the bubbler drinking fountain given by Mrs. Blum in 1928. This gift was received too late to permit of the construction of the seats in 1929. They will be placed early in the spring of 1930.

Additional seats are needed, and may be provided at a cost of \$150.00 each. The seats are unique, being designed specially for the Botanic Garden.

4. *Improvement of Alfred T. White Memorial.* During the fall it became evident that the area surrounding the Alfred T. White Memorial, first planted in the spring of 1923, and chiefly with *Pinus montana*, was greatly in need of replanting. This experience (like several others) emphasizes the futility of endeavoring to grow coniferous evergreens in such dust-laden and fume-laden atmosphere as obtains in the center of most large cities. Austrian pine and, to a less degree, a very few other species are the only conifers that seem to be able to do at all well under such conditions. The dwarf pines about the White Memorial were the generous gift of Mr. Frank Bailey, then chairman of the Botanic Garden Governing Committee. They were very beautiful when planted, but their fate was sealed when they were brought from the pure air of Locust Valley, Long Island, to Brooklyn.

On November 6, the Botanic Garden received a contribution of \$668.75 to cover the estimated cost of replanting this area with Rhododendrons. Of this gift, \$400.00 was from Miss Harriet H. White and Miss Frances E. White, sisters of Mr. White, and the remainder from his daughter, Mrs. Adrian Van Sinderen. The special preparation of the ground for Rhododendrons was completed during the fall, and the planting will be done in the spring of 1930.

The Richard Young Gate

The outstanding gift of the year is the new gate at the south Flatbush Avenue entrance. This was made possible by a gift of \$17,000.00, received on May 28th from Hon. Richard Young.

Mr. Young has been a resident of Flatbush for many years. He was Commissioner of Parks for the Boroughs of Brooklyn and Queens in 1902 and 1903, during Mayor Low's administration. The park systems of these two Boroughs, now separate, were then under one Commissioner. From March, 1909 to March, 1911, Mr. Young served as a member of Congress from the then Fifth Congressional District.

Mr. Young's influence, as Park Commissioner, was one of the largest factors in insuring the preservation for park purposes of that portion of the old "East Side Lands," now known as the Brooklyn Botanic Garden. Under his direction the grounds,

formerly crossed by streets, occupied by cheap buildings, and used in part as a dumping ground, were graded, landscaped, and topsoiled, the border mound constructed, the first iron fence erected, and the initial planting done. When this work was completed, formal exercises were held on November 14, 1903 to mark the opening of the new park to the public.

The *Richard Young Gate*, completed in December, 1929, was designed by McKim, Mead & White, who were also the architects of our buildings. On November 29, two pin oaks were planted, one on each side of the Gate. The one on the north is 37 feet and the one on the south 35 feet high, the ground being slightly lower on the north side of the Gate. The trees were included in Mr. Young's contribution.

It is hardly possible to overstate what this gift has meant to the Brooklyn Botanic Garden. Previously, all four entrances had been merely openings in a fence, and the situation at the south Flatbush Avenue entrance was particularly distressing since the street just outside the gate had never been regraded and the walk relaid and realigned since 1914 when the Botanic Garden came into possession of this portion of its grounds, known as the South Addition. As a result of the erection of this beautiful gate, preliminary steps were taken near the close of 1929 for putting the adjacent street area in proper condition. This work is in charge of the Department of Parks, as Flatbush Avenue, from Empire Boulevard to Grand Army Plaza, is a parkway, and the Botanic Garden has no jurisdiction outside of the Garden fence. It is anticipated that the work will be completed early in 1930.

Other Gates Needed

Designs for three other gates, all greatly needed, have been prepared by the same architects for the south Washington Avenue, north Washington Avenue, and Eastern Parkway entrances.

The Eastern Parkway Gate is specially urgent now that the Parkway has become built up opposite the Botanic Garden with high class apartment houses. This street, moreover, is one of the busiest thoroughfares of the City, and this is one of the most used entrances to the Garden, the registered attendance, in some months, exceeding 19,000.

The preliminary estimate of cost of the three gates, including architects commission, is as follows:

North Washington Avenue Gate	\$ 8,800.00
South Washington Avenue Gate	8,910.00
Eastern Parkway Gate	50,600.00

Doubling the Value of a Gift

Public institutions, such as botanic gardens, museums, colleges, and universities, need not only funds but friends, assurance of appreciation, encouragement, and a sympathetic, intelligent understanding of aims and needs. The "endowment" of an institution is never completely expressed in terms of dollars and cents. The Brooklyn Botanic Garden has been bountifully blessed with this combination of material and moral support. The value of practically all of our benefactions, including these "important gifts" and others acknowledged in this report, have in this way been more than doubled. Thus, in the correspondence offering to provide funds for the bridges, Mr. Jenkins writes: "I feel certain that these improvements will add to the beauty of *our* Garden, and you may be assured that it is affording me much pleasure to be the instrument in taking care of these requirements." In another letter: "The Brooklyn Botanic Garden deserves support and I am glad to be in a position to help along. . . . It may be my activity will lead some other residents to spend their money in this way, for the further embellishment of the Garden *to the benefit of the general public.*" And again: "I am indebted to you for the opportunity to make this contribution to the Brooklyn Botanic Garden, which is undoubtedly doing yeoman's service in the interest of the general public and *ought to be more generously supported.*" (All italics in these quotations are by the editor.)

In remitting the \$150.00 for the seat of the Garden Teachers Association, the treasurer of the Association writes: "The seat, as a gift, is only a slight token of our great love for the Garden, and of our appreciation for all the help extended to both teachers and pupils throughout the year."

Similar expressions, given orally, accompanied most of the other gifts listed above.

Restrictions Concerning Memorials

From time to time, since it was established, the Botanic Garden has been offered gifts of money to be used for planting a tree or providing some other object to be prominently placed and designated by a bronze tablet or other suitable marker as a memorial to someone related to or greatly admired by the would-be donor, but concerning whom the proposed memorial would be the first intimation to the general public that such a person had existed. City authorities have had such proposals with reference to public squares and parks. The motive of the donor is of the highest, but it requires only a brief consideration to make clear the impropriety of placing such marked memorials in public places. After a thorough consideration of this matter, the Botanic Garden Governing Committee, some time ago, adopted the following resolution:

Resolved that no memorial inscriptions should be permitted within the Botanic Garden other than to those whose life and whose scientific, educational, or civic activities have been such as to entitle them to commemoration in public places.

Bubbler Drinking Fountains

In the Brooklyn Botanic Garden RECORD for July, 1923, we published a letter from one of our visitors, which read, in part, as follows:

"I am writing this in favor of a number of small people who visit your beautiful gardens every day and who would very much like to know whether there could possibly be a drinking fountain placed somewhere on the lawns so as to enable them to quench their thirst these hot summer days."

Our reply contained the following statement: "We have, on a number of occasions, urged in our Annual Reports the need of more drinking fountains. At present, the only probability of our being able to secure funds for this purpose in the near future is for some public-spirited individual to make a contribution for this purpose."

In the spring of 1927, Mrs. Glentworth R. Butler (as recorded in our Annual Report for that year) interested herself in the matter and secured from seven members of the Woman's Auxil-



FIG. 3. Jenkins Boulder Bridge (upper). Replacing temporary wooden bridge. September 12. (6811.)

ary and one annual member of the Garden, contributions (seven of \$150.00 and one of \$250.00) totaling \$1,300.00 to be used for this purpose. At first, nine fountains were contemplated, but it was finally decided that eight would be sufficient and \$100.00 of the contribution of Mrs. William Hamlin Childs was transferred, with the consent of the donor, for the purchase of a glass-bead projection screen for the small lecture room. The names of the donors are as follows: Mrs. Edward C. Blum, Mrs. William H. Childs, Mrs. Frank H. Davol, Mrs. John E. Leech, Mrs. William W. Marshall, Mrs. Edwin P. Maynard, Mrs. Adrian Van Sinderen, Miss Harriet H. White.

The fountains were designed by Mr. Harold A. Caparn, consulting landscape architect of the Garden and, owing to unavoidable delays, their installation was not completed until May 3, 1929. They meet a real need. Each one has been surrounded on three sides with a planting of shrubbery, and when this matures they will add to the aesthetic pleasure as well as the comfort of Botanic Garden visitors.

Research during 1929

Brief statements of the results obtained by investigations carried on during 1929 may be found on pages 55-68, and need not be reviewed here.

Pure and Applied Science

Since the Botanic Garden was established its program of botanical research has been one chiefly of pure science. No hard and fast line can be drawn between pure and applied science. For example, the investigations at the Garden during the past eight years on the general project of Disease Resistance in Plants have yielded information of both theoretical and practical importance. The same has been true of other projects and problems. The advantage of a Botanic Garden in contrast, for example, with such an institution as an agricultural experiment station, is that, so far as it may seem desirable, the Garden can focus its energies on pure science problems, while the experiment station must, in the nature of the case, devote much of its time and resources to problems of applied science, not calculated to yield fundamental principles. It is for this reason, in part, that the research of the Botanic Garden is in little, if any, danger of duplicating the work

in these other institutions, important and essential as it is. This matter has been stressed in preceding reports of the Garden, but the question of duplication is like a perennial plant, whose root seems never to die, and so we are forced to give some attention to it at intervals in the annual reports.

Only the ignorant now question the importance of pursuing knowledge merely for the love of it. All the mechanical inventions which are the chief distinction between ours and earlier civilizations are merely by-products of the work of investigators pursuing their studies only for the joy of discovering new truth. The applied sciences of agriculture and horticulture are built upon foundations of pure science research. Such has been the foundation of all the educational work of this and other botanic gardens, including the exhibits in plantations, conservatories, and museums, and the formal instruction in classes and lectures.

Beardless Iris Project

Iris is one of the few ornamentals to enjoy such widespread popularity as to have national organizations (in this and other countries) formed for the express purpose of furthering public interest in it and promoting our knowledge of it. This, of course, is evidence of the rare beauty of the flower, and of its wide range of variation and hardiness. In April, 1920, the Botanic Garden entered into a cooperative agreement with the American Iris Society to maintain here a test garden for beardless Irises and to make a special study of their culture, breeding, diseases, classification, nomenclature, and comparative merit. This Agreement was published in the Brooklyn Botanic Garden RECORD for October, 1920. In 1924, Dr. Reed, curator of plant pathology, took charge of the project, as the pathology of Iris is one of the most fundamental of these problems, affecting its culture and breeding. The investigations have resulted in substantial additions to our knowledge of this important group of plants, and valuable data have been accumulated, including many beautiful water color illustrations of the more desirable varieties. Our test garden now contains what is probably the largest collection of beardless Iris, in number of varieties, in the world.

This investigation has now reached a stage where a trip to Japan is essential for the purpose of making first-hand studies

of the culture, breeding, history, nomenclature, etc., of the Japanese varieties.

Dependence of Research on Public Support

Everyone benefits from scientific research; the public should, therefore, support it. States have recognized this responsibility more generally and more generously than have municipalities. In particular, our cities are dependent upon research which yields results applicable to the raising of crops. The total annual saving effected by diminished loss and increased yield through a better knowledge of plant diseases, plant breeding, and agronomy amounts to millions of dollars annually. Municipalities and dwellers in cities benefit most from this saving because they do the bulk of the buying. General John J. Carty, vice-president of the American Telephone and Telegraph Company, in referring to the economic benefits of scientific research, has recently written as follows:

"American business and commerce and industry and the American public should be urged to give to scientific research in our universities and elsewhere that support which it so greatly needs. The progress of scientific research in our country depends in the last analysis upon the support which it receives from the public. There is no lack of problems to be solved, all of which in one way or another affect the welfare of the nation, and there will be no lack of competent scientific investigators who will solve them if the necessary financial support is provided."

A statement of additional funds needed for research may be found on pages 50-53 following. In our preceding annual report, we pointed out in some detail how adequate the resources of Brooklyn are to finance all those cultural agencies (schools, botanic gardens, museums) which minister to the city's most fundamental need. All that is necessary is to arouse a public sense of this need. This has been nowhere more effectively stated than by Graham Wallas.

"The main hope for the future of American creative thought lies in an extension of the American sense of need. We do not despise the intellectual creator who gives us something that we ourselves really desire; and to an increasing extent the desires of the great average population of America, may turn towards values that cannot be expressed in terms of money. No one now makes money by looking at the glorious marble buildings of Wash-

ington . . . or the pictures and statues and biological collections that attract scores of thousands of eager visitors to the Metropolitan Museums of Fine Art and Science. And fifty years hence the great grandsons of the American pioneers may feel not only moral sympathy but spontaneous gratitude for that kind of effort by which alone the weak and imperfect human brain can add to its scanty store of knowledge and beauty." (*The Art of Thought* (1926), pp. 202-3.)

Educational Activities

"One of the greatest menaces to civilization" (as a writer in *Mind* for October, 1929, has pointed out) "is the ever widening gulf between scientific and common knowledge." Recognizing the truth of this statement, we should welcome all serious attempts to interpret the results of modern scientific discovery to the non-specialist—the intelligent layman.

A complete statement of our educational work since the Garden was established may be found in the Brooklyn Botanic Garden RECORD for July, 1929, entitled *Public Education at the Brooklyn Botanic Garden, 1910-1928*.

School Service

The school service of the Botanic Garden extends to all five boroughs of Greater New York. This includes the supply of study material (largely living plants and plant parts), sterilized agar for the study of bacteria, the loaning of lantern slides with lecture text, conferences with teachers, installing exhibits in the schools, supplying potted plants for the beautification of classrooms, and packets of vegetable and flower seeds for planting in school and home gardens. Over 286 day schools were served in one way or another in 1929, including 241 out of a total of 294 (82%) in the Borough of Brooklyn.

The extent and variety of this service are shown in the tables on pages 27 and 71. Considering the fact that our work is confined wholly to the study of plant life, and therefore finds only two or three points of contact with the school course—nature study (in part), biology (in part), and geography (in part)—the statistical figures are truly impressive.

TABLE I

STATISTICS OF SCHOOL SERVICE

	1929	1928
<i>Conferences</i>		
No. of conferences	7	
No. of teachers involved	288	1,060
No. of pupils involved	14,023	49,600
<i>Loan Lectures (Lantern Slides, etc.)</i>		
No. of sets lent	27	
No. of teachers involved	97	60
No. of pupils attending	6,000	6,736
<i>Material Supplied</i>		
Total number of requests from schools	443	975
Number of different schools	140	
High Schools & H. S. Annexes		
Brooklyn (Total No. 33)	24	25
Queens (Total No. 13)	7	8
Manhattan (Total No. 28)	14	19
Other Boroughs (Total No. 16)	14	10
Junior High Schools (Totals in Brooklyn, 17) ...	18	18
Colleges and Universities (Total in Brooklyn, 7)	11	11
Training Schools (Total in Brooklyn, 2)	4	4
Elementary		
Brooklyn (Total No. 234)	29	123
Queens (Total No. 150)	0	
Manhattan (Total No. 192)	2	
Other Boroughs (Total No. 137)	1	
Private and Parochial		25
High	6	
Elementary	6	
Other Institutions	8	5
No. of potted plants for nature study	3,956	
No. of Petri dishes filled with agar	4,134	3,231
Total number of teachers supplied	6,457	3,818
Total number of pupils reached	282,299	156,619
<i>Living Plants Placed in School Rooms</i>		
No. of schools	41	
No. of plants	307	
No. of teachers	441	
No. of pupils	21,357	
<i>Plants Distributed (Raised in Classes)</i>		
No. of teachers taking plants	713	
No. of children taking plants	3,298	
Total number of schools represented	393	
<i>Seed Packets for Children</i>		
No. of schools	437	415
No. of teachers	6,591	3,574
No. of pupils	263,662	177,110
No. of packets	795,307	559,754
<i>Exhibits Provided</i>		
No. of exhibits	36	29
Viewed by	31,744	89,065
<i>Newspaper Clippings Received</i>		
	792	1,117
<i>Outside Organizations Meeting at Garden</i>		
Number	10	19
Attendance	859	1,175

Independent Elementary Instruction

The words "independent elementary instruction" refer to our work with teachers and children organized independently of the schools, and includes classes in the instructional greenhouses, the children's garden, the plantations, conservatories, classrooms, and laboratories. Also projects undertaken by boys and girls outside of class organization—individual work, under personal supervision, in which some problem, chosen or assigned, is investigated after the manner of research, as independently as possible and as thoroughly and over as long a period of time as the pupil wishes. Such projects are undertaken by boys and girls who have been taking work at the Garden, outside of school hours, for as many as three or more years—in some cases for as long as six or eight years. This is work which yields the most substantial educational results, and is given special recognition by the Garden in the way of medals and scholarships.

The appended report of the curator of elementary instruction gives a detailed account of this work during 1929, as well as of our activities in cooperation with schools.

Public Instruction

The title "public instruction," as here used, refers to the broader aspects of our educational work, such as newspaper publicity, popular publications, flower days, public lectures, cooperation with colleges and high schools, and classes or field work for adults.

The gradual increase in registration in classes for adults is worthy of special note. Sometime ago, the registration in certain classes (notwithstanding the fact that a nominal tuition is charged), reached the capacity of our instructional greenhouses and the number accepted was necessarily restricted, this fact being announced in the *Prospectus*. The number of applicants, however, continued to increase until it became necessary to organize some of the classes in two or three sections. While somewhat embarrassing, this has been very gratifying, for it shows, not only an increased public interest in plant life and gardening, but also that the courses offered are meeting the needs and interests of the public.

Demonstration Mounts for High Schools

Special attention is called to the report (p. 82) of demonstration mounts of cereal grains, corn, and sorghum which have been prepared by Dr. George M. Reed in cooperation with Dr. Ralph C. Benedict, resident investigator, and distributed to High Schools in every borough of Greater New York. These have been purchased by the schools and have thus become part of the permanent equipment of the various departments of biology. Dr. Reed calls attention to the fact that the materials supplied were, to a great extent, by-products of our research.

Plantations and Grounds

During the season of 1929, the garden itself gave a greater impression of maturity than ever before since the initial planting began in 1911. This was so noticeable that visitors frequently commented on it. The effect was due largely to the growth of the earlier planted trees and shrubs, to the greater number of woody plants, and to the introduction of new major features, such, for example, as the Rose Garden, the three new boulder bridges, and the new garden seats.

Gardening Operations

Spring work on the grounds opened on March 23, as compared to April 2 in 1928. Among the larger operations were the re-planting of the Azaleas at the Richard Young entrance and, on Azalea Hill and Azalea Bank, and the planting of 100 lilacs, north and south of Lilac Triangle, adding about 100 varieties to those planted in 1916. The total number of lilac varieties is now approximately 200.

The Museum embankment immediately north of the Rose Garden, after soil treatment, was planted with about 100 climbing roses, in ten varieties and with a ground cover of "Japanese spurge," *Pachysandra terminalis*.

Wild Flower Garden

Because of insufficient gardeners, it became necessary in 1924, temporarily, to discontinue the Local Flora Section (Native Wild



FIG. 4. Aster "Mauve Cushion." A Horticultural Variety derived from American Wild Asters.
October 24. (6878.)

Flower Garden). This was a pity, for much labor, in collecting and planting, had been expended on this section, and it had become one of the most popular sections of the plantations. In anticipation of its re-development, new planting plans were made, involving discontinuing the arrangement of the herbaceous plants in beds, and also the planting of a small grove of local flora trees, both deciduous and evergreen, in the northern part of the local flora "valley." The purpose of these trees was not only to have the various species represented, but to secure in that area, on a small scale, the conditions of a "woods" or open forest canopy, favorable to the growth of native woodland species, requiring more or less shade. The trees have now grown sufficiently to afford these conditions, and the Native Wild Flower Garden may now be re-established whenever funds become available for the salaries of additional gardeners.

Undeveloped Area

For several years attention has been called to the undeveloped state of the North Addition, comprising about three acres, between Mt. Prospect Reservoir on the west and Brooklyn Museum property on the east, together with a strip south of the reservoir. Although this area fronts on Eastern Parkway (one of the most used thoroughfares of the Borough), and is in full view of the apartments recently constructed on the opposite side of the Parkway, it has remained under the plow for the past 16 years, owing solely to lack of funds for its development and subsequent maintenance.

On December 7, 1929, a request was forwarded to the Board of Estimate and Apportionment for an appropriation of corporate stock of the City of New York in the sum of \$24,100.00 for the improvement of this area. Plans have been prepared by the consulting landscape architect, Mr. Caparn, and these were approved by the Botanic Garden Governing Committee on December 19, 1929. They have also received the approval of McKim, Mead & White, the architects of the Museum Building. Their approval was sought because this area will serve as the setting for the west facade of the Museum Building, when completed, and this fact has been one of the chief controls in the landscape design.

Rose Garden

About 700 plants, representing 149 varieties, were added to the Rose Garden during the year. Additions have also been made to the structural work. A fuller statement is given in the appended report of the horticulturist and head gardener, page 100. By constant attention and intelligent care, the garden successfully withstood a severe drought during the summer. The period of bloom was unusually long—over 100 varieties being in flower as late as November 22, the first frost, on the following day, putting an end to the bloom. The second annual Rose Garden Day was held on June 14. (Cf. p. 79.)

Japanese Garden

Mention has already been made (p. 15) to the woven wood fence erected around the Japanese Garden in the spring, thereby completing its enclosure. During the coming year, the Japanese type fence and the large bridge will both have to be rebuilt.

Laboratory and Conservatory Plazas

On April 25, 1929, the Board of Estimate and Apportionment appropriated \$21,000 of Tax Notes of the City of New York for the completion of the improvement of the areas in front of the Laboratory Building and Conservatories. Delays of one sort or another prevented the beginning of this work during the year, but everything was in readiness in December for advertising the contracts for public bidding, and this will doubtless be done early in 1930, so that work may be undertaken in the coming spring.

Library

Resignation of Miss Simpson

The resignation of the librarian, Miss Ray Simpson, to take effect on September 1, 1929, was presented to the Governing Committee at its meeting of June 11. With expression of my personal regret at the resignation (owing to ill health) of one who had been an efficient member of our staff for so many years, I am glad to include here the resolution adopted by the Governing Committee in accepting the resignation, as follows:

Resolution. The members of the Botanic Garden Governing Committee learn with special regret of the resignation of Miss Ray Simpson, librarian of the Brooklyn Botanic Garden since September 18, 1916. The director of the Garden is requested to convey to Miss Simpson an expression of the Committee's sincere appreciation of her faithful and effective administration during the past thirteen years. Members of the Committee who have had occasion to use the library have always been impressed with the efficiency and cheerfulness of the service, and regard Miss Simpson's resignation as a distinct loss to the Botanic Garden organization."

When Miss Simpson entered upon her duties in 1916 the library, of about 4,000 volumes and 6,000 pamphlets, largely unbound, occupied temporary quarters in Room 327 of the Laboratory Building. At the time of her resignation the library occupied three stack rooms, besides the librarian's office and a duplicate room, and its more than 13,000 volumes and 10,000 bound pamphlets had outgrown the available shelving; the number of visitors had increased from about 1,400 to over 6,000. During this period, also, the library had acquired the reputation for rendering prompt, efficient, and cheerful service, not only to the staff, but also to the general public, all of which has been of great value to the Botanic Garden and very greatly appreciated.

Appointment of Mr. Foss

On June 28, Mr. Calvin W. Foss was appointed librarian, beginning as of October 1, 1929. Mr. Foss graduated from Dartmouth College in 1900 with the degree of B.L., and was assistant librarian of Amherst College (1905-1907), assistant reference librarian, Brooklyn Public Library (1908-1909), and reference librarian (1910-September 30, 1929).

New Library Stacks

On April 25, 1929, the Board of Estimate and Apportionment adopted a resolution (Calendar No. 43-A) authorizing the issue of Tax Notes of the City of New York in an amount not exceeding \$3,000.00 for new library stacks for the entire second floor of the reading room and the main stack room, and for additional

shelving for the main floor of the reading room and the stack room on the street floor.

On October 22, bids for this contract were received by the Park Board as follows (*City Record*, Nov. 9, p. 7897) :

1. Art Metal Construction Co., Jamestown, N. Y.....	\$3,426.23
2. The General Fireproofing Co., New York City	3,578.00
3. Jamestown (N. Y.) Metal Equipment Co.	4,100.00

The lowest bid was, therefore, \$426.23 in excess of the amount appropriated.

On December 5, the Board of Estimate and Apportionment passed two resolutions, as follows :

1. Approving increased estimate of cost for this work in the sum of \$3,426.23.
2. Authorizing issue of Tax Notes of the City of New York in an amount not exceeding \$425.00 to supplement the original appropriation.

At the close of the year the contract had not been awarded.

Needs

In previous annual reports it has been noted that the library never had any special fund for its initial purchase of books. It has, from the beginning, grown by such modest annual increments as have been made possible by comparatively small sums set aside from special contributions and endowment income. Although our *Agreement* with New York City provides (Paragraph Sixth, *Brooklyn Bot. Gard. Record* 1: 11. Jan. 1912) that the City will make annual appropriations in its Tax Budget for the purchase of publications, the City has never been asked to do this, the library, from the beginning, having been financed from private funds. About six per cent. of the total private funds income is now set aside for the purchase of publications (including subscriptions to periodicals) and for binding. This has been supplemented by publications received as gifts and in exchange for our own serials.

At the close of the year 1929, the director has in hand requisitions for 1930 representing urgent needs for \$2,100.00 worth of publications—an amount that equals practically the entire antici-

pated funds for such purpose for next year. Many of these items are back sets of serial publications and botanical classics, very essential for such a library as ours, but which are becoming scarcer and more expensive every year.

There are also, at the close of the year, about one thousand volumes needing to be bound. From these statements it may be readily seen that we have urgent need for additional funds to be expended for present requirements, and also for a special library endowment fund to insure a larger annual income in the future.

Herbarium

Appropriation for New Cases

In the preceding report, I called attention to the need of additional herbarium cases. On March 5, 1929, with the authorization of the Governing Committee, a request was submitted to the Board of Estimate and Apportionment of New York City for an appropriation of \$6,000.00 for these cases. On April 25, the Board passed a resolution authorizing the issue of tax notes in the total sum of \$30,000.00 for permanent improvements, including an item of \$6,000.00 for the herbarium cases. Bids for this contract were received by the Park Board on October 15, as follows:

The General Fireproofing Co.	\$6,890.00
Art Metal Construction Co.	6,450.00
Roger A. Simonson & Co.	5,995.00
Jamestown Metal Equipment Co.	5,957.00

The contract with the low bidder was executed on November 21, the work to be completed within sixty working days.

Miscellaneous

During November, doors were provided for the storage shelves in the Herbarium Work Room.

Special attention is called to fact that several thousand specimens remain unmounted for lack of funds for a temporary assistant for this work.

Accessions to the herbarium are noted in the appended report of the curator of plants.



FIG. 5. *Crocus vernus*, "naturalized" in the lawn. March 28. (6781.)

Gifts

The Garden has received during the year an unusually large number of gifts which have been acknowledged with the thanks of the Botanic Garden Governing Committee. They are listed on pages 132-140. Their number and geographic distribution is gratifying evidence of the widespread interest in the Brooklyn Botanic Garden.

It is a pleasure to acknowledge here the professional services donated in such a fine spirit by the following Japanese:

Mrs. Tsuya Okuda, principal of the Okuda Sewing High School for Girls, Tokyo, who graciously performed the Japanese Tea Ceremony in the Tea House on Japanese Garden Day, May 24.

Mr. B. Matsuki, who acted as guide to our guests on Japanese Garden Day, and who has freely rendered numerous other services.

Mr. Y. T. Sathaki, who has come to the Garden at frequent intervals during the year to care for the Garden's collection of Japanese dwarfed trees, as only a native Japanese could do. These trees were presented by Mr. Ernest F. Coe, in June, 1925.

Also to the members of the Woman's Auxiliary of the Garden who individually and as an organization contributed freely of services, materials, and equipment on the occasion of our Spring Inspection, and to whom the success of that delightful function is largely due.

To the Woman's Auxiliary, also, the Botanic Garden is indebted for the gift of the Picture Map of the Garden, presented in memory of Dr. Glentworth R. Butler, as a token of appreciation of Mrs. Butler's services as president of the Auxiliary for several years.

Membership

Enrollment

The total number of members at the close of the year was 1,187, a slight decrease from last year. As in 1928, membership privileges have been extended during 1929 to those who contributed \$25.00 or more to the Citizen's Endowment Fund, subscribed in 1926. The list of members (as of February 24, 1930) is given on pages 156-170.

Special Service

Nursery Catalogs. In February, a large collection of nursery catalogs was placed on the Library tables and post-card bulletins announcing this were sent to all members.

Colored Souvenir Post Cards, showing views in the Botanic Garden were distributed free to members during the Spring. These are the first colored post-cards of the Garden, and included the following subjects: Children's Garden (The Formal Garden); Children's Garden (Saturday Morning Scene); The Rock Garden (Waterfall and Iris); The Lake: View Facing West (East Indian Lotus—*Nelumbo nucifera*); The Brook (View Facing North); Daffodils (*Narcissus Pseudo-Narcissus* Variety "Emperor"), naturalized in the lawn. The cards have been on sale daily since published—on Sundays on the Grounds, on week days in the Laboratory Building.

Distribution of Surplus Plant Material to members included 1700 Chrysanthemums and 200 Asters. This has become a popular service, the demands being in excess of our ability to respond.

Flower Days. These are reported on in detail by the curator of public instruction (page 78). They increase in popularity from year to year.

Fifteenth Annual Spring Inspection

On account of rain during part of the day, the attendance at the Annual Spring Inspection was only about 500—somewhat smaller than on preceding years. The Inspection, as usual, was held on the second Tuesday in May, which fell in 1929 on May 14.

The tour of the grounds included inspection of the statuette "Merchild" (permanently installed during the year), the Rock Garden, the eight new bubbler drinking fountains, the Hills Boulder Bridge, Lilac Triangle and Rose Garden, new Garden seat, Cherry Walk and Japanese Garden, and the Woven Wood Fence around the Japanese Garden.

The exhibits included a rare collection of reproductions of original water colors and drawings of Portuguese flowers by H. M. Queen Amelie of Portugal, Princes of France; also Indian, Persian, and European book illustrations (miniatures), showing the use of flowers, trees, and gardens in decorative illustrations

from the 15th to the 18th centuries. For the opportunity of exhibiting these items the Garden is indebted to Messrs. Maggs Bros., London.

There was on exhibit a picture map of the Botanic Garden, designed and executed by Miss Helen Sewell, and presented by the Woman's Auxiliary of the Garden in memory of Dr. Glentworth R. Butler. Also designs of proposed entrance gates, fountains, seats, etc. prepared by the architects (McKim, Mead & White) and the consulting landscape architect (Mr. Harold A. Caparn).

As usual, the tea was in charge of the Woman's Auxiliary with Miss Elise Stutzer, as chairman of the social committee.

Cooperation

U. S. Department of Agriculture. The Garden has continued during the year to afford accommodations for the local headquarters of Mr. L. F. Butler and Mr. C. O. Bratley of the Office of Horticultural Crops and Diseases, Bureau of Plant Industry. The work of these men is being carried on in cooperation with the Bureau of Agricultural Economics, which maintains throughout the United States a force of inspectors to estimate the amount of spoilage of fruits and vegetables in transit and storage, and to issue to the consignee and shipper certificates of the percentage of loss. In case of disagreement between shipper and consignee the matter is referred to Government pathologists for an opinion as to the amount and cause of damage.

Messrs. Butler and Bratley are also engaged in research on the organisms and conditions involved in the spoilage of fruits and vegetables, the rates of decay and methods of prevention.

Turkestan Plant Breeding Station. On November 6, we received from the Central Cotton Committee of this station, located in Tashkent, U. S. S. R., nine packets of seeds of different varieties of cotton grown in different Asiatic countries, with a request to receive from us seeds of cotton plants grown in the United States. These seeds were forwarded to the Bureau of Plant Industry, Washington, D. C., and we have arranged with the Bureau to send to Tashkent samples of seed of 44 varieties grown in this country.

Water Transportation Bibliography, "a cooperative, non-commercial enterprise," with headquarters at 110 Washington Street, New York City, asked for the cooperation of the Garden library in the compilation of references for the Bibliography on plant introduction—laws and regulations, and meteorology as affecting the shipment of plants, and other related topics. The chairman of this organization is Mr. Merl E. Pellet, librarian of the Port of New York Authority.

It would not be feasible to list all of the several hundred institutions and organizations with which the Garden has cooperated during 1929. The following are given to illustrate the variety and geographical range of the service.

Merchants' Association, New York City. The director of the Garden has continued during the year as a member of the Association's Committee on Plant Quarantines and their Administration.

Scuola Elementare "De Amicis," Rome, Italy. Photographs of a class from P. S. No. 4, Brooklyn, receiving practical instruction in our greenhouses, have been forwarded through Miss Eva C. Wood, principal of that school.

Fifth National Shade Tree Conference. A report on this conference, held at the Garden on Thursday and Friday, February 7 and 8, is given in the appended report of the curator of public instruction.

Johns Hopkins University. In January, we supplied the Department of Botany of the Johns Hopkins University with living material of the "Bird-of-Paradise Flower" (*Strelitzia Reginae*), and also of Manila Hemp (*Musa textilis*) needed for research work in progress there. Equivalent material has been received in exchange.

Swansea College, Wales, supplying printed matter and photographs to illustrate a magazine article by the principal. (January.)

Dayton (Ohio) School Authorities, in connection with the labeling of trees and shrubs on school property in Dayton. (March.)

Brooklyn Chamber of Commerce, Cleaner Brooklyn Committee. The Garden, through one of its staff, acts as Street Supervisor for certain areas adjacent to the Garden.

University of Nebraska. Eleven photographs supplied for the purpose of illustrating a publication.

Home for Consumptives, Brooklyn. In cooperation with the National Plant, Flower and Fruit Guild, the Garden gave the services of Miss Zelda Sargent, instructor, to visit the Home for Consumptives weekly to supervise the children's gardens on the grounds of that institution.

Idaho Agricultural Experiment Station (Moscow, Idaho), was supplied with seeds of *Valeriana* and *Valerianella* for rust investigations being carried on in cooperation with the U. S. Department of Agriculture.

Visit of Park Association

The Park Association of New York City, Inc., made a tour of Brooklyn parks and playgrounds on September 18. The Brooklyn Botanic Garden was included in the itinerary, and the visitors included Borough President James J. Byrne, the Democratic leader of King's County and Chief Clerk of the Surrogate's Court, John H. McCooey, the Commissioner of Parks, Borough of Brooklyn, James J. Browne, the President of the Park Association and former State Senator, Hon. Nathan Straus, Jr., the secretary of the Association, Mr. M. Lawrence Craner, and various other officials of the Park Association, the Department of Parks, and numerous civic associations.

Appointments

Governing Committee

Mr. Alfred W. Jenkins, of Brooklyn. April.

Staff and Other Employees

George R. Bishop, foreman gardener, beginning April 1.

Laura M. Brewster, stenographer, beginning March 1.

Calvin W. Foss, B.L., librarian, beginning October 1.

Marie-Louise Hubbard, A.M., secretary to the director, beginning October 16.

Lucile S. MacColl, instructor, beginning February 1.

Frances Miller MacKinnon, A.B., secretary to the director, beginning September 6.

L. Gordon Utter, B.S., M.S., research assistant, beginning August 15.

Hilda Vilkomerson, stenographer, beginning March 1.

Evelyn M. Williams, stenographer, beginning September 1.

Resignations

Governing Committee

Mr. Edwin Gould, Manhattan. May.

Staff and Other Employees

Clement G. Agate, foreman gardener since May 16, 1927, resigned April 1.

Caroline M. Donald, secretary to the director since October 29, 1927, resigned August 31.

Frances Miller MacKinnon, A.B., secretary to the director beginning September 1, 1929, resigned October 15.

Ray Simpson, librarian since September 18, 1916, resigned September 1, 1929. (See pp. 32-33.)

Marjorie R. Swabey, A.B., research assistant since February 16, 1926, resigned September 30.

Terminations of Appointment

Governing Committee

Mr. Frank Babbott, Brooklyn. Member *ex officio* as president of the Board. Membership on the Committee terminated with Mr. Babbott's resignation from the presidency, in May.

Staff and Other Employees

Norman Taylor, curator of plants (March 16, 1911, to December 31, 1920); curator of plants and plantations (January 1, 1921 to December 31, 1926); curator of plants (January 1, 1926 to March 20, 1928); curator (March 21, 1928 to December 31, 1929).

Evelyn M. Williams, stenographer, October 1, 1928 to March 1, 1929.



FIG. 6. Japanese Tea Ceremony. Mrs. Tsuya Okuda presiding on Japanese Garden Day. (6798.)

Deaths

Governing Committee

Mr. Alexander M. White, member of the Governing Committee.

At the first meeting of the Botanic Garden Governing Committee (November 26) following the death of Mr. White, the following minute and resolution were adopted:

Minute Concerning Alexander M. White

In the death of Alexander M. White on September 21, 1929, the Brooklyn Botanic Garden has sustained a very great loss. Mr. White became a member of the Governing Committee of the Botanic Garden in 1924 and worked untiringly in its behalf until the illness preceding his death. He was also Chairman of the Citizen's Committee of the Brooklyn Botanic Garden Endowment Fund Campaign in 1926, and in a few months he raised more than \$250,000, thereby enabling the Botanic Garden to secure a fund of a quarter of a million dollars offered by Mr. John D. Rockefeller, Jr.

Mr. White held a prominent place in the business and philanthropic

world in Brooklyn, carrying on the fine tradition of his family in the city. He was also keenly interested in horticulture, and had planned to extend his activities in behalf of the Brooklyn Botanic Garden which owed its existence to the vision of his uncle, Alfred T. White.

The Governing Committee of the Botanic Garden deeply regrets the untimely loss of a brilliant, able, and devoted member and extends its sincere sympathy to Mr. White's family in the great bereavement that they have sustained.

RESOLVED, that the above minute be spread upon the records of the Governing Committee and the Secretary be directed to send a copy of it to the family of Mr. White.

Employees

John Trainor, suddenly at the Botanic Garden, September 17. Mr. Trainor, who was in advancing years, had been a valued employee of the Botanic Garden since April 1, 1918.

Miscellaneous

Phenology. The spring of 1929 was an early one as indicated by the blooming of the Snow Drops (*Galanthus Elwesii*), which were in flower as early as February 14. Daffodils were above ground about February 21. Other herbaceous plants and shrubs were in bloom about two weeks earlier than usual.

Merchild in Place. The bronze statuette, Merchild, by Miss Isabel M. Kimball, sculptor, presented in 1928 by Mr. Richard R. Bowker, a member of the Board of Trustees, was permanently installed in April on a small boulder in the Brook, at the foot of the dam at the outlet of the Swamp.

Popularity of the Leaflets. Brooklyn Botanic Garden *Leaflet* for April 3, 1929 (Series XVII, No. 1-3), "A selected list of publications on gardening and wild flowers," has proven very popular. Among other requests was one from The Macmillan Co., publishers, who asked for 50 copies for their salesmen to show to libraries over the country. The New York Public Library asked for copies of the same issue for all the branch libraries of Manhattan.

In December, request was received from and granted to The Missouri State Board of Agriculture to reprint the *Leaflet* on "Our common garden vegetables" (Series 15, No. 8-9), by Dr. Orland E. White, formerly curator of plant breeding and economic plants on the Garden staff.

Summer Seed Collecting. In connection with our International Seed Exchange, the largest demand, very naturally, is for seeds of native American plants. In order to secure seeds from a wider geographic range, the Garden has had collectors in the field during the past summer, as follows: Mr. J. P. Anderson, Alaska; Miss Belle H. Burr, Newfoundland; Dr. C. Stuart Gager, Maine; Dr. Alfred Gundersen, Catskill Mountains; Students of Prof. D. B. Swingle, Montana; Students of Prof. Aven Nelson, Wyoming.

Chrysanthemum and Rose Exhibit. At the request of the Garden Department of the Garden City-Hempstead Community Club, the Botanic Garden, on November 11, made a display at their flower show of about two dozen named Chrysanthemums from our outdoor beds, and about two dozen named Roses from our Rose Garden. This occupied the entire front of the stage of the auditorium where the show was held, and made a very pleasing and striking appearance.

Financial

Tax Budget Accounts

The initial Tax Budget appropriation for 1929 was as follows:

	Requested	Granted
Personal Service.....	\$101,614.00	\$75,240.00
Other Codes.....	22,728.00	15,705.00
Totals.....	\$124,342.00	\$90,945.00

In response to our requests, appropriations, supplementary to the original Tax Budget appropriation for maintenance for 1929, have been made as follows:

1. At its meeting on April 4, 1929, the Board adopted Resolutions (Cal. Nos. 99-A and 99-B), providing for a transfer *from* Code No. 3071, Line 1, For Adjustment of Personal Service and Expenses in the Various Public Libraries and Other Institutions *to* Brooklyn Botanic Account, Code No. 1361, Other than Personal Service, as follows:

Line	Requested Feb. 21	Granted	New Totals
4.....	\$750	\$200	\$1700
5.....	300	0	
8.....	2,250	1000	2350
9.....	900	600	2350
10.....	1,000	1000	5000
	\$5,200	\$2800	

2. At its meeting on April 25, 1929, the Board adopted Resolutions (Cal. Nos. 43-A and 43-B), providing for the transfer from Code No. 3701, Line 1 (as above) to Botanic Garden Code No. 1360, Salaries, Regular Employees, as follows:

To Line 18 a, Guard and Gardener, 2 at \$1440.00 (8 mos.), \$1920.00.

This was in response to our request of March 5, 1929, for four new positions, as follows:

Foreman Gardener, 1 at	\$1860.00
Guards and Gardeners, 3 at \$1560	4680.00
	\$6540.00

3. On November 26, 1929, the Governing Committee authorized the director to request the Board of Estimate and Apportionment to make appropriations for maintenance, supplementary to the original Tax Budget appropriation for the year, as follows:

Code 1361

Line 4. Botanical and Agricultural Supplies	\$2500.00
Line 11. Light, Heat and Power	115.00
Line 12. Telephone Service	50.00
Line 14. Express and Deliveries	45.00
Total	\$2710.00

The first item was to meet the need for additional fertilizer and manure. Since the Botanic Garden lawns were first made, in 1912, they have never had a general top dressing of any kind of fertilizer, and the need of this is now everywhere apparent, as the great increase of attendance (to more than 1,000,000 persons) results in very hard usage of the lawns.

On December 19, the Board of Estimate and Apportionment took action as follows:

(Cal. No. 389—Item A)

“Resolved, That the Board of Estimate and Apportionment, pursuant to the provisions of section 237 of the Greater New York Charter, hereby approves of the transfer of funds within appropriations made for the year 1929, as follows:

FROM	
BOARD OF CHILD WELFARE	
2004 Fixed Charges and Contributions	\$1,710.00
TO	
BROOKLYN INSTITUTE OF ARTS AND SCIENCES, BOTANIC GARDEN AND ARBORETUM	
1361 Expenses for other than Personal Service—	
4. Botanical and Agricultural Supplies	\$1,500.00
11. Light, Heat and Power	115.00
12. Telephone Service	50.00
14. Expressages and Deliveries	45.00
	\$1,710.00”

The final total Tax Budget appropriation for the year including the initial and three supplementary appropriations, was as follows:

Personal Service	\$77,160.00
Other Codes	20,215.00
	\$97,375.00

Corporate Stock and Tax Notes

(For permanent improvements)

At its meeting on April 25, 1929, the Board adopted a resolution (Cal. No. 43-A), authorizing the issue of Tax Notes of the City of New York in an amount not exceeding \$30,000.00 for the following permanent improvements at the Brooklyn Botanic Garden:

a. For the completion of the *improvement of the plaza* of the Brooklyn Botanic Garden, including the construction of underground storage room for tools and bulbs (including architect's fees)

\$21,000.00

b. For completion of metal *stacks in library rooms and herbarium cases* and mezzanine floor in herbarium room.. \$9,000.00
The above item of \$9,000.00 is distributed as follows:

New Herbarium Cases	\$6,000.00
New Library Stacks	3,000.00
Total	\$9,000.00

Compensation Insurance

Under date of July 17, 1929, we received from the Department of Finance, City of New York (Frank J. Prial, Deputy Comptroller) a letter reading as follows:

"I transmit for your files a communication dated June 29, 1929, addressed to you by the State Insurance Fund together with its policy No. 69,376 covering the period of twelve (12) months from January 1, 1929, to January 1, 1930, which covers the liability of the City of New York under the Workmen's Compensation Act to the extent of the amount of salaries and wages paid to employees of the Brooklyn Institute of Arts and Sciences—Botanic Garden and Arboretum, from funds provided by the City of New York."

The premium paid by the City was \$459.90 based on the Tax Budget Payroll for the year 1929, as follows:

Class	Amount	Rate	Premium
Nurserymen.....	\$33,000.00	\$0.87	\$287.10
Clerical.....	31,000.00	.05	15.50
Others.....	11,000.00	1.43	157.30
Total.....			\$459.90

Arrangements for the payment of the premium on the private funds payroll were not quite completed at the close of the year.

Private Funds Accounts

The Private Funds Budget for 1929 was \$129,322.81, as against \$102,456.90 for 1928, an increase of \$28,865.91. The Private Funds Budget exceeded the Tax Budget for the third consecutive

year, the amount of the excess being \$31,947.81. The percentages of the two budgets for the past five years are as follows:

	1925	1926	1927	1928	1929
Tax Budget.....	58%	57%	43%	48%	43%
Private Funds.....	42%	43%	57%	52%	57%

Of the total of \$129,322.81 private funds income, \$54,052.86 is income from endowment, and \$75,269.95 (or three fifths) is from the uncertain and fluctuating sources of contributions solicited annually, membership dues, special gifts, and tuitions and sales.

Collections Fund Contributions

Although our needs increase annually to meet increasing demands for service, the amount contributed to the Botanic Garden Collection Fund (for the purchase of books, plants, and specimens, and to meet various other needs of our scientific and educational work, but not for maintenance) has steadily decreased since 1927, without compensation by income from other sources for similar purposes, as follows:

	1927	1928	Decrease	1929	Decrease
From within the Board.....	\$2,350	\$1,025	\$ 425	\$1,850	\$ 75
From without the Board.....	7,532	5,495	2,037	5,432	63
	\$9,882	\$7,420	\$2,462	\$7,282	\$138

Membership Income

Although Brooklyn, with a population of over 2,200,000 is the third largest city in America (Greater New York, of which Brooklyn is a part, being first, and Chicago second), and although the registered attendance at the Garden in 1929 (1,127,000) was equal to one half the population of the Borough, only 1097 members were enrolled (five ten thousandths of one per cent. of the population), and several of these reside outside of Brooklyn and some outside of New York State. The total income from memberships of all classes was \$7,632.27.

The support of the citizens by way of membership is less than that accorded to similar institutions in Manhattan and the Bronx and in other cities of comparable size, such, for example, as Chicago and Buffalo. It is less out of all proportion to the wealth



FIG. 7. Dwarfed Japanese Azalea. One of the plants presented in 1925 by Mr. Ernest F. Coe. (6229.)

of Brooklyn and the extent to which the citizens take advantage of the facilities and opportunities afforded by the Garden.

Need for Additional Endowment

The twentieth birthday of the Brooklyn Botanic Garden occurred on December 28, 1929. On that date the Agreement was executed between the City of New York and the Trustees of the Brooklyn Institute of Arts and Sciences providing for the establishment of the Garden. The condition for the signing of this Agreement on behalf of the City was that the Institute should

secure by private subscription the sum of fifty thousand dollars "the principal of which or the income thereof to be set apart and used by the said institute for the purchase of plants, flowers, shrubs, and trees, to be set out in said botanic garden or arboretum."

In providing this initial \$50,000.00 the Brooklyn Institute fulfilled all of its financial obligations under the Agreement. So great was the need for the Botanic Garden, however, that City appropriations for maintenance, which have increased from \$14,550.00 in 1911 to \$97,375.00 for 1929, very shortly became inadequate and the private funds budget has had to be increased from \$5,626.00 in 1911 to \$129,322.81, the amount of the private funds budget for 1929.

The experience of semi-public museums, botanic gardens, and zoological parks, in this and other cities, has clearly shown that generous provision must be made from private funds to supplement Tax Budget appropriations, if the development of these institutions is to proceed as rapidly as the public use of them demands and as the nature and importance of their work requires.

I have several times pointed out, as have the administrators of other private and semi-private institutions, the necessity of having a certain minimum of annual private funds income assured by endowment. Income derived in any other way (by solicited or voluntary subscriptions, membership dues, etc.) is fluctuating and uncertain. Sure and solid progress of development is largely dependent upon the extent to which annual income is assured and the administration relieved of financial limitations and uncertainty.

The Brooklyn Botanic Garden has no fund that can be used for maintenance of plant; this expense is borne entirely (and properly so) by the City. Private funds are restricted to the scientific and educational work for which the Garden was established, including the purchase of plants, books, herbarium specimens and study collections, special educational features such as the Rose Garden, Japanese Garden, and Water Garden, popular and technical publications, special research projects, and a generous percentage of the salaries of those engaged in research and teaching. The plan of organization adopted soon after the

Garden was established is not yet fully realized,—and such departments as have been established are undermanned and underfinanced, able only in part to meet the demands of the City and the needs of botanical science. It has been necessary temporarily to suspend the department of plant breeding and genetics.

Additional endowment income is needed for two broad purposes:

1. *To beautify the grounds and to improve and expand the botanical and horticultural exhibits.*

The Brooklyn Botanic Garden affords an opportunity for private munificence to provide a public garden as beautiful as our most beautiful private places, not only for the enjoyment of the masses, but as an object lesson of what is really possible in the way of a public garden perfectly maintained. No such public garden exists in America.

A public that has an opportunity to become familiar with a perfectly maintained botanic garden will have higher standards for public parks and gardens and will demand of public officials greater efficiency and higher ideals.

In no American city is there a public park or garden in the same class as many private gardens in their suburbs, from the standpoint of design and maintenance. What a wonderful thing it would be if such a public garden could be provided for the most populous borough of Greater New York! This can never be accomplished by dependence on public appropriations alone.

With the Botanic Garden twenty years old and with only 50 acres, the entire area is underdeveloped compared with the standards of private places. Several acres remain wholly undeveloped. This is due solely to lack of funds.

Our ideal is to create here the most beautiful spot in Greater New York.

It is impossible to exaggerate the civic and educational importance of the realization of this ideal—what it would mean as a standard of excellence for public parks and gardens—as a stimulus to private gardening and interest in ornamental horticulture—as a contribution to public education and the advancement of a knowledge and love of plant life.

2. *To enrich and extend our educational and scientific activities.*

Extensive as our educational program now is, it fails to meet the demands of the schools and of the public outside of the schools. Quantitative statements of this work for 1929 are given on preceding pages of this report and need not be repeated here. A summary of this work since the Garden was established is given in the Brooklyn Botanic Garden RECORD for July, 1929.

Our scientific work in plant breeding, genetics, plant pathology, ecology, and systematic botany has been summarized in the Brooklyn Botanic Garden RECORD for July, 1928 (*Research at the Brooklyn Botanic Garden*) and in several annual reports. Research is one of the fundamental purposes for which the Garden exists. It is undermanned and underfinanced for the projects already in hand; its enrichment and extension along conservative, logical lines are now quite impossible.

How Much Is Needed?

To meet existing needs there is required, in addition to our present private funds budget, an annual income of not less than \$27,500.00—the interest at 5½ per cent. on a capital sum of \$1,000,000.00. The director will be glad to furnish anyone interested a statement of the items that enter into this total.

Appended Reports

There follow reports on the research work of the Garden for 1929, administrative reports of the various heads of departments, and Appendices 1-7, all of which contain important information for those actively interested in the progress and welfare of the Brooklyn Botanic Garden.

Respectfully submitted,

C. STUART GAGER,
Director.



FIG. 8. Picture Map of Brooklyn Botanic Garden, presented by the Woman's Auxiliary. (6796.)

REPORTS ON RESEARCH FOR 1929

Plant Pathology

BY GEORGE M. REED

Physiologic specialization of the oat smuts

In 1924 we published our first data, giving definite evidence of the existence of specialized races of both loose (*Ustilago avenae*) and covered (*U. levis*) smut. The data were obtained from two collections of both of the smuts, and each collection showed well marked differences in its capacity to infect varieties of oats. A second paper dealing with the same problem was published in 1927, and contained the account of the demonstration of specialized races characterized by their capacity for infecting the cultivated varieties of Red Oats, which are grown more or less extensively in the southern part of the United States. In these experiments two distinct races were differentiated, one of which proved capable of infecting Fulghum and related varieties, while the other seemed to be largely confined to the Red Rust-proof types.

During the past few years several additional collections of both loose and covered smut have been obtained from various sources. Many of these have been secured in the United States, while others have come from various parts of Europe, and one from China. These collections have been used to inoculate definite strains or selections of oats in order to determine whether they showed differences in their capacity for infection. Relatively few varieties of oats have been used in all of these experiments, but they have served to differentiate distinct races of smut. Altogether, twenty-eight varieties belonging to seven different species have been grown.

Adequate data on fifteen collections of the loose smut have been secured, and eleven distinct races have been found. Nine collections of the covered smut have also been used, and there is definite evidence of five distinct specialized races.

Some of the more important points in the behavior of the oat varieties may be mentioned. The wild oat (*Avena barbata*) seems to be perfectly susceptible to every race of loose and cov-

ered smut, although it has not been tested with one or two of each. On the other hand, *A. brevis* has shown high resistance to all the races of the loose smut, although Miss Sampson in England has found a race of this smut which vigorously attacks it. This oat, further, is somewhat susceptible to several races of covered smut and is extremely susceptible to at least one.

Among the common cultivated oats, two varieties (Black Mesdag and Markton) stand out as extremely resistant to all races of both smuts. In contrast with these two varieties are Canadian and Victor, which have proved to be extremely susceptible to practically all the races, both being resistant to one race of loose smut and one of covered smut. These two varieties seem to differ only in the fact that Canadian is susceptible to the Red Rustproof Race of loose smut, while Victor seems to be resistant. Several other varieties, such as Early Gothland and Monarch, show interesting contrasts. Early Gothland is susceptible to several races of loose smut but resistant to all races of covered smut, while Monarch is susceptible to a few races of both smuts. So far as determined, however, these two varieties are never susceptible to the same race of either smut.

The varieties of *Avena sterilis* are characterized by harboring their own peculiar races of smuts. The Red Rustproof Race seems to be sharply limited to this particular group of varieties, while the Fulghum Race is capable of attacking several varieties of the common oats, as well as the Fulghum strains.

The different races of smut show certain peculiarities. There is one race of loose smut which seems restricted entirely to *Avena barbata* although this host, as already noted, seems susceptible to every race of both loose and covered smut. There is also a race of covered smut which is limited to *A. brevis* and certain strains of *A. strigosa*.

There is some evidence that there is even further differentiation among a number of the collections used. A few of them seem to be very similar and so have been grouped together as essentially alike. There is, however, some evidence of possible differences and further experiments will be necessary to determine whether any additional specialization exists.

The results obtained during the past few years have been prepared for publication in the *Bulletin* of the Torrey Botanical Club.

Inheritance of resistance of oat hybrids to loose and covered smut

The studies on the inheritance of smut resistance in oat hybrids have been continued and a large amount of data has been obtained with the second generation plants of several different crosses. Since it is this generation of hybrids which regularly shows the segregation of various characters, we may expect, in crosses involving a resistant and susceptible variety, that some of the second generation plants will prove to be resistant while others will be susceptible. Additional data on this generation have been secured with the hybrids Hull-less \times Black Mesdag, Early Gothland \times Victor, Fulghum \times Black Mesdag and Early Champion \times Black Mesdag, all of which have been previously reported upon. The new data correspond rather closely with the results previously published. Since relatively small numbers of plants were involved, there were minor variations from the results previously obtained, but no very wide departures were noted.

Perhaps the most interesting new combination involved a cross between Early Gothland and Monarch. The former is very susceptible to the loose smut but resistant to the covered, while the Monarch variety shows exactly the reverse behavior with reference to the two smuts. A few second generation plants of a cross involving these two varieties were grown, one set having been inoculated with the loose smut and another with the covered smut. The combined results for the loose smut with the reciprocal crosses between the varieties gave 9 infected plants out of a total of 50 (18.0 per cent.), and for the covered smut 9 infected plants out of a total of 85 (10.5 per cent.). The study of the third generation grown from the resistant individuals of these experiments as well as from uninoculated second generation plants promises to yield very interesting results. A large number of such third generation plants are now being grown in the greenhouse and additional ones will be planted in the field in 1930.

A great many third generation progenies of various crosses were grown during the past season. There were included 34 such progenies of Early Gothland \times Victor and 102 of Early Gothland \times Hull-less. These were all inoculated with the covered smut. Since one parent—Early Gothland—is resistant, while the other parent—Hull-less in one cross and Victor in the other—is

susceptible to this parasite, with these two crosses in the second generation, segregation of resistant and susceptible individuals was obtained. With Early Gothland \times Victor less than 25 per cent. of the second generation plants were infected, while with Early Gothland \times Hull-less, considerably more than 25 per cent. were infected. In the third generation there was obtained an exceptionally large number of resistant families in the first cross, while in the second there were relatively few. Thus the results obtained with the third generation seem to harmonize fairly well with those obtained with the second generation, but the two sets of hybrids show obvious differences in their behavior.

Other third generation progenies included 243 of the hybrid Monarch \times Hull-less inoculated with the loose smut, 99 progenies of Fulghum \times Black Mesdag inoculated with the Fulghum Race of loose smut, 67 progenies of Silvermine \times Black Mesdag, and 55 progenies of Early Champion \times Black Mesdag inoculated with the loose smut. In the case of these last two hybrids, seed of most of the same progenies were also inoculated with the covered smut.

For the most part, the results obtained with these progenies are in harmony with the data secured on the second generation plants. The second generation of Monarch \times Hull-less has given slightly more than 30 per cent. of infected individuals, and among the third generation progenies there was an excess of segregating and susceptible families. The progenies of Silvermine \times Black Mesdag and Early Champion \times Black Mesdag showed a similar behavior to both loose and covered smut.

A large number of F_1 plants involving many varieties differing in their reaction to the smuts have been grown and the seed for growing the second generation has been obtained. Many of these have been planted in the greenhouse and additional ones will be grown in the field.

Artificial illumination of oat hybrids

During the past season the use of artificial light for hastening the growth of oat plants was tried out. The seed of a number of crosses made in the summer of 1928 were planted in the greenhouse in the early winter. Ordinarily, such plants would mature in the following May or June. They were illuminated by electric

light, however, each evening, beginning just after sunset and continuing for a few hours for about 12 weeks, and, as a result, ripe seed was obtained on many of the plants in the latter part of March. It was possible to plant this seed out of doors and thus secure the second generation crop during the same season. The utilization of artificial illumination is particularly valuable in such work, especially for the relatively small number of first generation plants. These occupy little space and, since they can be brought to maturity in sufficient time to plant a second crop out of doors in the early spring, an entire season may be gained.

Sorghum smut investigations

The main studies during the past year have been in connection with the resistance of various hybrids to the covered kernel smut. The second generation progenies of sixteen different crosses of quite diverse parentage were inoculated with this smut and grown to maturity, and quite divergent results were obtained with many of the hybrids. A cross between the two susceptible varieties Dawn Kafir \times Red Amber Sorgo gave 60.9 per cent. infection. This corresponded rather closely to the per cent. of infected plants obtained with the Dawn Kafir and was somewhat higher than that obtained with the other parent, Red Amber Sorgo. The hybrids Feterita \times Sumac Sorgo and Feterita \times Dawn Kafir gave percentages of infection approaching or somewhat above 50 per cent., but lower than that secured with the susceptible parent. Feterita \times Brown Durra, Feterita \times Manchu Kaoliang and Feterita \times Red Amber Sorgo, gave comparatively low percentages of infection, ranging between 13.8 to 22.8 per cent. In all the combinations in which varieties of Milo were used as the resistant parent, low percentages were secured. Black Amber Sorgo crossed with varieties of Milo gave 14.2 to 19.2 per cent. infection and Dawn Kafir crossed with the same varieties gave 6.5 to 12.2 per cent. infection. It is not at all clear just what is the actual mode of inheritance of the resistant quality. The results are complicated by failure to secure practically 100 per cent. of infection of the susceptible parents, since this depends upon various environmental factors which greatly influence the process. However, the results seem to indicate that the mode of inheritance is some-

what different, depending upon the varieties used in the original cross.

Beardless Iris Project

BY GEORGE M. REED

Japanese Iris (Iris kaempferi)

Since most of the varieties of Japanese Iris had been transplanted in 1927 and had become well established, they gave abundant bloom during the past season. The first varieties came into flower a few days earlier than usual, but the flowering period was greatly shortened due to the excessively dry weather in July. It was possible, however, to obtain excellent material for the comparison of the different varieties, and considerable progress was made in their proper identification. Most of the varieties were also classified on the basis of the scheme of classification which we had previously worked out.

The most important addition to the collection was seventy-five varieties obtained from T. Sakata & Co., a nursery in Japan. The plants arrived in the first part of May in fairly good condition and most of them survived the adverse season; in fact a very few produced flowers. It is hoped that these varieties are reasonably true to name and, if so, they will be very valuable in aiding in the proper identification of varieties now in the collection.

All the varieties of Japanese Iris were divided and reset during the late summer and early fall. In the new beds, so far as possible, they were grouped according to our color scheme of classification. Very similar varieties will thus be growing beside each other, and it will be possible to more conveniently make accurate comparisons. A large number of correctly named varieties have been planted along the Brook on the main grounds of the Garden.

In cooperation with Mrs. W. H. Peckham, who was preparing the new checklist of Iris names, we looked up the history of the varieties of the Japanese group. Unquestionably, the worst tangle of names among Iris is to be found among the Japanese varieties, and the complete story will be very difficult to work out. However, in time we may be able to secure a fairly accurate history of most of them. The great difficulty is to obtain the early catalogues of dealers who listed these plants. Information

is often lacking as to whether the varieties were originally introduced from Japan or grown from seedlings.

The usual diseases and pests were in evidence. Several plants were lost through the decay of the fibrous roots. More serious trouble seemed to be associated with the maggot or larva of a fly which has been identified as *Chaetopsis fulvifrons*. A great many plants died during and after the blooming season and, in most cases, it was possible to find the larvae in the dying leaves.

Miss Louise B. Mansfield made for us several additional water-colors of the Japanese varieties, as well as some of the other species. These are valuable additions to our collection of colored illustrations.

Siberian and miscellaneous beardless Iris

Since most of the plants of this group were transplanted in the fall of 1928, they were not thoroughly established and did not give abundant bloom during the past year. The plants, however, grew quite well and in another year should bloom vigorously.

Several of our own seedlings bloomed for the first time and among them there were several that were particularly interesting, especially those grown from Dorothea K. Williamson. This variety is a hybrid between *Iris fulva* and *I. foliosa* and is well known as a valuable garden plant. The flower was selfed in 1925 and the seed collected. A few seedlings were secured, some of which bloomed for the first time in 1928 and still others during the past season. The new plants are unusual in the combination of color, and extremely interesting in view of their parentage.

The following table shows the sources of the plants which have been added to the collection:

Japanese Iris

Mr. L. F. Hoyt, East Aurora, N. Y.	1 variety
* T. Sakata & Co., Japan	75 varieties
* Vilmorin, Andrieux et Cie, France	11 "

Miscellaneous beardless iris—species and varieties

Dr. S. S. Berry, Redlands, Cal.	1
Mr. W. Herbert Dole, West Orange, N. J.	1
Mr. L. F. Hoyt, East Aurora, N. Y.	4
Dr. Orland E. White, University, Va.	1

* Purchased.

During the past season we sent out some of our surplus material to other test gardens. A fairly large collection of plants was sent to the test gardens of the Iowa State College of Agriculture at Ames, Iowa, the Missouri Botanical Garden at St. Louis, Mo., and the California Botanic Garden at Los Angeles, Cal. Material of some varieties was also furnished to individuals who gave us plants in exchange.

Forest Pathology

BY ARTHUR HARMOUNT GRAVES

Progress toward the Development of Disease Resistant Strains of Chestnut

As in former years, all of the work done on the chestnut has been carried on in collaboration with the Office of Investigations in Forest Pathology, Bureau of Plant Industry, U. S. D. A., which has reimbursed us for the traveling expenses involved.

Nearly all of the work the past year has been projected with a single purpose in view; namely, to assist in the development of a type of chestnut which will be practically immune to attack by the parasitic fungus (*Endothia parasitica*) causing the chestnut blight, and will at the same time possess the timber producing character of the native American chestnut.

Economic Value of the Chestnut. If one is to judge from the variety of uses to which it is put, and the extent to which it has been used for each of these purposes, the American chestnut is, or was, one of the most valuable of our forest trees, perhaps the one which least of all we could afford to lose. A tall, fast-growing tree, especially from sprouts, its timber is remarkably durable in the soil, being less prone to decay than oak. These two characteristics have made it invaluable for telephone and telegraph poles, which must be tall and straight and with one end in the soil. Its durability in the soil has also rendered it extremely useful for railroad ties. For these two purposes no native wood can take its place. The timber has been valued also for furniture, resembling ash in appearance, and it has been used for construction timbers of houses. Besides these uses, the bark and to some extent the wood are used in the production of tannic acid, for tanning leather; and this tree and the hemlock have been the main sources

of tannic acid for this purpose. Again, besides the timber and the bark, the sweet, edible nuts have always been popular and used extensively as food in the fall of the year. Finally, as an ornamental tree, the American chestnut has been highly prized: many fine old estates along the Hudson, through New England, and farther south were noted for their massive, patriarchal chestnut trees.

Extent of Damage and Amount of Loss Caused by Chestnut Blight. The most recent surveys of the Office of Forest Pathology, U. S. Dept. of Agriculture, show that by the end of 1930 all of the chestnut producing counties in the Southern Appalachians, the stronghold of the American chestnut, will show an infection of sixty per cent. or more. With practically all of the merchantable chestnut now dead in the region north of this area, this means that the American chestnut as a timber producing tree will soon become extinct. It means also, therefore, a tremendous pecuniary loss to the American people, not only from the death of the existing stands of this valuable timber, but from the cessation of production of all the future stands. Whereas, in 1911, \$25,000,000.00 was regarded as a conservative estimate of the loss from this dire disease, now, with its advance into practically the entire area where the chestnut is of commercial importance, the loss must be many times greater than this.

Character of the Work of the Brooklyn Botanic Garden in 1929. For the securing of stock wherewith to make desirable crosses in the future, the work has gone forward in three directions during the past year. First, by the planting and cultivation of seedlings and hybrids which we have received from outside sources; second, by a survey of existing, disease-resistant, oriental trees in the region about New York with a view to determining which are the best for stock to be used in crossing, and third, by the collection of nuts from these trees, to be used in the raising of future stock for hybridization. These lines of work are described below.

Plantations. A beginning of these had already been made in 1928 (Brooklyn Bot. Gard. RECORD 18: 58, 1928) when nuts of the Japanese species, *Castanea japonica*, and of the Chinese, *C. mollissima*, were germinated here at the Garden. At that time fifteen of the Japanese and five of the Chinese were set out at

the eastern edge of the experimental plot. Due in part to the severe drought of the past summer, one of the Japanese died and four of the Chinese. The location is not good, nor is the soil deep enough, although fertile at and near the surface, to afford the best development for the characteristically long tap roots of the chestnut. Therefore, a shipment of young trees which we received from the U. S. D. A. in March were planted out on March 25 in fairly rich, deep soil on land owned by the writer in Hamden, Connecticut, near New Haven. This plantation consisted of eighteen *Castanea mollissima*, about four years old; ten *C. Henryi*, also about four years old, which is a rather large chestnut from central and western China; nineteen *C. Seguinii*, about two years old, a rather shrubby species from central and eastern China; and five hybrids between the American chinquapin, a fairly disease-resistant species, and the hairy Chinese chestnut, *C. mollissima*. During the present season we have lost a few of these young trees due to the drought, but the rest are thrifty. On November 27 we received from the U. S. D. A. sixty-five seedlings of a forest type of the Japanese chestnut, *C. crenata*. These are to be planted out also on the Hamden tract, but the ground being frozen at the time of their receipt they were heeled in and will be planted when the ground is workable in the spring. Along with these seedlings we heeled in twenty scions of hybrid chestnuts originated and given to us by Dr. Robert T. Morris of New York City and Stamford, Conn., the well-known expert in nut growing.

Large Oriental Chestnuts in the Vicinity of New York City. Within a radius of sixty-five miles from New York City as a center, there are some splendid specimens of chestnut which are available for breeding stock. Most of these are the Japanese chestnut, *C. crenata*. Perhaps the best specimen is one of several located at Brielle, Monmouth County, New Jersey, and is the property of Mr. John H. Folk. This tree, under the trade name of "Japanese Giant," was purchased 18 years ago from a nursery in Rochester, N. Y., and therefore is now about twenty-three years old. The circumference five feet above the ground is 4 feet 3/4 inches, which is equivalent to a diameter of about 1 1/3 feet. It is a handsome tree, especially at flowering time—about July 1—is about 30 feet high and bears about one-half bushel of nuts

each year. This year, in late July, it was well supplied with young burs. The owner states that he has noticed no effects of the blight. The trunk is on the whole healthy and sound, and yet I found the blight fungus present in two spots. Apparently it makes little advance. A few small dead limbs were also present this year which may have been killed by the blight fungus. The fungus is abundantly present in this region, the woods about two miles distant having formerly produced fine native chestnuts. At present the usual basal shoots, both blighted and unblighted, may be found in large numbers in these woods.

Another interesting specimen is located on an estate at Syosset, Long Island (Fig. 9). It is said to be a Spanish chestnut, although it may have an admixture of Japanese blood. It is evidently a grafted tree because one leader (there being two main trunks) bears a single and the other three nuts in each bur. The leaves also differ slightly in each leader. One trunk is about three feet in circumference breast high, and the other two and one-half feet. The fungus is present in many places on both trunks, but the tree is growing well and the new growth is evidently more than replacing the loss by blight. The smaller leader has a canker in the trunk about one and one-half feet from the base with fruiting bodies present, and the length of life of this trunk is obviously dependent upon the progress of the fungus. The owner harvests a good crop of nuts from this tree each year.

Another valuable tree is growing on an estate at East Norwich, Long Island. This is four feet one inch in circumference breast high or about sixteen inches in diameter. It is 25-30 feet high and has a spread of 45 feet. The leaves are a little too long for *C. crenata*, so that it may have, as Prof. J. F. Collins of the U. S. Dept. of Agriculture has suggested, some admixture of European stock. On the whole the trunk is very sound. On one side a fungus lesion has evidently been entirely healed over. Yet the blight is present here and there in the branches, and the gardener says very few nuts have been produced for the last three years, the burs falling off prematurely.

Another specimen, evidently of hybrid nature, is located at Oyster Bay, Long Island. This is about one foot in diameter breast high, and is about thirty-five years old. The owner thinks



FIG. 9. An exotic chestnut (*Castanea crenata?*) in full bloom on the estate of Mr. Bronson Winthrop, Syosset, L. I. June 28, 1929. (6820.)

it came from a nursery near Rochester. It has a spread of about thirty feet. It bears only one nut in each bur. The fungus is present here as on all these specimens, and places on the trunk and branches may be seen where the cankers have been healed over.

Other promising stock, evidently of the Japanese chestnut, may be seen on private estates at Jericho and Huntington, Long Island, at Ardsley and Kitchawan, New York, and in several other nearby localities.

Nuts of Resistant Stock. Collections of nuts from most of the above trees and from others in Connecticut and New York, including a valuable hybrid originated by Dr. Robert T. Morris between the native chinquapin and chestnut, are being overwintered at Hamden, Conn., and will be planted in the spring.

Systematic Botany

BY ALFRED GUNDERSEN

International List of Genera

Communication No. 10 was issued in mimeographed form in January, containing differences in usage as to plant families. Replies as to preferences of institutions will be included in the next communication. Compilation of differences as to usage in genera has required a large amount of time, but will be ready for publication early in 1930. In this connection I corresponded with many botanists and visited the National Herbarium in the spring, and the Arnold Arboretum and Gray Herbarium in the fall.

Floral Structures

I continued studies of the floral structures and the distribution of families of dicotyledones.

Frankenias

A paper on South American *Frankenias* is nearly ready for publication, though I am in need of more material, especially from Argentina.

Opposite-leaved Shrubs

Miss Mary MacMurray, of the Richmond Hill (Long Island) High School, continued the study of opposite-leaved shrubs, begun in 1928.

American Clubmosses

Miss Margaret Griffin, of the Paterson, New Jersey, High School, began a study of the distribution of *Lycopodium* in North America.

Genetics*Studies on the Variation of Nephrolepis (Boston Fern, etc.)*

BY RALPH C. BENEDICT

The collections of these ferns at the Brooklyn Botanic Garden comprise three groups of variant types: (a) bud variations of the Boston fern; (b) sporeling variations of *N. exaltata fertilis*; and (c) species types, including several collections from tropical America and various types obtained from European dealers. All three groups require rather frequent stock-taking and re-arrangement. In general, the aim has been to maintain as complete a series of the significant forms as possible, but it is difficult, in the space available to keep a sufficient number of plants constantly under development. This general maintenance demands considerable oversight and also actual labor with the plants.

While several reports dealing with the bud mutations have been published, there are still unreported results and further experimental cultures under way. During the year past, new cultures have been made of two sporeling types, from which a large number of young plants have been raised to maturity, with a resultant surplus crop of over one thousand which were turned over to the curator of elementary instruction for class work. One preliminary report has been published dealing with some of the species forms; much remains to be done. In the meantime, the general collection remains the most comprehensive of this group; and from time to time requests come in for representative sets for use in genetic experimentation. Such a set, of nearly fifty plants, was sent to Professor Roberts of the University of Manitoba, Winnipeg, this fall.



FIG. 10. Nurses' Training Class in the Japanese Garden. A plant of *Ephedra distachya* is nearby. The alkaloid, ephedrine, is derived from another species of *Ephedra*. (6888.)

REPORT OF THE CURATOR OF PUBLIC INSTRUCTION FOR 1929

DR. C. STUART GAGER, DIRECTOR.

Sir: I take pleasure in submitting herewith my report for the year ending December 31, 1929.

Garden Attendance

Registration at Entrance Gates. There has been a slight increase in total registration at the entrance gates for the year, the final figure being 1,127,475, as against 1,101,653 last year (see Table I). The attendance for March, 101,434, was by far the largest ever recorded for that month, the best previous record being in 1927—63,185. This was owing in part to favorable weather, but was undoubtedly largely due to the display of spring crocuses—yellow, purple, and white—in the lawns in the southwest part of the Garden, the first ones, the yellow variety, appearing on March 13. Through our news releases and from posters placed in the subway trains the glad tidings were spread abroad. Thousands of visitors came to enjoy this first floral display of the season ushered in by these modest yet colorful little flowers. Over the week-end, including Saturday and Sunday, March 23 and 24, the attendance was 15,500, and at the next week-end 14,596. This is an interesting contrast with conditions in earlier years. In March, 1920, for instance, the total attendance for the entire month was 19,757. The attendance during the months of April, May, and June was slightly smaller than last year, but during July, August, and September somewhat larger—just why, it is hard to explain. Possibly weather conditions were an important factor.

Adult Students

A figure that does not appear in the table is the total number of adult students attending classes at the Garden. This was larger last year than ever before. The figures for recent years are as follows:

Year 1925.....	434
" 1926.....	437
" 1927.....	435
" 1928.....	490
" 1929.....	512

These are of course mainly teachers of nature study, botany, and biology, who come to the Garden after school hours or on Saturdays, and it is for their convenience that all of the courses except those on Saturday are scheduled at 4 p.m.

TABLE II
ATTENDANCE AT GARDEN DURING 1929

	Jan.	Feb.	Mar.	Apr.	May	June	July
At regular classes.....	1,682	1,225	2,731	4,855	3,361	1,667	11,250
At visiting classes.....	885	1,112	3,359	5,080	6,885	4,451	80
At lectures to children....	505	950	2,188	3,268	4,475	3,731	60
At lectures to adults.....	—	175	24	126	139	110	—
At conservatories.....	1,434	2,361	5,491	2,669	3,635	3,299	1,839
At grounds.....	45,263	61,419	101,434	97,682	159,234	126,659	118,220

	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Totals
At regular classes.....	8,000	4,157	5,214	4,382	3,180	51,704
At visiting classes.....	—	345	5,059	4,101	2,036	33,402
At lectures to children....	—	245	4,391	3,731	1,040	24,584
At lectures to adults.....	—	32	138	135	80	959
At conservatories.....	1,759	3,261	4,392	1,812	928	32,880
At grounds.....	112,993	109,980	103,268	53,254	38,069	1,127,475

Study Material Supplied to Schools

The past year has witnessed a tremendous growth in this part of the work of the Garden, as is shown by the following figures:

Year	Pupils Supplied	Teachers Supplied
1926	91,300	2,450
1927	109,011	2,995
1928	136,619	3,818
1929	282,299	6,457

For the Department of Public Instruction, which deals mainly with the high schools, colleges, and universities, Miss Rusk has been in charge as usual. The Department of Elementary Instruction is in charge of the distribution to the elementary schools. During the year 24 high schools and high school annexes in Brooklyn have been supplied, 7 in Queens, 14 in Manhattan, and 14 in

other boroughs. Eighteen junior high schools, 4 training schools for teachers, 11 colleges and universities, and also 29 elementary schools in Brooklyn and 3 in other boroughs have been assisted in this way. Twenty private and parochial schools and other institutions should be added to this list.

Some idea of the kind of material furnished will be afforded by the following list, which is by no means exhaustive :

PROTOZOA	OTHER ANIMALS
Amoeba	Daphnia
Paramoecium	Snails
Euglena	
ALGAE	LIVERWORTS
Oscillatoria	Marchantia
Nostoc	Lunularia
Spirogyra	Conocephalum
Closterium	Chiloscyphus
Vaucheria	
Nitella	
MOSESSES	FERNS
Fontinalis	Prothallia
Polytrichum	Fronds with spores (sporophylls)
Protonema and sporophytes	Selaginella
	Azolla
	Marsilea
SEED PLANTS	
Pine cones	Spirodela
Water Hyacinth	Sagittaria
Coleus	Leaves of Polygonum
Bryophyllum leaves	Leaves of Bidens
Elodea	Leaves of Manila Hemp
Linum	Flowers of Trollius
Corn stalks	" " Tradescantia
Sorghum stalks	" " Delphinium
Flax	" " Sagittaria
Wheat	" " Aster
Lotus pods	" " Cosmos
Cuttings of various plants	" " Dahlia
Plants for nature rooms	
Material showing seed dispersal	
Various loan exhibits, such as silk, flax, cotton.	

There has been a large increase in the demand for sterile agar in petri dishes, the number of dishes having nearly doubled in the last two years. The following figures show the increase during the last four years:

Year 1926	1,667
" 1927	2,338
" 1928	3,231
" 1929	4,134

The dishes, brought by the school messenger, are filled by us with the sterile agar, and then called for. They are practically indispensable for the teaching of the manner of growth and development of colonies of bacteria and fungi.¹

In all of this work it should be emphasized that it is the policy of the Garden to supply the schools with materials which they could obtain easily in no other way. This applies particularly to fresh living specimens, which are of inestimable value for enlivening the printed pages of text books. It has never been the aim of the Garden to supply the schools with charts, mounts, or diagrams which can readily be bought at supply houses. This policy applies also to the preparation of the agar for petri dishes. This is done by the Garden only for those schools which have not the requisite apparatus for doing it themselves.

Classes, Courses, Etc.

The course in General Botany B1, as well as the Life of Plants C10, have been omitted from the Curriculum for the present school year (Sept., 1929-June, 1930), and we have arranged a new course planned especially for teachers—Field Botany B6, starting in September. In this course we are trying to bring in more of the out-of-doors, either by holding classes on the grounds of the Botanic Garden or Prospect Park if the weather permits, or by the study of fresh material brought in to the laboratory. Each student

¹ During the year, Riker mounts and exhibition cases showing various types of wheat, barley, oats, rye, rice, and corn, as well as specimens of sorghum varieties showing the results of crossing, have been prepared by Dr. G. M. Reed, Curator of Plant Pathology. These mounts and exhibits have been made for distribution to the schools who, in turn, pay for the cost of the material. (See p. 82.)



FIG. 11. Class in Haaren High School, New York City, studying preparations of cereals prepared by Brooklyn Botanic Garden.

makes his own labeled collection of the most important representatives of the various plant groups. The response has been encouraging. This year fifty people elected the course, most of them teachers.

Besides these courses, in which I was assisted by Miss Rusk, I gave the spring course in Trees and Shrubs, with a registration of forty. In Dr. Gundersen's absence Miss Rusk conducted a number of the exercises in the spring course on the "Flowers and Ferns of the New York Region." In the lecture course entitled "the Story of Plant and Animal Evolution" comprising three lectures, I gave the first—Water Plants and Water Animals—the other two being given by Dr. Gundersen. Beginning March 19 and continuing until May 21, I gave weekly lectures on the classification of plants to a class of twenty-five biology students from the Maxwell Training School for Teachers.

A Voluntary Testimonial. Our courses have never been given with the object of cramming teachers with facts so that they might pass examinations toward higher teaching licenses, but rather to give them a fully rounded conception of the whole subject. It was, nevertheless, gratifying to learn recently from one of our students that he has passed examinations entitling him to the position of first assistant in high school biology—in other words, head of the biology department. This pupil states that he was able to answer many of the questions only because of the knowledge of plants derived from our field courses.

Course for Student Nurses

For eight weeks in the fall a course in botany was given to a class of thirty-five student nurses from Kings County Hospital, Clarkson Avenue. The course consisted of trips through the Garden plantations, with explanatory talks about the nature and functions of plants, particularly those of medicinal value. The structure of flowers and their care in the sick room were also discussed. These outdoor excursions were supplemented by indoor laboratory work and informal illustrated lectures, in which the nature and food value of seeds and fruits were explained.

A list of the plants most used in medicine was furnished by the regular instructors of the nurses, and as many as were avail-

able were shown to the class. The following are some of these, classified according to their uses. Many of them were seen growing in the outdoor plantations and conservatories; others were studied from herbarium specimens. The latter are marked H.

Expectorants

- Squill—*Urginea Scilla*—related species were seen in the Rock Garden.
 Wild Cherry—*Prunus serotina*.
 Licorice—*Glycyrrhiza glabra*. H.

Bitters and Carminatives

- Gentian—*Gentiana lutea*. H.
 Cinchona (Quinine) *Cinchona rubra*. H.
 Berberis—*Berberis vulgaris*.
 Serpentaria—*Aristolochia serpentaria*—Virginia snakeroot. H.
 Cardamon—*Elettaria cardamomum*.
 Ginger—*Zingiber officinalis*.
 Cinnamon—*Cinnamomum zeylanicum*. H.
 Peppermint—*Mentha piperita*

Emetic

- Ipecac—*Cephalis ipecacuanha*. H.

Cathartics

- Cascara—*Rhamnus purshiana*. H. Species of *Rhamnus* seen on plantations.
 Senna—*Cassia acutifolia*. H.
 Aloe—*Aloe vera*.
 Rhubarb—*Rheum officinale*—related species growing in plantations.
 Podophyllum—*Podophyllum peltatum*—Mandrake.
 Jalap—*Ipomoea jalapa*. H.
 Gamboge—*Garcinia hanburii*. H.
 Elaterium—*Ecballium elaterium* (squirting cucumber).
 Castor oil—*Ricinus communis*.
 Agar agar—Material from laboratory shown.

Anthelmintics

- Aspidium—*Aspidium filix-mas* and *marginalis*.
 Pepo—*Cucurbita Pepo* (pumpkin seed).
 Granatum—*Punica granatum* (pomegranate). H.
 Santonin—*Artemisia pauciflora*. H.
 Spigelia—*Spigelia marilandica* (pink root). H.
 Chenopodium—*Chenopodium ambrosioides*.
 Thymol—*Thymus vulgaris*.
 Turpentine—from resin of *Pinus* (Canada Turpentine = Canada Balsam from *Abies balsamea*, the fir).

Heart Stimulants

- Digitalis—*Digitalis purpurea*.
 Squill—*Urginea Scilla*.
 Strophanthus—*Strophanthus hispidus*. H.
 Convallaria—*Convallaria majalis* (lily-of-the-valley).
 Camphor—*Cinnamomum camphora*.
 Caffeine—*Coffea arabica* and other species.
 Nux vomica } —*Strychnos nux-vomica*. H.
 Strychnine }
 Ephedrine—*Ephedra vulgaris*—related species in Japanese Garden.

Heart Depressants

- Aconite—*Aconitum Napellus*
Veratrum viride. H.

Respiratory Stimulant

- Belladonna—*Atropa Belladonna*. H.

Local Anaesthetic

- Cocaine—*Coca erythroxyton*

Cerebral Stimulants

- Caffeine—*Coffea arabica* and related species.
 Atropine—*Atropa Belladonna*. H.

Cerebral Depressants

- Opium—*Papaver somniferum*—related species seen in plantations.
Cannabis indica.

Antihysterical and Antispasmodic

- Valerian—*Valeriana officinalis*
 Ergot—parasitic fungus on rye.

Counterirritants

- Flax seed—*Linum usitatissimum*.
 Capsicum—*Capsicum fastigiatum*. H.
 Mustard—*Sinapis alba* and *nigra*.

Parasiticide

- Delphinium—*Delphinium staphisagria*—related species in plantations.

Others seen, some of which are only occasionally used, are sweet flag (*Acorus Calamus*); iris, the source of orris-root used in the manufacture of tooth powder; the toothache tree (*Xanthoxylum americanum*); the Jimson weed (*Datura Stramonium*); the marshmallow (*Althaea officinalis*), sage, horehound, hyssop, balm, catnip, and witch-hazel.

Flower Days

In order to afford members of the Garden an opportunity to view its most prominent floral displays both at a time when they appear at their best and also under expert guidance, a series of special exercises known as "Flower Days" was initiated in 1927. During the past year the social nature of these exercises has been emphasized, and at the same time specialists in the culture of the various flowers concerned—some from our own staff, and some from outside—have been engaged to act as guides. This year each ceremony has commenced with an informal tea, given by officers of the staff to the members of the Garden and their guests and to the speaker of the day, who has followed with a short address, usually illustrated with lantern slides, about the flower of the day, its history, culture, etc. The final event is a visit to the flowers of the day as displayed in the outdoor plantations of the Garden. Under the guidance of the leader there is an informal discussion of the different varieties, those most suited for growing in one's own garden, best methods of culture, etc. On each flower day a selection of books and magazine articles bearing on the subject is displayed on the tables in the library, for consultation by visitors.

In this way, Daffodil Day, Rock Garden Day, Iris Day, Inspection of the Rose Garden, Water Garden Day, and Chrysanthemum Day were celebrated. But the nature of the exercises on Japanese Garden Day was somewhat different, the main feature being the performance of the ancient and revered Japanese tea ceremony by Mrs. Tsuya Okuda, principal of the Okuda Sewing High School for Girls, Tokyo, with Mr. E. Matzuki, of Columbia University, as interpreter. This ceremony was performed in the Japanese Garden, in the tea house on the margin of the lake. At the sound of the gong, struck by Mrs. Okuda after her preliminary preparations were completed, the expectant guests, waiting in the "Machiai" across the lake, inclined their heads politely in the direction of the tea house and proceeded slowly around the lake in that direction. After the customary greetings the guests seated themselves on the floor while Mrs. Okuda served each in succession a cup of tea brewed according to the orthodox Japanese method. Each guest turned the cup around three times and then

drank the contents in three swallows. If the taste was satisfactory he rendered effusive thanks; if the contrary, his praise was tempered somewhat. The whole ceremony consumed about twenty minutes, since the tea must be made afresh for each guest. The meaning of the various rites was explained in Japanese by Mrs. Okuda and interpreted in English by Mr. Matzuki. The latter also conducted the members of the Garden and their guests about the Japanese Garden, explaining the symbolism of its various features.

Following is the list of these various "Days" with the subjects and leaders, which was mailed to members early in April. Since the dates of flowering depend on the whims of the weather, they are of necessity tentative. Cards announcing the definite dates were mailed a few days before each event.

Friday, April 19. Daffodil Day.

Leader: Miss Hilda Loines, F.R.H.S., Chairman of the Brooklyn Botanic Garden Governing Committee.

(Tuesday, May 14. Date of Annual Spring Inspection.)

Friday, May 24. Japanese Garden Day.

Leaders: Mr. B. Matzuki, Columbia University, and Mrs. Tsuya Okuda.

Friday, May 31. Rock Garden Day.

Leader: Mr. Montague Free, Horticulturist, Brooklyn Botanic Garden.

Friday, June 7. Iris Day.

Leader: Dr. George M. Reed, Curator, Brooklyn Botanic Garden.

Friday, June 14. Second Annual Inspection of the Rose Garden.

Leader: Dr. J. Horace McFarland, Vice-President, American Rose Society, Harrisburg, Penna.

Friday, September 6. Water Garden Day.

Leader: Mr. Charles L. Tricker, Specialist in Water Lilies and Water Gardens, Arlington, N. J.

Friday, October 25. Chrysanthemum Day.

Leader: Professor Hugh Findlay, Columbia University.

It is a pleasure to add that the Flower Days this year have enjoyed a greater popularity than ever before, so that they seem now to have earned a place as regular events on the Garden's calendar.

Fifth National Shade Tree Conference

The purpose of this Conference, held February 7 and 8 at the Brooklyn Botanic Garden, is stated as follows: "To stimulate

greater interest in the study of Shade Tree Problems. To exchange ideas for enhancing the beauty and usefulness of shade trees. This is to be accomplished by holding meetings in different cities where methods of shade tree preservation can be studied; by discussing information; by cooperation with scientists engaged on tree problems."

The entire two days, from 10:30 Thursday morning, February 7 until 6 p.m. Friday, were devoted to lectures and informal discussions on shade trees viewed from many different angles, such as the healing of wounds, fertilizing, spraying, fungous diseases, and insect troubles. One hundred and ten men and women from nine states and thirty-seven cities were present at the conference. They represented investigators, "tree doctors," and nurserymen from State Experiment Stations, colleges and universities, the U. S. Department of Agriculture, and private firms dealing with the care of shade trees, tree surgery, and landscape gardening. A report of the proceedings, issued by the Shade Tree Association, is now published. During the part on fungous diseases of trees, held Friday afternoon, I served as leader of the discussion.

Publicity

During the year we issued nineteen news releases comprising sixty-three typewritten pages describing events at the Garden. As in previous years, Mrs. Warner, of the Brooklyn Publicity Bureau, has cooperated in this work. As a result we received from our clipping bureau 792 items from various metropolitan and other dailies telling of our activities.

Editorial Work

I have continued to serve on the editorial board of the *American Journal of Botany*, but with the increasing pressure of my other work have been obliged to delegate a large part of the details to Miss Rusk. As editor of the *Brooklyn Botanic Garden Leaflets*, I have to report that twelve numbers have been issued. I have also continued to serve as editor of the *Brooklyn Botanic Garden Contributions*, and as editor of the plant section of *General Biology of Biological Abstracts*.

Miscellaneous

Bureau of Information. We are constantly receiving requests for information about plants, for advice as to their care, and for other assistance of various sorts. For example, on the day this is written a messenger from a well known rose grower on Long Island comes to us for advice as to the best methods for testing soils; a resident of Brooklyn telephones us to inquire how to get rid of scale insects on her ivy, and how and when to divide primrose plants; and a professor from a University comes to secure specimens of pine needles of different species, in order that he may complete a key to the identification of the various kinds of pines by means of their needles.

Post Card Bulletins. On February 23 post card bulletins were sent to members of the Garden, announcing that the new seed and nursery catalogs would be placed on the tables in the library, March 4-9. On May 21 post card bulletins sent to members announced that over 1,000 chrysanthemum cuttings were available for distribution.

Personal Activities. In early May, I represented the Garden at a meeting of the Cleaner Brooklyn Committee. In October I served at the Children's Fair at the American Museum of Natural History as chairman of the judges of the exhibits of plant and animal life for classroom use. During the year I gave eighteen talks and addresses for various organizations and institutions, and conducted two field trips for the Torrey Botanical Club.

Boy Scout Examinations. As usual, I have conducted examinations for Boy Scouts desiring to obtain merit badges in conservation and forestry.

Increased Personnel. The work of this department has been steadily increasing in all of its branches since I joined the staff of the Garden in 1921, more than eight years ago. We have therefore been fortunate in enlisting the services of Miss Hilda Vilkomerson as stenographer. Miss Vilkomerson commenced her duties March 1, 1929.

Research. A report of my work in forest pathology during the past year appears on pages 62-66.

Respectfully submitted,

ARTHUR HARMOUNT GRAVES,
Curator of Public Instruction.

SPECIMENS OF CEREALS FOR HIGH SCHOOLS

DR. C. STUART GAGER, DIRECTOR.

Sir: I beg to submit the following special report for 1929.

In cooperation with Dr. R. C. Benedict, I arranged two special meetings for the New York Association of Biology Teachers. Our first meeting was held on Saturday, October 12th, and was planned primarily to show the sorghums and corn in the Experimental Field. At that time the crop was maturing and the various hybrids being grown in connection with our studies of smut resistance were in excellent condition for observation. Several different varieties of sorghum, showing wide variations in plant characters, as well as the first generation hybrid plants, were being grown. There was also a considerable number of second generation progenies of hybrids which had been inoculated with the covered smut and which showed the inheritance of the smut-resistant quality. At the same time, Dr. Benedict had a series of types of the cabbage family, including the wild cabbage, cultivated cabbage, kohlrabi, brussels sprouts, and other members of the group. These were also at their best condition for a comparison of the great variation to be observed in a closely related group of plants.

The second meeting was held in the Laboratory Building on November 23d, and was intended primarily for the examination of specimens of various cereals, with some emphasis on the genetic aspects. We prepared a large number of different types of specimens of wheat, oats, rye, barley, sorghum, and corn, and put them on display. As a part of the same program, Dr. Benedict showed to those present his studies on ferns.

Very great interest was aroused by the examination of the cereal specimens, and the possibility of their use in connection with the High School teaching of botany was taken up. These plants, although constituting the basal food plants of the world, were more or less unfamiliar to the high school teachers. Some of them had never seen wheat, oats, rye, barley, or sorghum. Corn was slightly familiar because of its appearance on the market.

It was evident to those who attended the meetings that the material would prove very valuable in the instruction of the high

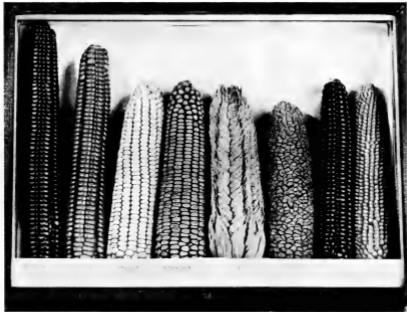


FIG. 12. Types of corn (*Zea Mays*), prepared for High School demonstration. (6883.)

school students. Accordingly, plans were prepared and a large number of different types of specimens were arranged and supplied to the schools which desired them. Several of these specimens were mounted in glass-covered exhibition cases which displayed the material in a very satisfactory fashion. Test tubes also proved valuable containers for certain types of material. The only charge to the schools was the actual cost of the exhibition cases, test tube containers, and ears of corn varieties which had to be purchased from the dealers.

Among the specimens exhibited and later prepared for the schools were the following:

1. Types of small cereals—7 small bundles of heads, including wheat (awned and awnless), barley (awned and awnless), oats, rye, and rice.

2. Types of wheat—one bundle each of 8 varieties showing the following characters:

- | | |
|-----------|--------------------------------|
| <i>a.</i> | Awned, white, glabrous glumes |
| <i>b.</i> | Awnless, " " " |
| <i>c.</i> | Awned, brown, " " |
| <i>d.</i> | Awnless, " " " |
| <i>e.</i> | Awned, white, pubescent glumes |
| <i>f.</i> | Awnless, " " " |
| <i>g.</i> | Awned, brown, " " |
| <i>h.</i> | Awnless, " " " |

3. Sorghum hybrids and parents—Heads of Dawn Kafir, Red Amber Sorgo, and the first generation plant.

4. Corn varieties—Ears of Yellow and White Dent, Yellow and White Flint, Sweet, Pop, Pod, and Indian Flour Corn. These varieties showed the variation in color, shape of ear, and other characters.

5. Corn hybrids—Ears of two parental varieties and the hybrid between them, showing the segregation of the second generation endosperm characters. A number of different types of crosses were available, and the schools selected one or more for their purposes.

In addition to the above, there were various miscellaneous specimens mounted in test tubes. One set consisted of seven tubes of small cereals—a single head of each in a tube with some of the

grain at the bottom. A second series consisted of eight tubes of grain, including wheat (red and white grains), barley (hulled and hull-less grains), oats (black and white hulled grains), rye, and rice. Other tubes contained the heads of Kanred, Kubanka, and Marquis wheats and also specimens of wheat rust, wheat smut, oat smut, and barley smut.

The seedlings of certain sorghum crosses have proved to be very interesting for observing the inheritance of the red and green color of seedlings. Seeds from the first generation plant for growing the second generation in order to obtain the segregation of red and green seedlings were furnished to many of the teachers; about seventy-five packets of seed of the hybrid, together with each of the parents, were prepared.

In the accompanying table there are listed the High Schools which obtained the various specimens. There is also indicated a fairly complete summary of the different types of material which we furnished: 68 exhibition cases, 12 Riker mounts, and about 215 tubes containing miscellaneous material were prepared.

Cereal Specimens—High Schools

Alexander Hamilton High School, Brooklyn, N. Y.
 Erasmus Hall High School, Brooklyn, N. Y.
 Flushing High School, Flushing, N. Y.
 Haaren High School, New York City.
 James Madison High School, Brooklyn, N. Y.
 Julia Richman High School, New York City.
 Manual Training High School, Brooklyn, N. Y.
 New Utrecht High School, Brooklyn, N. Y.
 Port Richmond High School, Port Richmond, S. I.
 Stuyvesant High School, New York City.
 Theodore Roosevelt High School, New York City.
 Thomas Jefferson High School, Brooklyn, N. Y.
 Wadleigh High School, New York City.
 Walton High School, New York City.

	Number of Schools Supplied
Types of small cereals, in case	9
Types of wheat, in case	9
Sorghum hybrid and parents in case	12
Corn varieties, in case	9
Corn hybrids, in case (26 cases—1 or more per school)	12
Types of wheat, barley, etc. in Riker Mounts (12 mounts—1 or more per school)	7
Test tube mounts—Types of cereals, types of wheat, grain, diseases, etc. (215 tubes—1 or more per school)	12

To a great extent the materials supplied were the by-products of our research. These various cereals were grown in connection with our investigations, and surplus material was secured. It is noteworthy that such material has found a demand in connection with the high school instruction in botany and that it thus serves a very useful purpose.

Some of the material to supplement what we had was obtained from other sources. Through the cooperation of the Office of Cereal Crops and Diseases, U. S. Department of Agriculture, we obtained some sorghums from their Field Stations in Kansas and Oklahoma; Dr. L. R. Waldron of the North Dakota Agricultural Experiment Station supplied us with some fine material of Kurbanka and Marquis wheats. Varieties of corn were secured from different growers, but the hybrids were grown at the Garden.

Respectfully submitted,

GEORGE M. REED,
Curator of Plant Pathology.

REPORT OF THE CURATOR OF ELEMENTARY INSTRUCTION FOR 1929

DR. C. STUART GAGER, DIRECTOR.

Sir: I hereby present the eighteenth annual report from the Department of Elementary Instruction under the following headings.

Class Work

This might well be divided into four parts, as follows: visiting classes, extension classes, children's Saturday classes, and children's outdoor garden classes.

Visiting Classes

The work in our visiting classes for this season has been most successful in respect to the quality of work and the demand for it. The attendance has been greatly reduced, due to the fact that for several years we have put a strong emphasis on our desire to have smaller numbers in groups, and to encourage groups

coming over a period of several weeks. In this way a body of knowledge has been built up for each group and greater help has been given to the schools for their work in geography and nature study, so that during 1929, classes of forty to fifty individuals each have been coming, rather than groups of from eighty to one hundred and fifty or more, such as we have had in years past. Eighteen different schools have availed themselves of this group system of visiting class work. It might be of interest here to note that the emphasis placed upon this phase of the work at the Brooklyn Botanic Garden is equally stressed at the Field Museum in Chicago. Typical lists of lessons given in a series are as follows:

FIFTH GRADE

Spring

1. Demonstration lessons on seed planting
2. Soil (Experiments)
3. Seed planting (Greenhouse)
4. Trees (Outdoor excursion)
5. Seed pricking (Greenhouse)
6. Seed dispersal (Grounds)
7. Seeds (Demonstration)
8. Spring; Wild and Garden Flowers (Lantern talk)
9. Flowers and plants for classrooms (Demonstration with material)
10. Meaning of a flower
11. Spring walk (Tree walk)
12. Japanese Garden (Outdoor excursion)

JUNIOR HIGH SCHOOL

Spring

1. Demonstration lessons on seed planting (Greenhouse)
2. Soil (Experiments)
3. Seed planting (Greenhouse)
4. Seed pricking (Greenhouse)
5. Trees (Outdoor excursion)
6. Forms and functions of leaves (Blueprints)
7. Seeds
8. Field trip—Ecology (Grounds)
9. House plants (Demonstration)
10. Shrubs (Grounds)
11. Story of plant life (Lantern talk)
12. Spring walk

SIXTH GRADE

Fall

1. How to make cuttings (Greenhouse work)
2. Bulbs for classroom planting (Demonstration)
3. Planting bulbs (Greenhouse)
4. Economic plants (Lecture and visit to Economic greenhouse)
5. Potting cuttings (Greenhouse)
6. Trees familiar to Brooklyn boys and girls (Excursions on the grounds)
7. Excursions to discover plants of different countries (Economic greenhouse)
8. House plants (Lecture and greenhouse work)

P. S. 4, which has been sending a class of children for this intensive work for two years, asked to have some pictures taken, showing the opportunities offered by us to public schools. The pictures were added to a book they had prepared for a school in Italy, the Scuola Elementare "DeAmicis," in Rome.

The work of visiting classes for the year 1929 was in charge of the Acting Assistant Curator.

Extension Classes

Extension classes have been carried on as appeared in the Prospectus of Courses.

The B2, Nature Study class, has been divided into two sections so that the classes may receive the benefits of individual, personal attention. One of the requirements of the work is for each class member to take over some section of the grounds, making a special study of trees, shrubs, weeds, and flowering plants on the given section. This work is possible to carry out only when classes are in small groups.

B3, the beginners' greenhouse section, registered ninety-nine students—the largest class in this subject ever held at the Brooklyn Botanic Garden.

Children's Saturday Classes

I should like to call to your attention a new plan we have called the group plan, used in our 1929 fall classes. The children were placed in groups according to age and length of time spent in study at the Garden. There were four of these groups for the



FIG. 13. Class from Public School 18, Brooklyn, studying fruits of trees at the Botanic Garden. (6620.)

early morning period, and four for the second period. Each group met with a different teacher for four consecutive Saturdays. Each teacher represented a subject, for example, greenhouse, outdoor work, classroom experiments, and clubroom investigation. In order that each teacher's work should not stand out as a separate entity, but appear as a part of the whole, a common theme was chosen, namely, nature's plans for winter.

This group plan has worked well and was much enjoyed by the children. At the end of four weeks a questionnaire was given in order to find out the children's reaction to the plan. One hundred children received this questionnaire. Younger children were not asked to fill it out for various reasons. The result was as follows:

- 60 per cent. of the children enjoyed most their greenhouse work.
- 20 per cent. preferred classroom experiments.
- 11 per cent. voted for outdoor study.
- 9 per cent. liked best the work in connection with the clubroom and the reference books kept in that room.

Children's Outdoor Garden

One hundred seventy-six children were in the outdoor garden. On account of the season's drought, it was a very poor season for work, and the lack of fertility in our soil was plainly demonstrated, so that toward the end of the summer, the gardens were given up, manure plowed in, and winter rye planted.

Because of the poor season more work than usual was done on allied garden subjects, such as insect pests, animal study, etc. Terraria of woody plants and mosses were set up, the grounds studied, and a special feature made of the Shakespeare Garden. In midsummer an exhibit was set up in the house of all the different phases of this work. It was entirely an exhibit of the children's own planning and consisted of collections, models, insect mounts, and intensive study of special features, such as the Shakespeare Garden and perennial border.

The Boys Cup for 1929 was presented by the Garden Teachers Association to John Degen, and the Girls Cup presented by Mrs. Glentworth R. Butler to Mary McPike of Barnard College. Silver and bronze medals were given as usual.

Seed Work

This year 797,664 packets of seeds were distributed, which is nearly 240,000 more than were distributed last year. This number of packets represents nearly 265,000 children, 6,621 teachers, and 437 schools.

Distribution of Nature Materials

Under this heading I should like to call to your attention the enormous amount of nature material and living plants which goes out from this department annually.

During the year 1929 more material was distributed by the Department of Elementary Instruction than ever before in its history. Nearly 4,000 potted plants were sent to schools, not for aesthetic purposes, but for definite study. This represents over 4,000 teachers and nearly 200,000 children. Plants are still presented to classes to be taken back to schools largely for decorative purposes. Over 300 such plants were sent out to 66 schools, representing over 20,000 children and over 500 teachers.

It might be of interest to note here that from our instruction greenhouses through our teachers' classes and our children's classes, and the schools sending classes for intensive study, over 22,000 plants have gone out. The sum total of all this work represents nearly 27,000 plants, over 5,000 teachers, and nearly 250,000 children. This figure does not take into account the perennials and annuals supplied to our school gardens of Brooklyn. This year we presented nearly 8,000 of these plants to 26 of our school gardens, representing help to over 1,000 teachers and more than 50,000 children.

The following letter from one of the schools is typical of those received by us in connection with this work of plant distribution.

P. S. 46,
Borough of Brooklyn,
March 18, 1929.

My dear Miss Shaw:

All of us here feel that the success of our Nature Room is due to your great interest and generosity. The children love to go to it and learning about the specimens is a pleasure and not a task for them.

We want you to know that we appreciate very much all you have done for us.

Sincerely yours,
 (Signed) ELIZABETH H. ELLIS,
Principal.

This work alone makes heavy demands upon the time of the department and upon the greenhouse space given to us. We feel that it is one of our greatest contributions to the schools of Brooklyn, but I think it should be held in mind that the mere mechanics of this part of our work represents a great drain upon time. It might be of interest to some to see a partial calendar of work done in our instruction greenhouses.

JANUARY-MARCH

Begonia seedlings started
 (Almost 1,000 begonia plants were raised)
 Cuttings taken of ivy, impatiens, cuphea, and other stock plants
 Pansies and perennials planted for the children's garden
 Bulbs brought in from the pit
 (Over 800 bulbs brought to bloom and distributed)

APRIL-JUNE

Fern plants potted for fall stock
 (2,000 in number)
 Annuals, planted in spring classes, raised
 Perennials, planted in spring classes, raised
 Annual seedlings distributed for school gardens
 Plants supplied to nature rooms

JULY-SEPTEMBER

Desert plant stock tripled by means of cuttings

OCTOBER-DECEMBER

Plants started from seedlings for winter bloom
 Begonia plants and others brought in from the outdoor garden, cut back for winter stock
 Ferns repotted
 Desert plant cuttings potted
 Cuttings made to increase stock

Exhibits

Thirty-four exhibits were set up during the year which brought us in contact with over 45,000 children. These exhibits were

almost entirely those sent to schools for use of the entire school or to school nature rooms or to the School Nature League. Among those of special interest were the following.

The exhibit set up for the Girl Scouts at the Thirteenth Armory in May.

This consisted of model grounds with a lake, vegetable garden, and flower garden, and utilized seedlings raised in our greenhouse.

The exhibits which were set up Saturday mornings throughout the spring in the clubroom were:

Plants blooming in the greenhouse

Early twigs, showing buds

Twigs for indoor forcing

Tree exhibit (showing leaves, twigs, pictures of whole trees, and fruit of each)

Economic plants

Early blooming trees and shrubs

Twigs in leaf

Interesting plants in the greenhouse

A bud exhibit

An exhibit with pictures showing activities of early spring in other parts of the United States in agriculture and forestry

Special Departmental Features

Miss Hammond, Assistant Curator of Elementary Instruction, was granted a continued leave of absence until September 1, 1930.

The Curator of Elementary Instruction has written a series of thirty-seven articles for the *New York Sun*, and six articles for *The American Home* besides other publications.

The Acting Assistant Curator has prepared a "List of Books on Gardening and Botanical Nature Study."

The Alfred T. White Scholarship this year was awarded to Rosemary Kennelly, a sophomore at St. Joseph's College for Women.

The Girl Scouts of Red Bank, New Jersey, carried on a demonstration Scout garden. Miss Sargent, of our department, was assigned to assist in this work and supervise it, going once every two weeks to Red Bank. She also carried on the little garden at the Brooklyn Home for Consumptives under the auspices of the Brooklyn Branch, National Plant, Flower and Fruit Guild.

The Curator of Elementary Instruction was given a five months' leave of absence. Because of this an extra assistant was appointed,

the additional funds for salary being contributed by members of the Garden who have been especially interested in the work of this department.

Personal Activities

I continued to act as Honorary Secretary of the National Plant, Flower and Fruit Guild.

I served on the Executive Board of the Campfire Girls; the Board of Directors of the Coordinating Council on Nature Activities; the Board of Directors of the School Nature League; as one of the Directors of the School Garden Association, and as Secretary-Treasurer of the American Nature Study Society. In the latter capacity, I attended the December meeting of the American Association for the Advancement of Science at Des Moines, Iowa, and submitted my Secretary's and Treasurer's Reports at that time. I also served on the Program Committee for that meeting.

Respectfully submitted,

ELLEN EDDY SHAW,
Curator of Elementary Instruction.

REPORT OF THE CURATOR OF PLANTS FOR 1929

DR. C. STUART GAGER, DIRECTOR.

Sir: I beg to submit herewith my report for the year 1929.

Collections

We received plants of *Microcycas* from Cuba, so now we have eight of the nine genera of Cycads, lacking only *Stangeria*. Many of the new plants received were roses. Collections of *Sedum* and *Thymus* were increased. Every year we obtain numerous herbaceous plants, but nearly as many die out. To increase the variety of these plants special conditions such as shade, water, sand, limestone, etc., would be desirable, but this extension is not possible with present gardening force.



FIG. 14. Tree study in the Botanic Garden. Small Group Work. The pupils are supplied with Guide Sheets.
(6475.)

Iris Plantations

Under Dr. Reed's supervision several beds in the Iris Section were replanted with varieties of Tall Bearded Iris during the past season. Many of these beds had been idle for one or more years, the old plantings having been taken up, partly because of their crowded condition and partly because of prevalent diseases. The newly set plants started off in vigorous growth and there is every indication of abundant bloom during the coming season.

A good many varieties of Tall Bearded Iris were received in exchange, mainly for Siberian and Japanese varieties. Mr. L. F. Hoyt, East Aurora, N. Y., sent us 4 varieties; Mrs. Thomas Nesmith, Lowell, Mass., supplied us with 18 varieties, including 2 of her own seedlings; and Col. J. C. Nicholls, Ithaca, N. Y., sent us 6 varieties.

We have also added to our collection of the Pogocyclus Iris and related forms. The former are particularly interesting because of their hybrid character. Col. J. C. Nicholls sent us 3 varieties; Mr. F. X. Schreiner, St. Paul, Minn., sent us 12 varieties; and Mr. Howard Weed, Beaverton, Ore., supplied us with 11 varieties of the Pogocyclus group.

In addition to the above, several species and varieties belonging to the Oncocyclus and bulbous groups of Irises were obtained from C. G. Van Tubergen Ltd. of Haarlem, Holland, and Fr. Vester & Co. of Palestine.

Phanerogamic Herbarium

Among collections received were the following: 170 specimens, mostly ferns from Miss E. M. Kittredge, Vermont; nearly 2,000 Long Island plants and 1,000 Brazilian plants collected by Mr. Norman Taylor; 243 specimens from Alaska, collected by Mrs. Ynes Mexia, presented by Mrs. Adrian Van Sinderen, who met Mrs. Mexia while traveling in Alaska; 300 specimens from W. A. Schipp in British Honduras; 226 from the University of Cluj, Roumania, and 250 arctic plants from Germany. No mounting has been done as the herbarium cases are nearly filled.

Cryptogamic Herbarium

Dr. Reed reports that the following specimens were added to the fungus collection of the Cryptogamic Herbarium during the past year:

329	specimens	by	purchase
213	"	"	exchange
2,705	"	"	gift

In turn, we sent to correspondents 180 specimens.

Mr. Charles C. Hanmer, Fishers Island, N. Y., gave us his collection of 2,705 specimens. The collection included a large number of species of Agarics and related higher forms of fungi. Mr. Hanmer has been a collector of this group of fungi for many years, the majority of his specimens having been secured in Connecticut. Many, however, were obtained through exchange with correspondents. His material arrived in excellent condition and is available for students of the higher fungi.

Conservatories

Loan of Plant.—On September 17, Mr. Edward C. A. Olson, of Brooklyn, brought to the Botanic Garden for temporary exhibit in our conservatories, a beautiful flowering specimen of *Hæmanthus albiflos*, a South African plant of the Amaryllis Family. Subsequently, Mr. Olson presented two smaller specimens of this species as a gift to the Garden.

Chocolate Tree in Bloom.—During October, the chocolate tree (*Theobroma cacao*), a native of tropical America, was in full bloom in the Economic House, and many classes from the public schools came to see it. As is well known, this plant bears its flowers on the old wood, including the branches, larger limbs, and the trunk, where the flowers extend down nearly to the ground. This is contrary to the method of most plants which bear their flowers at the tips or along the sides of the new growth of the given year.

Transparencies.—A number of illustrations were selected to make enlarged transparencies of economic plants. Three large drawings were nearly completed by Miss Maud H. Purdy to

illustrate fossil plants for the Evolution Exhibit. These transparencies are to be hung in the conservatories back of the living plants so as to make the exhibits more instructive.

Need of Rearrangement.—In order to make the conservatories more effective educationally, a rearrangement is desirable. Plans for this were instigated in December, in anticipation that they may be put into effect in 1930.

Lectures and Classes

Following Dr. Graves's lecture on water life, I gave two lectures in March on "The Story of Plant and Animal Evolution." Assisted by Miss Hester M. Rusk, I gave eight field lessons on "Spring Flowers and Ferns" during May and June.

International Seed Exchange

Distribution of Cactus Seeds

In our International Seed Exchange list for 1929 were included seeds of Cacti collected in the summer of 1928 in Arizona. The distribution of these seeds to foreign countries has attracted considerable attention. Clippings concerning it have been received from newspapers in New Orleans, La. (*Picayune*), Indianapolis, Ind. (*Star*), Detroit, Mich. (*Free Press*), Independence, Mo. (*Examiner*), Amarillo, Texas (*News*), Marquette, Mich. (*Journal*), Norwich, Conn. (*Bulletin*), and Paterson, N. J. (*Call*), besides the Metropolitan press.

Summer Seed Collecting

The largest foreign demand, very naturally, is for seeds of native American plants. In order to meet this demand more generously, collectors have been in the field during the past summer as follows (in addition to collections in the Botanic Garden): Mr. J. P. Anderson, *Alaska*; Miss Belle H. Burr, *Newfoundland*; Mr. Lorentz Cantor, *New Jersey*; Dr. C. Stuart Gager, *Maine*; Dr. Alfred Gundersen, *Catskill Mountains*; Students of Prof. D. B. Swingle, *Montana*.

Extent of Distribution

In his report, appended hereto, the Horticulturist notes that over 3,300 seed packets were distributed. We are now in regular exchange with 145 foreign gardens.

Labels and Signs

Labels and signs were made by our labeler, Mr. John McCallum, as follows:

Steel labels for herbaceous beds	208
Family labels for beds	106
Lead labels for woody plants	90
Lead labels for rock garden	224
Small wood labels	448
Large wood labels	42
Wooden signs	60
Cardboard signs	176

Total 1,354

Also numerous miscellaneous numbers and signs.

A number of the larger trees in the garden were marked by labels on the trunks.

Statistics

	Plants	Species or varieties
<i>Living Plants Received:</i>		
By exchange	237	163
By gift	780	145
By purchase	23,707	602
Derived from seed	211	211
By collection	10	10
Total	24,945	1,131
<i>Living Plants Distributed:</i>		
To members		1,000
<i>Seed Packets Distributed:</i>		
By exchange		3,303
<i>Seed Packets Received:</i>		
By exchange		967
By gift		26
By purchase		158
Total		1,151

Herbarium Specimens Received:

By exchange	591
By gift	286
By purchase	795
By collection	2,870
	4,542
Total	4,542

Respectfully submitted,

ALFRED GUNDERSEN,
Curator of Plants.

REPORT OF THE HORTICULTURIST AND HEAD
GARDENER FOR 1929

DR. C. STUART GAGER, DIRECTOR.

Sir: I beg to submit herewith my report for the year ending December 31, 1929.

Personnel

Two men were added to the gardening force on May 1st. This brings the number of employees under this heading up to nine. As compared with 1927 this represents an increase of three men, but as the Rose Garden demands the time of two men, with occasional extra help throughout the growing season, the net increase in labor available for general upkeep of conservatories and grounds is slight. Half the time of one gardener, Miss Sutcliffe, was available for work in the Rock Garden during the growing season as in 1928.

Mr. Clement C. Agate, foreman gardener (outdoors), resigned his position March 31st, 1929. Mr. George R. Bishop was appointed in his place on April 1st, 1929.

The Passing of the Horse

The small tractor (adapted by our own men to serve both for plowing and trucking) and the motor cultivator purchased late in 1928 have greatly expedited our work and enabled us to dispense with horses entirely.



FIG. 15. View in the Rose Garden. June. Last view of Mt. Prospect Water Tower, taken down since this photograph was made. (6892.)

General Systematic Section

Five beds along the brook, formerly occupied by Iris, were planted in the fall with Globe Flower, Trollius; Columbine, Aquilegia; Plume Poppy, Bocconia; herbaceous Spiraea; and Astilbe. These are all ornamental plants of garden importance and are located near their respective plant family beds.

Three new beds of irregular shape were made in the Malvaceae Family and planted with garden varieties of hollyhock and marsh-mallow. The species bed was remade to harmonize with the new beds.

A hedge of *Hypericum densiflorum* was planted to mark the south edge of the aisle between the Malvales and Violales.

In the above Order a bed was constructed and planted with the interesting *Gordonia alatanaha*, and two beds were made and planted with one thousand pansy plants.

Two beds for the accommodation of the Primulaceae and Plum-baginaceae were remade so as to conform more harmoniously with the surrounding topography.

The small bed of *Abelia grandiflora* made such a charming display in 1928 that it was greatly enlarged and thirty additional plants set out.

Twenty-four varieties of Canna were added to our collection.

Bulb Planting

More than fourteen thousand Crocus corms were planted amongst the shrub honeysuckles and in weak spots of the existing Crocus groups in the vicinity of the Flatbush Avenue service entrance.

The garden varieties of tulip in the two beds near the White Oak Circle were taken up and replaced with new bulbs—about fourteen hundred bulbs in fifty-nine varieties being used.

Rock Garden

In addition to numerous alpine and rock plants derived from seed or purchase, the following bulbs suitable for rock garden adornment were planted during the summer and fall:

- 800 Crocus (autumn blooming) in 8 species and varieties
 800 Crocus (spring blooming) in 10 species and varieties
 450 Chionodoxa ("Glory of the Snow") in 5 species and varieties
 250 Muscari (Grape Hyacinth) in 11 species and varieties
 150 Narcissus in 3 species
 125 Galanthus (Snowdrop) in 5 species
 75 Tulipa in 3 species
 140 Miscellaneous Bulbs from Palestine in 10 species and varieties
 100 Eranthis Tubergeni (Winter Aconite)
 100 Fritillaria Meleagris (Guinea-ben Flower)

Rose Garden

About seven hundred new rose plants were set out during the spring and fall. The beds of hybrid tea, hybrid perpetual, tea, Bourbon, and China roses are now complete with the exception of a few varieties, difficult to obtain, that are required to complete the chronological sequence.

Considerable difficulty has been experienced in obtaining all the species roses desired for planting the side borders that extend all around the garden. It will probably be a matter of several years before it is possible to get all the species we want. As the frame of foliage provided by these species roses is very important in adding to the appearance of the rose garden, it was decided to spread out the species and varieties we already have and, by the use of duplicates, eliminate the spotty appearance that has hitherto existed. About half of this work was carried out in the fall when freezing weather put a stop to operations.

The museum bank immediately north of the rose garden was planted with about a hundred climbing roses in ten varieties and thousands of plants of *Pachysandra terminalis* were set out to provide a ground cover until the roses fill their allotted space.

Ornamental Planting

For a number of years the azalea planting at the Richard Young gate has been unsatisfactory, because of the distressing juxtaposition of difficult colors, the mixture of varieties, the crowded condition of some varieties, and the death of others. To remedy this condition involved the labelling (during the blossoming season) and replanting (in early fall) of over six hundred bushes.

This was done in 1929. Two hundred *Kalmia angustifolia* were planted as an irregular border around Azalea Knoll and ten large pin oaks were planted to give shade and protection to this area.

The construction of the new gate made necessary the removal and replanting of a number of shrubs in the vicinity. Two holes, 1.4 feet in diameter and 2½ feet deep, on either side of the arch, were dug by our men for the reception of two pin oaks each 35 feet high, planted by Hicks Nurseries from whom they were purchased.

The worn-out wire fence that protected the planting on both sides just inside the entrance was replaced by hedges of *Berberis Thunbergii minor*.

The Lilac Triangle was extended south to the west entrance of the Rose Garden. This accommodated fifty plants from our own nursery. The peninsula north of the triangle, after extensive grading, was planted with thirty-nine purchased plants.

The bed of lily-of-the-valley, given in 1925 by Mrs. Frederick W. Rowe, was replanted and extended to cover more than double its original area.

On the border mound adjacent to the lily-of-the-valley bed one hundred and fifty *Acanthopanax pentaphylla* were set out to block unauthorized passageways.

The two rows of *Ginkgo biloba* planted on the eastern end of the Museum bank, which had made poor growth, were amalgamated in one row and the row left vacant planted with twenty-five *Populus Eugeni*. Five hundred privet bushes were planted along the boundary fence to further screen the unfinished face of the Museum from the Garden.

The soil was improved, and plantings made, around the eight new drinking fountains. The following material was used: 100 *Berberis Thunbergii*, 25 *Rhamnus cathartica*, 15 *Malus atrosanguinea*, 10 *Syringa vulgaris*, according to the Plant Family area in which the respective fountains are located.

The display of hardy chrysanthemums proved to be so popular last year that the plantings were increased this year by providing an additional bed about seventy-five feet long containing 1,375 plants in twenty-five varieties.

About fifty square yards of ground in the vicinity of the Alfred T. White Memorial were prepared for the planting of Rhododendrons, in the spring of 1930, by digging to a depth of two feet and mixing in sand and peat moss.

Miscellaneous

Fifteen hundred feet of trench was dug by our men for the installation of irrigation pipes to cover the North Addition. Connection was made with existing garden mains and, on Eastern Parkway, with a new sixteen inch main of the Department of Water Supply. This main is laid under the sidewalk along the south side of the Parkway.

Trenches for water and sewer connections for eight bubbler drinking fountains were dug, concrete bases cast, and the pedestals set up in readiness for the plumber. Concrete platforms and "stepping blocks" were also made for the above.

Twelve concrete-and-wood garden benches, designed by our landscape architect, were set up and concrete platforms made for eleven of them.

The foundation was made, concrete mounting cast, and the metal bird bath installed in the Rose Garden.

Concrete foundations and bases were made and four additional pillars erected at the inside ends of the north pergola of the Rose Garden.

Concrete fence posts were cast and set up on top of the Museum embankment opposite the Rose Garden. This fence is designed to carry climbing roses, and will mask an awkward grade.

A section of roadway of tar macadam was laid over the north Jenkins bridge and its approaches.

The steps of granite blocks leading from the walk to the top of the reservoir bank were reset in cement on a foundation of ashes.

Seed and Plant Distribution

In connection with the International Seed Exchange, 3,303 packets of seeds, chiefly of herbaceous plants, were distributed to foreign and domestic botanic gardens, and to other institutions and individuals during the spring of 1929.

One thousand nine hundred plants of hardy chrysanthemums and hardy asters were distributed to Botanic Garden members.

Propagating material, sufficient to provide two thousand buds, of the Rose "Max Graf" was supplied to one of the liberal donors of roses to the Rose Garden.

Personal Activities

I attended the meeting of the Canadian Horticultural Council at Ottawa on Mar. 13-14.

I am continuing to serve on the Plant Registration Committee of the National Association of Gardeners and, in August, was appointed on the International Peace Garden Committee of the above organization.

Respectfully submitted,

MONTAGUE FREE,

Horticulturist and Head Gardener.

REPORT OF THE LIBRARIAN FOR 1929

DR. C. STUART GAGER, DIRECTOR.

Sir: Herewith is submitted the report on the condition and work of the library for the year 1929.

The present librarian began his duties on October 1, and is the fifth regular appointee since the library was established in 1911. From a modest beginning in one small room and without a book to form even the nucleus of a library, it has grown steadily during the nineteen years with an average of more than one thousand accessions per year. Fortunate in its librarians during the formative period, its largest and most substantial growth has taken place under the guidance of Miss Ray Simpson who resigned at the end of June after continuous service as librarian for thirteen years. Miss Simpson summarizes her administration as follows:

Final Report of Miss Simpson

"In presenting my last report as librarian, it may be of interest to glance in retrospect over the thirteen years of my stay at the

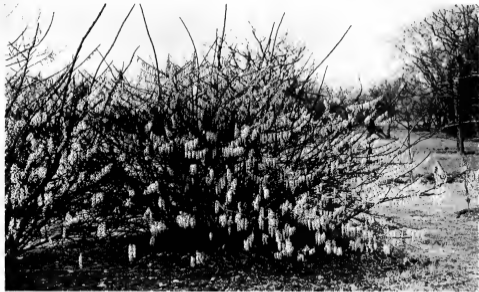


FIG. 16. Spiketail (*Stachyurus praecox*), in full bloom. General Systematic Section of the Plantations. April 4.
Cf. Fig. 17. (6780.)

Garden. When I arrived, there were in the library 3,804 volumes and 5,885 pamphlets. There were 224 serial publications received regularly, 150 of these being received in exchange. Thirteen years later the volumes in the library number 14,003, and the pamphlets 9,863. There are 950 titles in our current serial and periodical file, of which 685 are received in exchange. Not all of these serials issue numbers each year, but in 1928 the library received numbers or parts of 872 serials and periodicals aggregating 7,393 separate pieces. From January to June, 1929, numbers or parts totalling 3,378 were received from 607 serials and periodicals.

"The readers in the library for 1915 numbered 1,027, while the number for 1928 was 6,283. Books lent to members of the Garden staff numbered 246 in 1915, and 1,101 in 1928.

"For the ten-year period covering 1916-1926, 2,135 volumes were sent to the bindery. For the period covering 1927-1929, 2,619 volumes were bound. In the main, the volumes bound in 1927-1929 were serials, thousands of agricultural experiment station publications and U. S. documents.

"In these thirteen years the aim of the director and the librarian has been to complete the files of periodicals, serials and society transactions. The library today is rich in these completed sets, many of which, as well as the greater number of the works in our special collection of incunabula and Pre-Linnaean works, were purchased with the income from the Benjamin Stuart Gager Memorial Fund, given for this purpose.

"Attention may be called to the physical expansion of the library. In 1917 the library moved from the one room which it had occupied to its present quarters, consisting of a main reading room with its shelves of books and serials, two stack-rooms and a library office which also serves as a work room.

"The principal piece of work we set before us for accomplishment during 1929 was the binding of as many agricultural experiment station publications as possible. From January to June, 1,282 volumes, of which 421 were serials and 861 agricultural experiment station publications, were forwarded to the binder. In order to bind into volumes the agricultural experiment station annual reports, bulletins, circulars, etc., 10,837 parts were collated and prepared for the bindery.

"The librarian compiled Brooklyn Botanic Garden *Leaflets*, Series XVII, nos. 1-3, dated April 3, 1929, entitled 'A Selected List of Publications on Gardening and Wild Flowers.' An editorial comment regarding this list appeared in the American Library Association "Book List" for June, 1929. The Macmillan Company asked for copies to be distributed to public libraries by their salesmen in their several territories, and also requested permission to place a number on the table containing their books on gardening at the annual meeting of the American Library Association in Washington, D. C. The Chief of the Circulation Department of the New York Public Library also desired us to forward copies so that he could distribute them to various branches of the New York Public Library.

"The librarian compiled also, at the request of our horticulturist, a list of several hundred horticultural organizations in the United States for the use of the National Association of Gardeners.

"The nursery and seed catalogues have been rearranged in two new vertical files which will greatly facilitate their use.

"Special exhibits of books were arranged for the Annual Spring Inspection and for each of the Flower Days, and of seed and nursery catalogues during the week of March 4 to 9. Special notices were sent to all Botanic Garden members calling attention to the display of catalogues."

The above brief and characteristically modest report falls far short of conveying an adequate impression of the amount of devotion and painstaking labor which the writer must have given to bringing the library to its present state.

Use of the Library

The total recorded use of the library for the year 1929 was 5,396 and the number of books lent to the Garden staff 901. To one accustomed to the work of a busy public reference library, this record seems small. However, one has to keep in mind that much of the use of a general public library is hurried and superficial while, in a highly specialized library like our own, the exact reverse is true. In addition to its use by the curators and Garden staff who are engaged in scientific research and educational work,

its privileges are taken advantage of by teachers, students, writers, business organizations and various members of the community who are interested in plant life. The following are a few examples of the use made of the library by the public during the past year: the librarian of a large business corporation in Manhattan compiled a "Bibliography on petroleum products as insecticides," which was based largely on material in this library; the author of the article on botany for the 1929 edition of the *New International Yearbook* secured his data from the library's current publications; a local physician used our books in making a study of fungus diseases of plants for the purpose of discovering possible analogies to similar growths in human beings; a teacher requested a list of books to be used in identifying the seeds of weeds found in the locality of Brooklyn; investigators from the research department of a large fruit importing company made a study of the use of potassium for fertilizing purposes; a sculptor used illustrations of the European willow for decorative motives on a monument; a landowner in Connecticut sought information on the possibility of growing bamboo; several illustrators at different times used pictures of flowers; a local drug company asked for a list of books containing good drawings of medicinal plants; an investigator from a well-known research institute made a preliminary survey for a projected series of experiments with tea and coffee in relation to health.

Other topics on which information was given were: growing of narcissi, care of rubber plants, culture of honeysuckle, evergreens used as hedges, flower shows, cultivation of ginseng, historic trees, plant coloration, care of ferns, where to purchase orchids, plant genetics, teaching of botany, aquatic plants, rock gardens, garden furnishings, iris cultivation, peach tree diseases, flower arrangement, treatment of black rot in delphiniums, pools and water gardens, wood destroying insects, spraying apple trees, biographical sketches of various botanists.

An instance showing the practical use of the Pre-Linnean books was the following: a visitor wished information on the history of the microscope, especially experiments by Robert Hooke and his use of the word "cell" for the units of plant structure. Original sources for this information are Hooke's "*Micrographia*" and his

"Microscopic observations" of which the library possesses 1667 and 1780 editions respectively.

Accessions

During the year 1929 there were added to the library 1,767 volumes and 1,509 pamphlets, making a total collection on December 31 of 15,091 volumes and 11,108 pamphlets, or a grand total of 26,199. Besides the above volumes and pamphlets there were received 6,667 parts of publications which will be bound and accessioned later when complete volumes have been issued.

The number of volumes added by purchase was somewhat less than for the previous year. The funds allotted for the purchase of books were exhausted some time before the end of the year and many order slips which had already been written had to be filed and held for the beginning of the new year. This will result in considerable inroads on the ensuing year's appropriation at the very commencement and reduce by so much the number of other desirable books that can be purchased. This is particularly unfortunate at this time because of the large number of sets of botanical periodicals, serials, and other scholarly publications which are now in the market. Catalogues from English and European booksellers are being received constantly and checked for works needed for the library, only a fraction of which can be ordered because the income from the special book funds is insufficient for the purpose. Several rare botanical classics were purchased from the income of the Benjamin Stuart Gager Memorial Fund, but the opportunity of securing a number of other Pre-Linnean works had to be lost.

List of Some Important Accessions

- Albertus de Bollstaedt. Albertus magnus de secretis mulierum item de virtutibus herbarum lapidum et animalium. 1665.
 Allioni, Carlo. Flora Pedemontana . . . 1785. 3 vols. in 1. 1st edition.
 Alpinus, Prosper. Historia Aegypti naturalis . . . 1735. 2 vols. in 1.
 Belon du Mans, Pierre. De arboribus, coniferis, resiniferis . . . cum earumdem iconibus ad vivum expressis . . . 1553.
 Boccone, Paulo. Icones et descriptiones rariorum plantarum Siciliae, Melitae, Galliae, et Italiae. 1674. Bound with: Sabbati, Liberato. Syn-

- opsis plantarum . . . 1745. Allioni, Carlo. Rariorum Pedemontii stirpium specimen primum. 1755.
- Bonpland, Aimé. Archives inédites. V. 1. Lettres inédites de Alexandre de Humbolt . . . 1914. V. 2. Journal de botanique. 1924.
- Candolle, August P. de. Extrait de l'Astragologia. [1802?] (Manuscript of a portion of his work *Astragologia nempe astragali*.)
- *Astragologia nempe astragali* . . . 1802.
- Clusius, Carolus. Caroli Clusii atreb. aliquot notae in Garviae Aromatum Historiam . . . 1582. (Includes his: *Atrebatibus descriptiones pergrinarum nonnullarum stirpium* . . .)
- *Rariorum aliquot stirpium per Hispanias observatarum historia, libris duobus expressa: ad Maximilianum II Imperatorem*. 1576.
- Commelin, Jan and Kaspar. Horti medici amstelodamensis rariorum tam orientalis . . . 1607-1701. 2 vols. in 1.
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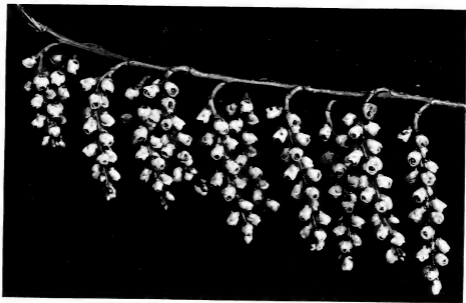


FIG. 17. Spiketail (*Stachyurus praecox*); Inflorescences. Cf. Fig. 16. (6479.)

Autograph Letters

There have been acquired from time to time a number of original letters of famous botanists and scientists which form the nucleus of what promises to become a valuable collection of this kind of material.

One of the most interesting is a letter written by Linnaeus in 1767 in which he introduces a friend and makes a request for various seeds which he needs. A letter by Charles Darwin mentions certain papers soon to be published. An autograph medical prescription signed by Erasmus Darwin bears the date 1794. An address to the Minister of the Interior in 1793, the second year of the French Republic, complains of the non-payment of pensions to members of the Academy of Sciences and is signed by a Committee of the Academy composed of Lavoisier, Laplace, D'Arcet and Bory.

Other letters are by Sir Joseph Hooker, Sir William Hooker, Humboldt, Elias Durand to Asa Gray, several written by Francois Michaux from Paris to Dr. John Francis of New York during the years 1817 to 1820, and one by Thomas Nuthall, dated 1838, in which he refers to "Mr. Gray" and also to his own researches on the *Compositae*.

Recent additions to the collection are letters by Boussingault, Sir Humphrey Davy, Parmentier, who introduced the potato into France, Persoon, an early Dutch mycologist, one by Brongniart, founder of the science of paleobotany, in which he refers to a paper read at the Academy of Sciences, and another by Humboldt inviting his correspondent to his house to make an experiment and asking him to bring a slab of zinc and a silver thread.

These items have been purchased with a special fund provided for that purpose.

Binding

The number of volumes which were bound during 1929 was 1,492 as against 1,105 the previous year. Many of these volumes are larger than the ordinary octavo book and the average cost of binding was approximately \$1.55 per volume. A conservative estimate would place the number of additional volumes that will be ready for binding during 1930 at upwards of 1,000. Eventu-

ally all these publications will have to be bound in order to preserve them and incidentally to make them more convenient to shelve and consult. It is hoped that about a hundred volumes a month can be sent to the bindery regularly, which would be as many as the small library staff could prepare in addition to performing other necessary routine activities.

Inter-library Loans

Thirteen volumes were lent to libraries of the following institutions: American Museum of Natural History, Boyce Thompson Institute, Carnegie Institution of Washington, Columbia University, New York State Library, New York University, Rockefeller Institute, Syracuse University, United States Rubber Company, Vassar College.

Twenty-seven volumes were borrowed for the use of members of the Garden staff from the American Museum of Natural History, Arnold Arboretum, Brooklyn Museum Library, Brooklyn Public Library, Columbia University, Massachusetts Horticultural Society, Medical Society of the County of Kings, Municipal Reference Library, United States Department of Agriculture Library, United States Department of the Interior Library.

Miscellaneous

The contract for new book stacks for the balcony and the second floor of the stack-room has been awarded to the Art Metal Construction Company and it is expected that the stacks will be installed within a few months. This will add approximately 1,400 running feet of shelving and, besides relieving the present very crowded condition, should provide room for expansion for some years to come.

For several years the library has been receiving the printed cards of the "Index Algarum Universalis" and the "Catalog en fiches de la bibliographie technique et agricole tropicale," but has been unable to file them because of lack of catalogue cases. A new sixty-drawer standard cabinet with special finish to match the library furnishings was ordered in November and has recently been received. This will permit the filing of all the accumulated cards, and make them available for consultation.

Perhaps the most important special piece of work for the immediate future is the filling in of gaps in our sets of periodicals and serials. As the result of correspondence with the library of the United States Department of Agriculture regarding a large accumulation of duplicates on its shelves, a want-list of our state agricultural experiment station publications was compiled and forwarded to that library, and it is hoped that many of the numbers which we need to complete files will be secured from that source. A similar want-list of our other periodicals and serials should be made and copies sent to institutions and booksellers to obtain, either by exchange or purchase, as many as possible of the volumes now lacking. A considerable collection of duplicates which have been received in the library from time to time as gifts or in exchange for Brooklyn Botanic Garden publications and are now stored in a basement room could well be utilized for the purpose of exchanging with other libraries, or perhaps could be sold and the proceeds applied to the purchase of other needed books.

It is too early for the present librarian to undertake to outline plans for indexing and bibliographic work which might be undertaken by the library, or to suggest methods of broadening its service to the community. The main task is to continue building up a collection of scholarly works on the foundation that has been so well laid.

Respectfully submitted,

CALVIN W. FOSS,
Librarian.



FIG. 18. Chocolate Tree (*Theobroma cacao*) in bloom in the Conservatories. The flowers are on the older branches and trunk, extending nearly to the ground. September 30. (6895.)

STATISTICAL REPORT ON THE LIBRARY

Accessions

	Volumes	Pamphlets	Parts (Including Periodicals)
Exchange	85	222	3,634
Gift	103	378	1,787
Publication	0	123	338
Purchase	291	786	906
Bindery	1,288	0	0
Deposit	0	0	2
Total	1,767	1,509	6,667

Total number of volumes in library, December 31, 1928

Number of volumes added during 1929

Total number of volumes in library, December 31, 1929

Total number of pamphlets in library, December 31, 1928

Number of pamphlets added during 1929

Total number of pamphlets in library, December 31, 1929

Total number of volumes and pamphlets in library, December 31, 1928

Number of volumes and pamphlets added during 1929

Total number of volumes and pamphlets in library, December 31, 1929

Serials, Periodicals, and Documents

Subscription	110
Gift	82
Exchange	583
Publication	11
Total	786

Cataloguing

Books, Pamphlets, and Serials catalogued	1,890
Total number of cards typewritten and filed	3,126

Printed Cards

Torrey Botanical Club index cards on file, December 31, 1928	38,581
Filed during 1929	1,278
Total, December 31, 1929	40,350

Index Algarum Universalis cards, December 31, 1928	24,419
Number of cards received during 1929	2,521
<hr/>	
Total Index Algarum Universalis cards, December 31, 1929	26,940
Catalogue en fiches de la Bibliographie Technique et Agricole Tropi- cale, Institut Colonial de Marseille, December 31, 1928	3,438
Number of cards received during 1929	1,378
<hr/>	
Total, December 31, 1929	4,816

Miscellaneous

Total recorded use of the library	5,396
Books lent to members of staff	901
Books lent to other institutions	13
Books borrowed from other institutions	27

REPORT OF THE RESIDENT INVESTIGATOR FOR 1929

DR. C. STUART GAGER, DIRECTOR.

Sir: I present herewith my report on educational and related activities for 1929. Report on research in progress will be found under that heading on page 68.

School Service

The *Nephrolepis* collections continue to be of interest and value to local teachers in connection with high school classes studying evolution. Two groups of teachers, during the year, were personally conducted in a survey of the various types of variation. Specimens have been provided for class use in a number of high schools, and the *Leaflet*, "Evolution as illustrated by ferns" has been reprinted, with some slight revision, including the replacement of one of the illustrations by two different pictures. This *Leaflet* article is regularly used as reference reading in high school classes in advanced biology.

Conservation of Native Plants

Under this heading, several lines of activity have been under way. Considerable correspondence has been carried on relating

both to the general program and to the special project which I have been engaged in, for the protection and propagation of the rare Hart's-tongue fern. At Easter time, a visit was made to Syracuse to observe the present status of the Jamesville station for this plant. Photographs were made as a record of the current stage in the destruction of the famous fossil waterfall east of Jamesville, near which a fine colony of the Hart's tongue was formerly located. The old plunge basin has now been turned into a great rock dump.

Assistance was rendered the Syracuse Botanical Club in preparing the introduction of amendments to the State Conservation Law, which, however, did not reach the Governor. A special article, "What should be conserved in New York State?," was written and published in the *Bulletin to the Schools* of the University of the State of New York in the April issue. One of the illustrations was a picture of the unique thatch palm which stands in the east end of the economic greenhouse.

Editorial Work

In the course of the year, numerous letters are received requesting information regarding fern culture, fern identification, fern books, etc., in answering which the facilities of the Garden are called upon. During 1930, the *American Fern Journal* plans to publish a special twentieth anniversary volume of larger size than usual and for which special articles are already assured from representative fern students the world over. From time to time, the writer's activities in the American Fern Society result in the receipt of valuable fern specimens which are turned over for the herbarium or for the greenhouse collections.

Science Education

Under this heading, I have cooperated with Dr. Reed and Dr. Graves in promoting several visits of high school biology teachers to the Garden, and with Dr. Reed in arranging for the distribution of the very valuable genetic collections of cereal specimens which are of special use in the course of advanced biology in the high schools. As a fern student, I was invited to serve as one of the

leaders on the May trip of the Torrey Botanical Club to Branchville. As a member of a committee of the Biology Teachers' Association, I collaborated in the preparation of a "Report on Science Sequence for High Schools" published in *Bulletin of High Points* for September.

As chairman of the Program Committee of the Biology Teachers, I have arranged for seven special programs, including addresses by Drs. A. B. Stout, L. O. Howard, G. N. Calkins, Knight Dunlap, A. E. Wiggam, and others. A program of several years standing, aimed to interest New York high school teachers in national science organizations, was continued by articles in *Bulletin of High Points*, "Keeping in touch with the stream of new science," and in *Science*, "Preaching the gospel of Science." During the years of this activity, over one hundred local teachers have joined the American Association for the Advancement of Science, nearly fifty the Torrey Botanical Club, thirty the American Genetic Association, and several the Ecological Society.

Respectfully submitted,

RALPH W. BENEDICT,
Resident Investigator.

FINANCIAL STATEMENT FOR 1929

I. Tax Budget Accounts

1360 *Personal Service:*

Appropriation	\$ 75,240.00	
Transferred from Miscellaneous New York City 3071 for Adjustments of Personal Service and Expenses in the Various public Libraries and other Institutions (8 months)	1,020.00	\$ 77,160.00
Expended		\$ 77,160.00

1361 *Other Codes than Personal Service:*

Line 1. Fuel Supplies:

Appropriation	\$ 4,200.00
Expended	4,200.00

Line 2	Office Supplies :		
	Appropriation	\$	500.00
	Expended		500.00
<hr/>			
Line 3	Laundry, Cleaning and Disinfecting Supplies :		
	Appropriation	\$	80.00
	Expended		80.00
<hr/>			
Line 4	Botanical and Agricultural Supplies :		
	Appropriation	\$	1,500.00
	Transferred from Miscellaneous New York City 3071 for Adjustment of Personal Service and Expenses in the Various Public Libraries and other Institutions	200.00	
	Transferred from Board of Child Wel- fare 2004 Fixed Charges and Contri- butions	1,500.00	\$ 3,200.00
	Expended		3,200.00
<hr/>			
Line 5	General Plant Supplies :		
	Appropriation	\$	350.00
	Expended		350.00
<hr/>			
Line 6	Wearing Apparel :		
	Appropriation	\$	40.00
	Expended		40.00
<hr/>			
Line 7	Office Equipment :		
	Appropriation	\$	200.00
	Expended		200.00
<hr/>			
Line 8	General Plant Equipment :		
	Appropriation	\$	1,350.00
	Transferred from Miscellaneous New York City 3071 for Adjustment of Personal Service and Expenses in the Various Public Libraries and other Institutions	1,000.00	\$ 2,350.00
	Expended		2,350.00
<hr/>			

Line 9	General Plant Materials:		
	Appropriation	\$ 1,750.00	
	Transferred from Miscellaneous New York City 3071 for Adjustment of Personal Service and Expenses in the Various Public Libraries and other Institutions	600.00	\$ 2,350.00
	Expended		<u>2,350.00</u>
Line 10	Repairs and Replacements:		
	Appropriation	\$ 4,000.00	
	Transferred from Miscellaneous New York City 3071 for Adjustment of Personal Service and Expenses in the Various Public Libraries and other Institutions	1,000.00	\$ 5,000.00
	Expended		<u>5,000.00</u>
Line 11	Light, Heat and Power:		
	Appropriation	\$ 400.00	
	Transferred from Board of Child Wel- fare 2004 Fixed Charges and Contri- butions	115.00	\$ 515.00
	Expended		<u>515.00</u>
Line 12	Telephone Service:		
	Appropriation	\$ 375.00	
	Transferred from Board of Child Wel- fare 2004 Fixed Charges and Contri- butions	50.00	\$ 425.00
	Expended		<u>425.00</u>
Line 13	Carfares:		
	Appropriation	\$ 60.00	
	Expended		<u>60.00</u>
Line 14	Expressage and Deliveries:		
	Appropriation	\$ 300.00	
	Transferred from Board of Child Wel- fare 2004 Fixed Charges and Contri- butions	45.00	\$ 345.00
	Expended		<u>345.00</u>

Line 15	General Plant Service:		
	Appropriation	\$	500.00
	Expended		<u>500.00</u>

Line 16	Contingencies:		
	Appropriation	\$	100.00
	Expended		<u>100.00</u>

Summary of Tax Budget Accounts:

Appropriated			
Personal Service			
	Original Appropriation	\$	75,240.00
	Supplemental (by transfers)	1,020.00	\$ 77,160.00
<hr/>			
Other Codes			
	Original Appropriation	\$	15,705.00
	Supplemental (by transfers)	4,510.00	20,215.00
<hr/>			
	Total	\$	97,375.00
	Expended		<u>97,375.00</u>

II. Private Funds Accounts

1. *Endowment Fund (\$50,500.00) Restricted* in Part:*

Income Account:			
	Income 1929	\$	2,777.48
	Transferred to Endowment Increment Fund \$	555.50	
	Transferred to Special Contributions	2,221.98	2,777.48
<hr/>			
		\$	0.00

2. *Life Membership Fund (\$6,500.00) Restricted:*

Income Account:			
	Income	\$	357.48
	Transferred to Endowment Increment Fund \$	71.50	
	Transferred to Annual Membership Account	285.98	357.48
<hr/>			
		\$	0.00

3. *George C. Brackett Library Fund (\$500.00) Restricted:*

Income Account:			
	Balance, January 1, 1929	\$	29.50
	Income 1929	27.48	\$ 57.07
<hr/>			
	Expended	\$	45.36
	Transferred to Endowment Increment Fund	5.50	50.86
<hr/>			
	Balance, December 31, 1929	\$	6.21

* Restricted funds are those limited, by terms of gift, bequest, or solicitation, to the scientific and educational work of the Garden.

4. <i>Benjamin Stuart Gager Memorial Fund (\$13,417.20) Restricted:</i>			
Income Account:			
Balance, January 1, 1929	\$	52.32	
Income 1929		737.92	
Sale of Duplicate Books		40.00	
Transferred from Annual Membership ...		226.21	\$ 1,056.45
<hr/>			
Expended	\$	908.87	
Transferred to Endowment Increment Fund		147.58	1,056.45
<hr/>			
	\$		0.00
5. <i>Murtha Woodward Stutzer Memorial Fund (\$10,000.00) Restricted:</i>			
Income Account:			
Balance, January 1, 1929	\$	706.62	
Income 1929		550.00	\$ 1,256.62
<hr/>			
Expended	\$	686.81	
Transferred to Endowment Increment Fund		110.00	796.81
<hr/>			
Balance, December 31, 1929	\$		459.81
6. <i>Mary Bates Spalding Fund (\$2,697.00) Restricted:</i>			
Income Account:			
Balance, January 1, 1929	\$	98.38	
Income 1929		148.32	\$ 246.70
<hr/>			
Expended	\$	200.00	
Transferred to Endowment Increment Fund		29.66	229.66
<hr/>			
Balance, December 31, 1929	\$		17.04
7. <i>Special Account W. (\$243,149.27) Restricted:</i>			
Income Account:			
Balance, January 1, 1929	\$	315.54	
Income 1929		13,373.20	\$ 13,688.74
<hr/>			
Expended	\$	170.75	
Transferred to Endowment Increment Fund		2,674.64	
Transferred to Special Contributions		10,500.00	13,345.39
<hr/>			
Balance, December 31, 1929	\$		343.35
8. <i>A. Augustus Healy Bequest (\$9,798.31) Restricted:</i>			
Income Account:			
Income 1929	\$	538.88	
Transferred to Endowment Increment Fund	\$	107.78	
Transferred to Special Contributions		431.10	538.88
<hr/>			
	\$		0.00

9. *Robert B. Woodward Bequest (\$25,000.00) Restricted:*

Income Account:		
Income 1929		\$ 1,375.00
Transferred to Endowment Increment Fund	\$ 275.00	
Transferred to Special Contributions	1,100.00	1,375.00
		<hr/>
		\$ 0.00

10. *Alfred T. White Memorial Tablet Fund (\$3,889.85) Restricted:*

Income Account:		
Income 1929		\$ 213.92
Expended	\$ 20.79	
Transferred to Endowment Increment Fund	42.78	
Transferred to Special Contributions	150.35	213.92
		<hr/>
		\$ 0.00

11. *Brooklyn Institute Centennial Fund B. B. G. Share (\$30,000.00) Restricted:*

Income Account:		
Income 1929		\$ 1,650.00
Transferred to Endowment Increment Fund	\$ 330.00	
Transferred to Special Contributions	1,320.00	1,650.00
		<hr/>
		\$ 0.00

12. *John D. Rockefeller, Jr., Fund (\$250,000.00) Restricted:*

Income Account:		
Balance, January 1, 1929	\$ 2,736.88	
Income 1929	13,750.00	\$ 16,486.88
		<hr/>
Expended	\$ 1,919.73	
Transferred to Endowment Increment Fund	2,750.00	
Transferred to Special Contributions	7,500.00	
Transferred to special Purposes (Miscel.).	300.00	12,469.73
		<hr/>
Balance, December 31, 1929		\$ 4,017.15

13. *Citizen Endowment Fund (\$253,929.26) Restricted:*

Income Account:		
Income 1929		\$ 13,966.10
Transferred to Endowment Increment Fund	\$ 2,793.22	
Transferred to Special Contributions	11,172.88	13,966.10
		<hr/>
		\$ 0.00

14. *Sustaining Membership. Restricted:*

Balance, January 1, 1929	\$	16.66	
Received from dues		574.79	\$ 591.45
			<hr/>
Transferred to Annual Membership Account			566.46
			<hr/>
Balance, December 31, 1929	\$		24.99

15. *Annual Membership. Restricted:*

Balance, January 1, 1929	\$	2,765.61	
Received from dues 1929		6,700.00	
Transferred from Life Memb. Acct.		285.98	
Transferred from Sustaining Memb. Acct. ..		566.46	\$ 10,318.05
			<hr/>
Expended	\$	5,882.72	
Transferred to Special Contributions		1,620.00	
Transferred to Benjamin Stuart Gager Memorial Fund		226.21	7,728.93
			<hr/>
Balance, December 31, 1929	\$		2,589.12

16. *Tuition and Sales. Restricted:*

Balance, January 1, 1929	\$	1,100.80	
Received 1929			
a. Tuitions		2,505.05	
b. Seed Packets		7,053.07	
c. Sales		265.78	
d. Miscellaneous		92.04	\$ 11,017.64
			<hr/>
Expended	\$	6,228.45	
Transferred to Endowment Increment Fund		1,942.16	
Transferred to Special Contributions		2,000.00	10,170.61
			<hr/>
Balance, December 31, 1929	\$		1,747.03

17. *Botanic Garden Collections Fund 1929. Restricted:*

Balance, January 1, 1929	\$	3,283.33	
Received from Contributions		7,352.00	
Transferred from Special Purposes (Garden Seats)		196.02	
Miscellaneous		176.18	\$ 11,007.53
			<hr/>
Expended	\$	9,126.81	
Transferred to Special Contributions		1,170.00	10,296.81
			<hr/>
Balance, December 31, 1929	\$		710.72

18. *Special Fund (Brooklyn Institute General Endowment Income: Annual Allotment) Restricted:*

Income Account	
Income 1929	\$ 995.00
Transferred to Special Contributions	995.00
	\$ 0.00

19. *Cary Library Fund (\$10,000.00—1/5 of Income to Brooklyn Botanic Garden) Restricted:*

Balance, January 1, 1929	\$ 160.27	
Income Allotment 1929	110.00	\$ 270.27
Expended	\$ 233.68	
Transferred to Endowment Increment Fund	22.00	255.68
Balance, December 31, 1929	\$	14.59

20. *Special Purposes. Restricted by Terms of Gifts:*

Balance, January 1, 1929	\$ 2,035.61	
Received:		
a. Anonymous for Japanese Garden	1,575.00	
b. Various for Japanese Iris Test Garden..	785.00	
c. Special Gifts for Children's Work	88.00	
d. Bubbler Drinking Fountain	30.00	
e. Bird Bath	100.00	
f. Garden Seats	1,817.66	
g. Richard Young Gate	17,000.00	
h. Truvision Beaded Screen	130.00	
i. Jenkins Bridges (2)	2,456.63	
j. For Planting at Alfred T. White Memorial	668.75	
k. Miscellaneous	387.60	\$ 27,074.25
Expended	\$ 15,719.96	
Transferred to Collections Fund	196.02	15,915.98
Balance, December 31, 1929	\$	11,158.27

21. *Plant Pathology Research Fmd. Restricted:*

Balance, January 1, 1929	\$ 2,756.61	
Income 1929	5,000.00	\$ 7,756.61
Expended	\$ 1,414.18	
Transferred to Special Contributions	5,421.50	6,835.68
Balance, December 31, 1929	\$	920.93

22. <i>Special Contributions (for 1929 only). Restricted:</i>		
Balance, January 1, 1929	\$	763.28
Anonymous		3,050.00
Transferred from		
Endowment Fund Income Account		2,221.98
Special Account W. Income Account		10,500.00
A. Augustus Healy Bequest Income Account		431.10
R. B. Woodward Bequest Income Account		1,100.00
A. T. White Memorial Tablet Fund Inc. Account		150.35
Brooklyn Inst. Centennial Fund Inc. Acct. ...		1,320.00
J. D. Rockefeller, Jr., Fund Income Ac- count		7,500.00
Citizens Endowment Fund Income Account		11,172.88
Annual Membership Account		1,620.00
Tuition and Sales		2,000.00
Collections Fund		1,170.00
Special Fund (Inst. General Endowment) ..		905.00
Plant Pathology Research Fund		5,421.50
		<u>\$ 49,416.09</u>
Expended		47,865.15
		<u> \$ 1,550.94</u>
23. <i>Endowment Increment Fund (\$75,613.05) Restricted:</i>		
Transferred from other accounts 1929	\$	11,857.32
Interest 1929		3,482.08
		<u>\$ 15,339.40</u>
Transferred to Principal		15,339.40
		<u> \$ 0.00</u>
<i>Summary of Private Funds Accounts:</i>		
Balances, January 1, 1929	\$	16,821.50
Income 1929		112,501.31
		<u>\$129,322.81</u>
Expended	\$	90,423.26
Transferred to Endowment Increment Fund		
Principal		15,339.40
		<u>105,762.66</u>
Balances, December 31, 1929	\$	23,560.15

III. Summary of Total Maintenance Budget for 1929

<i>Income</i>		
Tax Budget Appropriation 42.9%	\$	97,375.00
Private Funds Budget 57.1%		129,322.81
		<u> \$226,697.81</u>
Total		226,697.81
Transferred to Endowment Increment Fund Principal ..		15,339.40
		<u> \$211,358.41</u>
<i>Available</i>		\$211,358.41

Expended

Personal Service

Tax Budget \$ 77,160.00

Private Funds 47,865.15

Total \$125,025.15

Other than Personal Service

Tax Budget \$ 20,215.00

Private Funds 42,558.11

Total \$ 62,773.11 \$187,798.26

Balance, December 31, 1929 \$ 23,560.15

Respectfully submitted,

DANIEL C. DOWNS,

Secretary and Accountant.

Note:—The above "Financial Statement" is a transcript of Brooklyn Botanic Garden accounts in the books of the Treasurer of the Brooklyn Institute of Arts and Sciences. The Treasurer's accounts are audited annually by a Public Accountant, and a separate audit of this "Financial Statement" is not made in order to save unnecessary expense.

G. FOSTER SMITH,

*Treasurer.***IV. Tax Notes for Permanent Improvements**

N.D.P. 212Q—Completion of improvement of Plaza of Brooklyn Botanic Garden, including construction of underground storage room for tools and bulbs. (Including Architects Fees.)

Appropriation \$ 21,000.00

Contracts awarded

Architects Fees \$ 210.00

" " 1,255.12 1,465.12

Balance \$ 19,534.88

N.D.P. 212R—Completion of Metal Stacks in Library Rooms and Herbarium Cases and mezzanine floor in Herbarium Room, Brooklyn Botanic Garden

Appropriation	\$	9,425.00
Contracts awarded		
New cabinets and fabrication of cases	\$	5,957.00
New stacks	3,426.23	9,383.23
Balance	\$	41.77

Certified as correct,

EDWARD S. RYAN, *Chief Clerk,*
Department of Parks, Borough of Brooklyn.

APPENDIX 1

GIFTS RECEIVED DURING 1929

Collections Fund

Miss E. Addie Austin	Mrs. Whitney Merrill
Frank L. Babbott	Horace J. Morse
Mrs. Armin E. Brunn	Mrs. Grace Pullman Perkins
Mrs. Paul Bucher	Miss Julia J. Pierrepont
John J. Clark	George D. Pratt
Walter H. Crittenden	William A. Putnam
Mrs. John R. Defafield	Mrs. William A. Putnam
Dugan Brothers	Miss Lillian Sanger
Otto Ebel	Herbert S. Smith
Walter Ebel	Mrs. Daniel McL. Somers
Miss Adele F. Emerson	Miss M. Louise Spring
Gates D. Fahnestock	Dr. Edward H. Squabb
Mrs. Lewis W. Francis	Mrs. Seth Thayer Stewart
John W. Frothingham	Miss Elise W. Stutzer
Mrs. A. Augustus Healy	Herman Stutzer
Mrs. William T. Hunter	Mrs. Herman Stutzer
Miss C. Julie Husson	"C. W."
Edward A. Ingraham	Miss Frances E. White
Alfred W. Jenkins	Harold T. White
Miss Hilda Loines	Miss Harriet H. White
William G. Low	Miss Mary Blackburne Woodward
Mrs. F. D. MacKay	Women of "76" chapter, D. A. R.
William J. Matheson	

Living Plants

- Mr. A. T. Beals, 4 specimens, Hart's Tongue Fern (*Scolopendrium vulgare*).
 Bobbink and Atkins, 192 Roses, representing 52 varieties; 50 *Hibiscus Moschentos*.
 The Conard-Pyle Co., 240 Roses, representing 42 varieties.
 Boyce Thompson Southwestern Arboretum (through Mr. F. J. Crider), 1
Opuntia discata, 1 *Opuntia laevis*, 2 *Opuntia* "Burbank Hybrid," 3
Opuntia mamillata.
 Mrs. J. W. Draper, 36 Mandrake roots (*Podophyllum peltatum*).

- Henry A. Dreer, 17 Roses, representing 9 varieties.
 Miss R. W. Erlanson, 25 Roses, representing 10 varieties.
 The Hawaii Experimental Station, 1 *Canna edulis*.
 Miss Jane Hoagland, 7 *Asimina triloba*.
 Harlan P. Kelsey, 2 *Chrysanthemum corcanum*, 1 *Malus Bechteli*.
 Mr. A. L. Miller, 1 *Styrax Obassia*.
 The New York Botanical Garden, 3 *Pereskia aculeata*, 3 *Pereskia Bleo*.
 The New Brunswick Nurseries, 29 Roses, representing 19 varieties.
 Miss Marguerite Nightingale, 2 *Aster tardiflorus*.
 Mr. Edward C. A. Olson, 2 *Haemanthus albiflos*.
 Mr. Edward M. Powers, 1 Rose.
 Mrs. William A. Putnam, 1 *Cibotium Schiedei*.
 Mr. E. C. Robbins, 1 *Abies Fraseri*.
 The Rose Farms, 18 Roses, representing 3 varieties.
 Mrs. C. L. Tanner, 2 Cactus plants.
 Miss Venetia C. Taylor, 25 *Sarracenia purpurea*.

Seeds

- | | |
|-------------------------------|--------------------------|
| Dr. Frank L. Babbott, Jr. (5) | Dr. I. S. Kleiner (1) |
| Dr. A. F. Blakeslee (5) | Dr. Robert T. Morris (1) |
| Mr. Lorentz Cantor (6) | Mrs. E. Root (1) |
| Miss Margaret Cranford (1) | Mr. Alfred B. Sims (2) |
| Mrs. Catherine W. Deacon (1) | Miss Alys Sutcliffe (4) |
| Mr. G. W. Dubois (1) | Mr. E. N. Walther (1) |
| Mr. E. E. Edwards (1) | |

Phanerogamic Herbarium

- Dr. J. A. Drushel, 11 specimens.
 Mr. William C. Ferguson, 4 specimens from L. I.
 Miss E. M. Kittredge, 25 specimens from Vermont.
 Mr. Roy Latham, 23 specimens from L. I.
 Miss Ella C. Rowell, 1 specimen.
 Mrs. Adrian Van Sinderen, 243 specimens from Alaska.

Cryptogamic Herbarium

- Mr. Joseph C. Adams, 84 specimens from Woods Hole.
 Mr. A. T. Beals, 40 specimens.
 Children's Museum, Brooklyn, 143 specimens.
 Mr. D. Demaree, 40 specimens.
 Mr. Harold G. Rugg, 3 specimens.

Iris Project*Special Fund*

American Iris Society	\$200.00	
Mrs. Wheeler H. Peckham	50.00	\$ 250.00

For Expedition to Japan

Mrs. Wheeler H. Peckham	\$100.00	
H. F. duPont	100.00	
Bobbinck and Atkins	100.00	
John Scheepers	100.00	
Albert C. Burrage	100.00	
Robert Wayman	25.00	
John H. Love	10.00	535.00

\$ 785.00

Plants

Gifts of Plants for the Iris Project are listed on page 61.

For Garden Seats

Dr. and Mrs. Charles G. Purdy	\$ 150.00
Garden Teachers Association, Brooklyn Botanic Garden	150.00
Mr. and Mrs. Edward C. Blum	300.00
Alfred W. Jenkins	1,217.66

\$ 1,817.66

Richard Young Gate

Hon. Richard Young	\$17,000.00
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Jenkins Boulder Bridges (2)

Alfred W. Jenkins	\$ 2,456.63
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Japanese Garden

Anonymous	\$ 1,575.00
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Special Gifts for Children's Work

Gates D. Fahnestock	\$ 25.00
Woman's Auxiliary of Brooklyn Botanic Garden	100.00
Brooklyn Heights Seminary	10.00
Miss Ellen Eddy Shaw	3.00

Miscellaneous

Mrs. Adrian Van Sinderen, for planting in immediate vicinity of the Alfred T. White Memorial	\$268.75
Miss Frances E. White, ditto	200.00
Miss Harriet H. White, ditto	200.00
	\$668.75
Mrs. William H. Childs, for Truvison Beaded Screen ...	130.00
Miss Alice A. Driggs, for Bird Bath	100.00
Anonymous, for Purchase of Clock	24.00
Ansel J. Brower, for Rhododendron Seed	15.00
Mrs. Adrian Van Sinderen, for Herbarium Specimens ...	48.60

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- Mr. A. T. Beals, 1 photograph of *Habenaria ciliaris*.
 Mr. Albert C. Burrage, Certificate conferring on Brooklyn Botanic Garden all rights and privileges to construct on its premises a revolving greenhouse after specification of his Letters Patent of the United States, No. 1703388, February 26, 1929.
 Mr. F. W. Chaundy (of Dulau & Co. Ltd., London), 1 original print of James Benwell, in the Physic Garden, Oxford, England.
 Dayton Milling Co., 1 ton buckwheat hulls for mulching.
 Mr. Guy DuVal, 1 airplane photograph of Brooklyn Botanic Garden, Los Angeles (California) Chamber of Commerce, 21 photographs.
 Mr. Samuel Kay Roller, 1 photograph of his painting of Water Hyacinth (*Eichornia crassipes*) in natural habitat.
 Mr. Walter T. Swingle, 1 photograph, 8 x 10 inches, of Date Palm in fruit.
 Woman's Auxiliary, Brooklyn Botanic Garden, 3 brass samovars.
 Woman's Auxiliary, B. B. G. and other friends (anonymous), 1 picture map of the Brooklyn Botanic Garden.

Library

Books

Hon. Loring M. Black, Brooklyn, N. Y.	1
Messrs. P. Blakiston's Sons & Company, Philadelphia, Pa.	2
Brooklyn Institute of Arts & Sciences, Brooklyn, N. Y.	1
Brooklyn Museum Library, Brooklyn, N. Y.	14
Mrs. G. Stewart Brown, Brooklyn, N. Y.	1
Carnegie Institution of Washington, Washington, D. C.	2
The John Day Company, New York, N. Y.	1
The A. T. De La Mare Company, Inc., New York, N. Y.	4
Miss Louise Dreyer & Mr. Charles Dreyer, Brooklyn, N. Y.	3
Dr. C. Stuart Gager, Brooklyn, N. Y.	14
Miss Prudence Gager, Brooklyn, N. Y.	1

Mrs. Catherine Ihnen, Brooklyn, N. Y.	2
Miss Mabel Keep, New York, N. Y.	1
Miss Sophie L. Lauffer, F. R. P. S., Brooklyn, N. Y.	1
Dr. Albert Lemée, Brest, Finisterre	1
Miss Hilda Loines, Brooklyn, N. Y.	1
The Macmillan Company, New York, N. Y.	14
Dr. E. D. Merrill, New York Botanical Garden	1
Marquis Nabeshima, Tokyo, Japan	1
New York State Conservation Department, Albany, N. Y.	1
New York Zoological Park	1
The Orange Judd Publishing Company, New York, N. Y.	7
Dr. Vilho A. Pesola, Tikkurila, Finland	1
Public School 162, Brooklyn, N. Y.	4
Messrs. G. P. Putnam's Sons, New York, N. Y.	3
Hon. William C. Redfield, Brooklyn, N. Y.	1
Miss Elken Eddy Shaw, Brooklyn, N. Y.	7
The Frederick A. Stokes Company, New York, N. Y.	1
Third British Empire Forestry Conference, Canberra, Australia	1
Miss Doris Thruelsen, East Orange, N. J.	1
Miss Harriet H. White, Brooklyn, N. Y.	2
Hon. Richard Young, Brooklyn, N. Y.	1
Total	97

MANUSCRIPTS

Miss Martha E. Foulk, New York, N. Y.	2
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PAMPHLETS

Mr. Charles C. Adams, New York State Museum, Albany, N. Y.	2
Africa. Kenya Colony Protectorate, Forest Department	1
American Telephone & Telegraph Company, Statisticians Division, New York, N. Y.	1
Prof. Oakes Ames, Cambridge, Mass.	1
Mr. Ernst Antevs, New York, N. Y.	1
Prof. Howard J. Banker, Cold Spring Harbor, Long Island	1
Mr. A. H. M. Barrington, Rangoon, Burma, India	2
Dr. Ralph Curtiss Benedict, Brooklyn, N. Y.	5
Mr. Henry Bird, Rye, N. Y.	1
Botanical Institute, Department of Science, Imperial University, Kyoto, Japan	2
Mr. Richard R. Bowker, New York, N. Y.	1
British Association for the Advancement of Science, London, England	3
Mrs. N. L. Britton, New York Botanical Garden	4
Brooklyn Museum Library, Brooklyn, N. Y.	1
Dr. S. C. Brooks, University of California, Berkeley, Cal.	8
Mrs. S. B. Bryant, Rancho Santa Ana, Cal.	1

Carnegie Institution of Washington, Washington, D. C.	12
Carnegie Institution of Washington, Department of Genetics, Cold Spring Harbor, Long Island	7
Mr. L. Charles Clark, Bradford, Yorks, England	1
Dr. Leonard Cockayne, Ngaio, Wellington, New Zealand	1
Dr. Charles Drechsler, U. S. Department of Agriculture, Washington, D. C.	1
Miss E. W. Erlanson, University of Michigan, Ann Arbor, Mich.	2
Florida State Geological Survey, Tallahassee, Fla.	1
Forest Experiment Station, Department of Agriculture & Forestry, Meguro, Tokyo, Japan	1
Prof. George D. Fuller, University of Chicago, Chicago, Ill.	1
Dr. C. Stuart Gager, Brooklyn, N. Y.	37
Prof. R. Ruggles Gates, University of London, London, England	1
Dr. S. W. Geiser, Southern Methodist University, Dallas, Texas	1
M. P.-A. Genty, Jardin Botanique de Dijon, France	1
Dr. Arthur H. Graves, Brooklyn, N. Y.	1
Prof. S. Ikeno, Komaba, Tokyo, Japan	4
Dr. S. O. Illitchevsky, Poltava, U. S. S. R.	1
Iowa State College, Ames, Iowa	6
Kellogg Bird Sanctuary, Battle Creek, Mich.	1
Dr. J. Horace McFarland, Harrisburg, Pa.	2
Miss Ines Mexia, University of California, Berkeley, Cal.	1
Municipal Art Society of New York	1
Dr. G. E. Nichols, Osborn Botanical Laboratory, Yale University, New Haven, Conn.	1
Dr. L. V. Pammel, Iowa State College, Ames, Iowa	2
Department of Plant Pathology, Agricultural College, Ithaca, N. Y. ...	10
Mr. G. A. Plimpton, New York, N. Y.	1
Roger Williams Park, Park Museum, Providence, Rhode Island	1
Miss Edith R. Saunders	3
Prof. Dr. Hans Schinz, Botanisches Garten, Zürich, Switzerland	4
Mr. Harlan I. Smith, Kitwanga, British Columbia, Canada	1
Dr. C. van Steenis, Buitenzorg, Java	3
Dr. J. Valkenier Suringar, Wageningen, Holland	13
Dr. Walter T. Swingle, U. S. Department of Agriculture, Washington, D. C.	1
Mr. Norman Taylor, Brooklyn, N. Y.	2
Third British Empire Forestry Conference, Canberra, Australia	3
The Town Hall, New York, N. Y.	1
U. S. Forest Service, Forest Products Laboratory, Madison, Wis.	13
Miss Maude E. Voris, Brooklyn, N. Y.	1
Dr. E. E. Watson, Michigan State College, East Lansing, Mich.	1
Mr. Aaron Webber, Garfield Park Conservatory, West Chicago, Ill.	1
Dr. Hermann Zillig, Berncastel-Cues/Mosel, Germany	2
Total	233

PARTS OF PUBLICATIONS

(Exclusive of Government Documents)

American Association for the Planting & Preservation of City Trees	1
American Eagle, Estero, Fla.	60
American Horticultural Society, Washington, D. C.	1
American Museum of Natural History, New York, N. Y.	1
Miss E. Addie Austin, Brooklyn, N. Y.	2
Barro Colorado Island Biological Station, Panama Canal Zone	1
Dr. Ralph Curtiss Benedict, Brooklyn, N. Y.	4
Brooklyn Chamber of Commerce, Brooklyn, N. Y.	1
Brooklyn Institute, Children's Museum	1
Brooklyn Museum Library, Brooklyn, N. Y.	164
Mrs. Glenworth Butler, Brooklyn, N. Y.	1
Canal Zone Plant Introduction Gardens, Sumit, Canal Zone	1
Committee on the Relation of Electricity to Agriculture, Chicago, Ill.	2
The Commonwealth Fund, New York, N. Y.	1
Mr. Harry F. Dietz, Indiana Conservation Department, Indianapolis, Ind.	1
The Explorers' Club, New York, N. Y.	1
Federated Garden Clubs of New York State	1
Federation of Shade Tree Commissions, Kearney, N. J.	1
Mr. Montague Free, Brooklyn, N. Y.	12
Dr. C. Stuart Gager, Brooklyn, N. Y.	127
Miss Elsie M. Kittridge, North Ferrisburg, Vt.	1
Massachusetts Institute of Technology, Cambridge, Mass.	1
National Plant, Flower & Fruit Guild, New York, N. Y.	3
National Shade Tree Conference	2
National Society, Children of the American Revolution, Washington, D. C.	4
New York Academy of Sciences, New York, N. Y.	35
New York City Department of Health	52
New York State Conservation Department, Albany, N. Y.	1
L'Institut Oinose de recherches agronomique et biologique, Simo-omi, Japan	1
Philadelphia Academy of Natural Sciences, Philadelphia, Pa.	54
Port of New York Authority	1
School Garden Association of New York	8
Mrs. Annie Morrill Smith, Bronxville, N. Y.	2
Toboku Imperial University, Sendai, Japan	1
U. S. Department of Agriculture Library, Washington, D. C.	131
Mr. J. E. Weaver, Lincoln, Neb.	1
Wild Flower Preservation Society, Washington, D. C.	4
Woman's National Farm and Garden Association, New York, N. Y.	10
World Peace Foundation, Boston, Mass.	1
Total	697

PORTRAITS

Dr. Ralph Curtiss Benedict, Brooklyn, N. Y.	2
Dr. N. L. Britton, New York Botanical Garden	1
Prof. Stanley Coulter, Purdue University, Lafayette, Ind.	1
Dr. Adolph Engler, Botanisches Garten, Berlin-Dahlem, Germany	1
Dr. Francis E. Lloyd	1
Prof. C. Sauvageau, Bordeaux, France	2
Prof. Dr. Hans Schinz, Botanisches Garten, Zürich, Switzerland	2
Miss Ellen Eddy Shaw, Brooklyn, N. Y.	1
Total	11

MISCELLANEOUS

- Dr. C. Stuart Gager. Facsimile of an engrossed scroll presented to Theodore Augustus Havemeyer by the Horticultural Society of New York, March 11, 1929.

For the Department of Elementary Instruction

- Bartlett, Mr. H. Noble, Six outline maps of the children's gardens and borders.
- Bartlett, Mrs. Homer L., Forty-one plants for the children's garden.
- Bartlett, Mrs. L. Hall, One pottery fern dish for the children's club room.
- Blakiston's Son & Company, P., Two books for the children's club room library.
- Blatt, Miss Natalie, \$1.00 for the children's club room.
- Brooklyn Heights Seminary Club, \$10.00 for the children's work.
- Brown, Mrs. George Stewart, One book for the children's club room library.
- Butler, Mrs. Glentworth R., One prize cup competed for by the girls in the outdoor garden. Two books for children's club room library.
- Coca Cola Company, One thousand sets of tree picture cards.
- Dole, Mrs. Howard, Two plants for the children's garden.
- Driggs, Miss Alice, One prize book for the child who showed the greatest interest in the flowers in the outdoor garden.
- Flatbush Garden League (through Mrs. E. L. Carson), Prize book for the greatest improvement made by a first year child in the outdoor garden.
- Gager, Miss Prudence, One book for the children's club room library.
- Garden Teachers' Association, One prize cup competed for by the boys in the outdoor garden.
- Hogg, Mrs. L. W., Two cameras as prizes for children's garden work.
- Hyde, Mrs. Clarence R., One year's subscription to the Nature Magazine for the children's club room library.
- Jones, Mrs. I. T., One geranium for the instruction greenhouses.
- Lingnan University Trustees, Specimens of cocoons and raw silk for the children's work.

- Loines, Miss Hilda, One book for the children's club room library.
 Magalhaes, Miss Helen, Milkweed pods for the children's work.
 Marshall, Mrs. William W., \$5.50 for the children's club room library.
 Mothers' Club, P. S. 217, \$5.00 for the children's club room.
 Platt, Miss Sally, \$1.50 for the children's club room.
 Public School 162, \$5.00 for books for the children's club room library.
 Raymond, Mrs. Ralph, One plant of Baby Rose for the instruction greenhouses.
 Redfield, Hon. William C., One book for the children's club room library.
 Sargent, Miss Zelda J., One book for the children's garden library.
 Shaw, Miss Agnes M., One set of model English farm toys for the children's club room.
 Shaw, Miss Ellen Eddy, Six books for the children's club room library.
 Shaw, Miss Ellen Eddy, Two gold honor pins for honorable service in the outdoor garden.
 Thruelsen, Miss Doris, One book for the children's club room library.
 Woman's Auxiliary of the Brooklyn Botanic Garden, \$50.00 toward the publication of the children's booklist.
 Woman's Auxiliary of the Brooklyn Botanic Garden, \$50.00 for the children's work.
 Woodwork Class of Public School 90, Greenhouse implements for the instruction greenhouses.

Professional Services

- Mr. Y. T. Sathaki, in the care of the Botanic Garden's collection of dwarf Japanese trees.

APPENDIX 2

PUBLICATIONS OF MEMBERS OF STAFF DURING 1929

Bartlett, Kathryn Clark

- When the flowers move indoors. *Your Home*. July.
 List of books on gardening and botanical nature study. *Brooklyn Botanic Garden*. December.

Benedict, Ralph C.

- Who was Petri? *Torrey's* 29: 9-12. January-February.
 Keeping in Touch with the Stream of New Scientific Work.
Bull. of High Points 11: 29-33. March.
 What should be conserved in New York State? *The Univ. of the State of New York, Bull. to the Schools* 15: 194-196.
 April 15.

- Cabbages and Cacti. *Torreya* 29: 53-58. May-June.
 Fern Hunting at Branchville. *Torreya* 29: 108-110. July-August.
 Afield for Ferns in Sussex County, New Jersey. *Amer. Fern Jour.* 19: 105-108. July-September.
 Preaching the Gospel of Science. *Science* 70: 368-371. October 18.
 A Genetic Analysis of Variation in the Hart's Tongue (Review). *Amer. Fern Jour.* 19: 129-133. October-December.
 Evolution as Illustrated by Ferns. *Brooklyn Bot. Gard. Leaflets* XVII². November 6.
 Report of Committee on Science Sequence for High Schools, with Paul B. Mann and Elsbeth Kroeber. *Bull. of High Points*. September.

Free, Montague

- Eighteenth Annual Report of the Brooklyn Botanic Garden. Report of the Horticulturist. *Brooklyn Bot. Gard. Rec.* 18: 71-75. March.

Gager, C. Stuart

- Annual report of the Brooklyn Botanic Garden, 1928. Report of the Director. *Brooklyn Bot. Gard. Rec.* 18: 17-50. March.
 Aeration of tree roots. *The Shade Tree* 2: 2-3. May.
 Gardens within a garden: A general guide to the grounds of the Brooklyn Botanic Garden. Guide No. 2, *Brooklyn Bot. Gard. Rec.* 18: 153-188. May.
 Public education at the Brooklyn Botanic Garden. *Brooklyn Bot. Gard. Rec.* 18: 189-264. July.
 Botanic Garden. *Encyclopaedia Britannica* 3: 942-944. September.
 Dr. Britton and the New York Botanical Garden. *Sci. Mo.* 29: 475-477. November.
 Botany serving the public. *Proc. Ohio State Educational Conference. Ninth Ann. Session.* November.

Graves, Arthur Harmount

- Report of work in forest pathology for 1928. *Brooklyn Bot. Gard. Rec.* 18: 57-59. March.

Report of the Curator of Public Instruction for 1928. *Brooklyn Bot. Gard. Rec.* **18**: 75-90. March.

Forms and functions of stems. *Brooklyn Bot. Gard. Leaflets* **XVII**⁸⁻¹²: 1-16. November 27.

50 newspaper articles relating to the Brooklyn Botanic Garden, 7 abstracts in *Biological Abstracts*.

Graves, Arthur Harmount, and Hester M. Rusk

The distinguishing characteristics of the woody plants of Greater New York, including the kinds most commonly seen in cultivation. 38 pp. *Mimeographed*. May.

Gundersen, Alfred

Delectus Seminum (with Mr. Montague Free), 1929. (Seed List.) *Brooklyn Bot. Gard. Rec.* **18**: 1-16. January.

International Seed Exchange: Communication No. 9. (Plant Families.) January.

An International List of Genera of Vascular Plants. *Science* **70**: 15. July.

Various abstracts for *Biological Abstracts*.

Reed, George M.

Beardless Iris Test Garden at the Brooklyn Botanic Garden. (Brief report.) *Bull. Amer. Iris Soc.* **30**: 32-35. January.

Plant Pathology. *Brooklyn Bot. Gard. Rec.* **18**: 52-57. March.

Beardless Iris Project. *Brooklyn Bot. Gard. Rec.* **18**: 59-62. March.

One Hundred Japanese Irises, more or less. *Bull. Amer. Iris Soc.* **32**: 4-12. July.

New physiologic races of the oat smuts. *Bull. Torrey Bot. Club* **56**: 449-470. December.

Shaw, Ellen Eddy

Bulbs. *Everygirls*. January.

Window boxes. *Everygirls*. February.

Report of the Curator of Elementary Instruction. *Brooklyn Bot. Gard. Rec.* **18**: 90-95. March.

The outdoor window box. *Your Home*. July.

Everybody's window box. *Your Home*. November.

Children's work at the Brooklyn Botanic Garden. *Directory of Women in Brooklyn Today*. December.

Secretary's and Treasurer's Reports of the American Nature Study Society. December.

The following articles appeared in *The American Home* as indicated:

The soil's the thing. January.

The garden tool chest. February.

Starting the outdoor garden indoors. March.

First steps in the outdoor garden. April.

More steps in gardening. May.

Summer Seed sowing for next year's flowers. July.

The following articles appeared in the *New York Sun* on the dates indicated:

Planning the garden. January 11.

Choosing seed for the outdoor garden. January 25.

Starting seeds in the home. February 8.

Keep on planting. February 22.

Getting ready or the vegetable garden. March 8.

Roses. March 22.

Clearing up the garden. March 29.

Improving the soil. April 5.

Mid April in the garden. April 12.

A garden of constant bloom. April 19.

A little rock garden. April 26.

The outdoor window box. May 3.

The annual flower garden. May 10.

The annual flower garden (part 2). May 17.

Trouble in the garden. May 24.

June in the Garden. June 14.

Experiments in the garden. June 21.

The man with the hoe. June 28.

July in the garden. July 12.

In the flower garden. July 26.

Starting perennials for next year. August 9.

Late summer in the garden. August 23.

Plant propagation. September 6.

The outdoor bulb bed. September 20.

- When your plants move indoors. October 4.
 Checking up the garden. October 11.
 Indoor bulb planting. October 18.
 Growing bulbs indoors. October 25.
 Planting Easter lilies. November 1.
 Making cuttings. November 8.
 Raising plants from stolons. November 15.
 Planting calla lilies. November 22.
 Garden Christmas presents. November 29.
 Desert gardens. December 6.
 Making a fernery. December 13.
 Winter bouquets. December 20.
 Care of Christmas plants. December 27.

Simpson, Ray

- Report of the Librarian for 1928. *Brooklyn Bot. Gard. Rec.*
 18: 95-103. April.
 A selected list of publications on gardening and wild flowers.
Brooklyn Bot. Gard. Leaflets XVII¹⁻⁵. April.

APPENDIX 3

TALKS, LECTURES, ADDRESSES, AND PAPERS GIVEN BY MEMBERS OF STAFF DURING 1929

By the Director of the Garden:

- January 18. *The proper approach to scientific and religious data.* Central Y. M. C. A., Brooklyn.
 February 7. *Aeration of tree roots: Theory of.* (Introductory to a symposium on the aeration of tree roots.) Fifth Nat. Shade Tree Conference. Brooklyn Botanic Garden.
 February 17. *Harmonizing scientific and religious ideas.* Young Peoples Society; Lafayette Avenue Presbyterian Church.
 March 12. *Gardens within a Garden.* Convocation, Connecticut College for Women, New London.
 April 2. *Gardens within a Garden.* Women's League. Flatbush Congregational Church, Brooklyn.
 April 5. *Botany serving the public.* Ninth Annual State Educational Conference, Columbus, Ohio.

- April 20. *Effects of radium rays on plants.* Annual Science Dinner, New York Association of Biology Teachers. Aldine Club, New York.
- April 27. *Effects of radium rays on plants.* Polytechnic Chemical Society (Student Branch), American Institute of Chemical Engineers, Brooklyn Chamber of Commerce.
- June 5. *Gardens within a Garden.* Women's League. Ocean Avenue Congregational Church, Brooklyn.
- October 4. *Early botanical education in American Colleges, with special reference to Women's Colleges.* The Phi Beta Kappa Alumnae in New York, Columbia University.
- November 23. *The Y. W. C. A. and the Community.* Central Y. W. C. A. Building, Brooklyn.
- December 9. *Gardens within a Garden.* New Rochelle Garden Club, New Rochelle.

By the Curator of Public Instruction:

- February 8. *Investigations on the chestnut bark disease.* Before the National Shade Tree Conference. At the Garden.
- March 2. *Fungous diseases of forest trees.* To biology departments of Haaren and Newtown High Schools. At the Garden.
- March 19, 26; April 9, 16, 23, 30; May 7, 16, 21. *The classification of plants.* Biology class, Maxwell Training School for teachers.
- April 18. *Research at the Brooklyn Botanic Garden.* College of the City of New York, Brooklyn Branch.
- May 8. *Arbor Day, Conservation, and Brooklyn.* Boys High School, Waverly Annex.
- September 12. *The present status of the chestnut in North America.* Northern Nut Growers Association annual meeting. Hotel Pennsylvania, New York City.
- September 19. *Vegetative propagation.* Girls Commercial High School. Advanced biology class. At the Garden.
- October 29. *The chemical side of plant life.* Hunter College Chemistry Club. Annex, 145 E. 32d St., Manhattan.
- November 22. *The evolution of plants.* Biology class, Girls Commercial High School. At the Garden.
- December 5. *The cultural value of the study of natural sciences.* Boys High School, Waverly Annex.

By the Curator of Elementary Instruction:

- January 8. *A trip around the world.* P. S. 165.
- January 11. *Nature study for children.* Jamaica Training School.
- January 24. *Graduation address.* P. S. 47.
- February 4. *Garden soil.* Larchmont Garden Club.
- February 18. *The soil.* Women's Club of Englewood, N. J.
- February 19. *Starting the small garden.* Contemporary Club, Englewood, N. J.
- March 1. *Planning the small garden.* Palisade Garden Club.
- March 4. *Choosing seed for the perennial garden.* Women's Club of Englewood, N. J.
- March 5. *The garden and the child.* Women's Union, Brooklyn Society for Ethical Culture.
- March 11. *Indoor planting.* Women's Club of Englewood, N. J.
- March 13. *Starting children's outdoor gardens.* Norwalk Garden Club.
- March 16. *Nature study in education.* New Paltz Alumni Association.
- March 18. *Plant propagation.* Women's Club of Englewood, N. J.
- March 21. *Perennials.* Women's Club of Maplewood.
- March 25. *Pricking out seedlings.* Women's Club of Englewood, N. J.
- November 12. *Children's work at the Brooklyn Botanic Garden.* Woman's Auxiliary of the Brooklyn Botanic Garden. At the Garden.
- November 12. *Activities of the Brooklyn Botanic Garden.* Brooklyn Heights Seminary Club. At the Garden.
- November 23. *Children's activities at the Brooklyn Botanic Garden.* National Recreation School. At the Garden.
- November 25. *Thanksgiving.* P. S. 206.
- December 5. *Parents and children.* Neighborhood Teacher Association.

By the Curator of Plants:

- November 16. *The Plant-Animal Partnership.* At Labor Temple, 242 East 14th Street, N. Y. C.

By the Curator of Plant Pathology:

- March 16. *Some illustrations of genetics*. Biology teachers of Haaren and Newtown High Schools. At the Garden.
- February 6. *Iris*es. Little Gardens Club of Tarrytown, N. Y.
- April 22. *Iris*es. Contemporary Club of Brooklyn. At the Garden.
- May 31. *Iris*es. Iris Field Day. At the Garden.
- October 13. *Field experiments with sorghums and sorghum hybrids*. New York Association of Biology Teachers. At the Garden.
- November 7. *Examples of cereal breeding*. Biology class, Girls Commercial High School. At the Garden.
- November 23. *Cereals and cereal breeding*. New York Association of Biology Teachers. At the Garden.

By the Horticulturist:

- February 2. *Impressions of a Visiting Horticulturist*. Bermuda Garden Club, Hamilton, Bermuda.
- February 25. *Rose Growing*. Women's Club of Englewood, N. J.
- March 18. *Rock Gardens*. East Orange Garden Club, N. J.
- April 11. *English Gardens*. Brooklyn Institute of Arts and Sciences.
- May 8–November 20. *Eleven lessons on Garden Making*. Garden Department of the Garden City-Hempstead Community Club, L. I.
- July 9. *Rock Gardens*. Stamford Garden Club, Conn.
- August 13. *House Plants*. North Suffolk Garden Club, Jamestown, L. I.
- September 10. *Perennials and Biennials*. Garden Committee, Woman's Club, Great Kills, S. I.
- September 25. *Rock Gardens*. Summit Garden Club, N. J.

By the Resident Investigator:

- March 10. *Cabbages and Cacti*. Men's League, Flatbush Congregational Church, Brooklyn, New York.
- March 16. *Variations in Nephrolepis*. Biology Departments of Haaren and Newtown High Schools, at Brooklyn Botanic Garden.
- May 10. *Eugenics: a biologist looks into the future*. American Museum of Natural History, New York.

- May 20. *Eugenics and Religion*. Young People's Union, Central Presbyterian Church, Montclair, New Jersey.
- May 25. *Fern Hunting at Branchville*. Torrey Botanical Club Field Meeting, Branchville, New Jersey.
- June 3. *Biological History of the Hudson River*. Haaren High School, New York.
- October 12. *Cabbages and Related Types*. New York Association of Biology Teachers, at Brooklyn Botanic Garden.
- November 7. *How Uncle Sam breeds Novel Plants*. American Museum of Natural History, New York.
- November 12. *Scientific Plant Breeding*. Hunter College, New York.
- November 23. *The Boston Fern and its Varieties*. New York Association of Biology Teachers, at Brooklyn Botanic Garden.
- December 3. *Biology Lessons through the Apple*. Torrey Botanical Club, Barnard College, New York.
- December 8. *Choosing a Biological Profession*. Young People's Society, Flatbush Congregational Church, Brooklyn, New York.
- December 14. *What Ferns are best for the Home*. New York Botanical Garden.

By Instructors:

MRS. BARTLETT:

- April 23. *What the Brooklyn Botanic Garden does for boys and girls*. Mothers' Club, P. S. 129. At the Garden.
- May 10. *The work of the Brooklyn Botanic Garden*. People's Institute. At the Garden.
- May 28. *Japanese gardens*. Brooklyn Section, New York Public School Kindergarten Association. At the Garden.
- July 8. *Flower arrangement*. Garden Club of Bellport, Long Island.

MISS MARCY:

- November 14. *Bulbs as house plants*. Garden Club of Lawrence, Long Island.

MISS SARGENT:

- January 8. *House plants*. Sunnyside Garden Club.

- January 22. *Forestry*. P. S. 165.
- March 7. *Gardens for adults and children*. Garden Club of New Preston, Conn.
- March 18. *The living soil*. Mount Vernon Garden Club.
- March 21. *Activities of the Brooklyn Botanic Garden*. Mothers' Club, Central Congregational Church.
- April 8. *Nature in the life of a child*. Parent-Teacher Association, Floral Park, N. Y.
- April 10. *What the Brooklyn Botanic Garden does for children*. Parent-Teacher Association, Nepera Park, N. Y.
- November 6. *Forestry*. P. S. 167.
- November 12. *The children's garden at the Brooklyn Home for Consumptives*. Woman's Auxiliary of the Brooklyn Botanic Garden. At the Garden.
- November 13. *House plants*. Mothers' Club, P. S. 3.
- November 14. *Birds of Brooklyn and the Bird Hospital of Springfield, Massachusetts*. Bird Lovers' Club of Brooklyn.
- November 21. *The making of bayberry candles*. Mothers' Club, P. S. 171.
- November 25. *Children's garden at the Brooklyn Home for Consumptives*. Brooklyn Plant, Flower and Fruit Guild.

By the Custodian:

- February 18. *Trees of use and beauty*. Men's Club. Park Slope Evangelical Lutheran Church, Brooklyn.
- October 17. *Identification of trees*. Brooklyn Nature Club. Brooklyn Botanic Garden.

APPENDIX 4

REPORT ON BROOKLYN BOTANIC GARDEN
PUBLICATIONS, 1929

American Journal of Botany

Published monthly in cooperation with the Botanical Society of America. Volume XVI (1929) comprised ten monthly issues as usual (omitting August and September), with 66 papers, 881 pages, 79 plates, and 154 text figures (as against 54 papers, 610

pages, 47 plates, and 117 text figures in 1928). There was a supplement, as usual, in the December issue, comprising "Abstracts of the papers presented before the Physiological Section of the Botanical Society of America, Des Moines, Iowa, December 30, 31, 1929, and January 1, 1930." This supplement was printed and distributed on December 7, in advance of the regular issue. The cost of publishing and distributing the supplement was met by the Physiological Section. Eight papers were published on the "author-payment" plan. Dr. E. W. Sinnott, of Columbia University, continued as Editor-in-Chief, and Dr. Arthur Harmount Graves continued as Brooklyn Botanic Garden representative in the editorial board.

The circulation of this journal, as of November 30, 1929 (the close of the fiscal year), was 1,622 as against 1,448 a year ago, and the annual budget was \$15,807.77, as against \$12,454.73 in 1928. The journal closed the year with a balance of \$6,110.14 and assets over liabilities of \$5,988.84, not counting the value of back sets and volumes on hand.

Ecology

Published quarterly, in cooperation with the Ecological Society of America. The four issues of Volume XI comprise 38 papers (besides reviews, proceedings, and miscellaneous matter), 563 pages, 61 plates, and 36 text figures (as against 42 papers, 540 pages, 23 plates, and 58 text figures last year). The circulation at the close of the fiscal year, November 30, 1929, was 1,048, and the annual budget \$5,946.39, as against 1,058 and \$4,841.16 for 1928. The journal closed the year with a credit balance of \$1,060.73 and assets over liabilities of \$698.66, not counting the value of back sets and volumes on hand.

Genetics

Published bi-monthly, in cooperation with the Editorial Board of Genetics. The six numbers of Volume XIV comprised 23 papers, 644 pages, 19 plates, and 31 text figures (as against 27 papers, 570 pages, 5 plates and 62 text figures last year). The circulation at the close of the fiscal year was 623 and the annual budget \$5,957.63 (as against 605 and \$6,555.96 for 1928). The

journal closed the fiscal year with a cash balance of \$640.70 and assets over liabilities of \$254.80, exclusive of the value of back sets and volumes on hand.

Brooklyn Botanic Garden Record

Volume XVIII (1929) of the *Record* comprised 307 pages, as against 186 pages last year. Beginning with the January, 1929, number, the *Record* was issued bi-monthly. The six issues were as follows: January, *Delectus Seminum Brooklyn, 1928*; March, *Eighteenth Annual Report, 1928*; May, *Gardens within a Garden—A General Guide to the Grounds of the Brooklyn Botanic Garden. Guide No. 2*; July, *Public Education at the Brooklyn Botanic Garden*; September, *Prospectus, 1929-30*; November, *The Story of Our Metate—A Chronicle of Corn. Guide No. 3*.

Leaflets

Two double numbers (1-3, April 3 and 4-5, May 15) and one quadruple number (8-12, November 27) were issued. The circulation was 1860, as of December, 1929. No. 1-3 was "A selected list of publications on gardening and wild flowers," by Miss Ray Simpson, librarian of the Garden from 1916 to 1929.

Contributions and Memoirs

No numbers were issued in 1929.

Research Published

The total number of research papers published by the Garden in 1929 was 127, occupying 2,088 pages.

Bibliographies

Special attention is called to two bibliographies published during the year, as follows:

1. *A selected list of publications on gardening and wild flowers.* By Miss Ray Simpson, librarian of the Garden from September 18, 1916 to September 1, 1929. This constituted No. 1-3 of the *Leaflets*, noted above.

2. *List of books on gardening and botanical nature study.* By

Kathryn Clark Bartlett. This was issued in October as a separate pamphlet, and is on sale at 25 cents a copy.

APPENDIX 5

FIELD TRIPS CONDUCTED 1929

By the Director:

May 4. Torrey Botanical Club. Brooklyn Botanic Garden.

By the Curator of Plants:

August 5-9. Torrey Botanical Club. Catskill Mountains, Maplecrest, Greene Co., New York.

October 19. Torrey Botanical Club, Hillside, Queens Borough, L. I.

By the Curator of Public Instruction:

March 30. Torrey Botanical Club. Inwood Park, Manhattan.

September 8. Torrey Botanical Club. Fresh Kills, Staten Island.

APPENDIX 6

MEETINGS OF ORGANIZATIONS AT THE GARDEN

1929

February 7-8. National Shade Tree Conference.

March 26. Woman's Auxiliary of the Brooklyn Botanic Garden.

April 19. Contemporary Club of Brooklyn.

April 23. Mothers' Club, P. S. 129.

May 7. Vassar Club.

May 7. Winter's Night Club.

May 10. Peoples Institute.

May 18. Reconciliation Tours.

May 29. New York Kindergarten Association, Brooklyn Section.

May 30. New York League of Girls Clubs, Inc.

June 15. Italian Mission.

October 1. Torrey Botanical Club.

October 5. New York University.

October 15. Department of Botany, Brooklyn Institute of Arts and Sciences.

October 17. Brooklyn Nature Club.

October 20.	New York League of Girls Clubs, Inc.	
November 12.	Brooklyn Heights Seminary Club.	
November 12.	Woman's Auxiliary of the Brooklyn Botanic Garden.	
November 23.	National Recreational School.	
	Number of Organizations	19
	Total attendance	859

APPENDIX 7

REPORT ON PHOTOGRAPHIC WORK

Negatives on file December 31, 1928	6,600
Negatives accessioned during 1929	250
	<hr/>
Total negatives on file December 31, 1929	6,850
Lantern slides on file December 31, 1928	5,120
Lantern slides accessioned during 1929	250
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Total lantern slides on file December 31, 1929	5,370
Prints on file December 31, 1928	2,076
Prints made during 1929	1,847
Used or distributed	1,597
	<hr/>
Prints filed during 1929	250
	<hr/>
Total prints on file December 31, 1929	3,226
Enlargements made	33

Respectfully submitted,

FRANK STOLL,
Registrar.

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(Revised to February 24, 1930)

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 Fara Forni, Mme. A. F.
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 Farrier, Albert Moses
 Farrier, Frederick B.
 Ferrier, Miss Elizabeth A.
 Field, Miss Elizabeth
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 Ford, Sumner
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 Frothingham, Miss Helen H.
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 Gifford, Ira L.

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 Goodnow, Prof. Frank J.
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 Hirschberg, Mrs. Samuel
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 Waldman, Arthur
 Walsh, James A.
 Walton, Mrs. John J.
 Wardell, Mrs. Tylee W.
 Wark, Charles F.
 Warlow, Miss Dorothy
 Warren, William H.
 Wasserman, Mrs. Samuel
 Waters, Mrs. W. H.
 Watson, Thomas G.
 Wayman, Robert
 Weaver, Mrs. Susan
 Weber, Louis
 Weck, Mrs. Edward
 Weekes, Francis
 Weekes, Mrs. Mary
 Weeth, Dr. Charles R.
 Weinberg, Henry
 Weiss, Nathan
 Welden, Frank C.
 Wellman, Morris
 Wentz, George E.
 Wenzel, Fred.
 Werner, Mrs. Frederick J.
 Whitaker, Mrs. Blanche F.
 White, Mrs. Anna K.
 Wikander, Miss Elin
 Wildhack, Mrs. John
 Willard, George N.
 Williams, Mrs. John O.
 Williams, R. L.
 Winey, Mrs. C. L.
 Wing, Benjamin
 Wing, Miss Beulah A.
 Wittmer, Mrs. Mary
 Wolf, Dr. Adam B.
 Wolf, David
 Wolfe, Mrs. Christian F.
 Wolfe, Dr. Samuel A.
 Wolfer, Dr. Henry
 Wolkowitz, Max
 Wood, Dr. Thomas B.
 Woodruff, Miss Helen G.
 Woodward, Miss Mary Black-
 burne
 Wortmann, Fred H.
 Yeaton, Mrs. Ralph G.
 Young, Mrs. Charles T.
 Zabriskie, Mrs. Elmer Thomas
 Zartmann, Wm. J.
 Zellner, Mrs. Carl P.
 Ziering, Mrs. Louis
 Zimmele, Charles F.
 Zingler, Paul

SUMMARY OF MEMBERSHIP

Benefactors		6
Patrons		14
Donors		33
Permanent Members.....		90
Life Members		
Through the Botanic Garden.....	21	
Through Other Departments	<u>271</u>	292
Sustaining Members		
Through the Botanic Garden	25	
Through Other Departments	<u>43</u>	68
Annual Members		<u>648</u>
Total		1,151

THE BOTANIC GARDEN AND THE CITY

THE BROOKLYN BOTANIC GARDEN, established in 1910, is a Department of the Brooklyn Institute of Arts and Sciences. It is supported in part by municipal appropriations, and in part by private funds, including income from endowment, membership dues, and special contributions. Its articulation with the City is through the Department of Parks.

The City owns the land devoted to Garden purposes, builds, lights, and heats the buildings, and keeps them in repair, and includes in its annual tax budget an appropriation for other items of maintenance. One third of the cost of the present buildings (about \$300,000) was met from private funds.

Appointments to all positions are made by the director of the Garden, with the approval of the Botanic Garden Governing Committee, and all authorized expenditures for maintenance are made in the name of the private organization, from funds advanced by the Institute, which, in turn, is reimbursed from time to time by the City, within the limits, and according to the terms, of the annual appropriation.

All plants have been purchased with private funds since the Garden was established. In addition to this, it has been the practice of the Garden to purchase all books for the library, all specimens for the herbarium, all lantern slides, and numerous other items, and to pay certain salaries, with private funds.

The urgent needs of the Garden for private funds for all purposes are more than twice as great as the present income from endowment, membership dues, and special contributions. The director of the Garden will be glad to give full information as to possible uses of such funds to any who may be interested.*

* A written Agreement, dated August 17, 1914, between the City of New York and the Institute, touching the Botanic Garden, published in full in the *Brooklyn Botanic Garden Record*, for April, 1915, amends the agreement of September 9, 1912, which amends the original agreement of September 28, 1909, published in the *Record* for January, 1912.

INFORMATION CONCERNING MEMBERSHIP

The Brooklyn Institute of Arts and Sciences is organized in three main departments: 1. The Department of Education. 2. The Museums. 3. The Botanic Garden.

Any of the following seven classes of membership may be taken out through the Botanic Garden:

1. Annual member	\$ 10	5. Donor	\$ 10,000
2. Sustaining member	25	6. Patron	25,000
3. Life member	500	7. Benefactor	100,000
4. Permanent member	2,500		

Sustaining members are annual members with full privileges in Departments one to three. Membership in classes two to seven carries full privileges in Departments one to three.

In addition to opportunities afforded to members of the Botanic Garden for public service through cooperating in its development, and helping to further its aims to advance and diffuse a knowledge and love of plants, to help preserve our native wild flowers, and to afford additional and much needed educational advantages in Brooklyn and Greater New York, members may also enjoy the privileges indicated on the following page.

Further information concerning membership may be had by addressing The Director, Brooklyn Botanic Garden, Brooklyn, N. Y., or by personal conference by appointment. Telephone, 6173 Prospect.

.....
Date

To The Secretary,
Brooklyn Botanic Garden,
1000 Washington Ave., Brooklyn, N. Y.

Dear Sir:

I desire to become

An Annual Member	\$ 10	A Donor	\$ 10,000
A Sustaining Member ...	25	A Patron	25,000
A Life Member	500	A Benefactor	100,000
A Permanent Member ...	2,500		

Please find enclosed my check payable to Brooklyn Botanic Garden, and present my name to the Board of the Trustees for election.

Yours truly,

Name

Address

PRIVILEGES OF MEMBERSHIP

1. Free admission to the buildings and grounds at all times.
2. Cards of admission for self and friends to all exhibitions and openings preceding the admission of the general public, and to receptions.
3. Services of docent (by appointment), for self and party, when visiting the Garden.
4. Admission of member and his or her immediate family to all lectures, classes, field trips, and other scientific meetings under Garden auspices, at the Garden or elsewhere.
5. Special lectures and classes for the children of members.
6. Copies of Garden publications, as follows:
 - a. Record.
 - b. Guides
 - c. Leaflets
 - d. Contributions
 - e. Frequent Announcement Cards concerning plants in flower and other exhibits and events.
7. Privileges of the Library and Herbarium.
8. Expert advice on the choice and care of plants, indoors and out, on planting the home grounds, the care of lawns, and the treatment of plants affected by insect and fungous pests.
9. Identification of botanical specimens.
10. Participation in the periodical distribution of duplicate plant material and seeds, in accordance with special announcements sent to members from time to time.

FORMS OF BEQUEST TO THE BROOKLYN BOTANIC GARDEN

Form of Bequest for General Purposes

I hereby give, devise, and bequeath to The Brooklyn Institute of Arts and Sciences, Brooklyn, N. Y., the sum of.....Dollars, the income from which said sum to be used for the educational and scientific work of the Brooklyn Botanic Garden.

Form of Bequest for a Curatorship

I hereby give, devise, and bequeath to the Brooklyn Institute of Arts and Sciences, Brooklyn, N. Y., the sum of.....Dollars, as an endowment for a curatorship in the Brooklyn Botanic Garden, the income from which sum to be used each year towards the payment of the salary of a curator in said Botanic Garden, to be known as the (here may be inserted the name of the donor or other person) curatorship.

Form of Bequest for a Fellowship

I hereby give, devise, and bequeath to The Brooklyn Institute of Arts and Sciences, Brooklyn, N. Y., the sum of.....Dollars, the income from which sum to be used in the payment of a fellowship for advanced botanical investigation in the Brooklyn Botanic Garden, to be known as thefellowship.

Form of Bequest for other particular purposes designated by the testator

I hereby give, devise, and bequeath to The Brooklyn Institute of Arts and Sciences, Brooklyn, N. Y., the sum of.....Dollars, to be used (or the income from which to be used) for the Brooklyn Botanic Garden*
.....

* The following additional purposes are suggested for which endowment is needed.

1. Botanical research.
2. Publishing the results of botanical investigations.
3. Popular botanical publication.
4. The endowment of a lectureship, or a lecture course.
5. Botanical illustrations for publications and lectures.
6. The purchase and collecting of plants.
7. The beautifying of the grounds.
8. The purchase of publications for the library.
9. Extending and enriching our work of public education.

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ECOLOGY. Established, January, 1920. Published quarterly in cooperation with the **ECOLOGICAL SOCIETY OF AMERICA**. Subscription, \$4.00 a year. Circulates in 48 countries.

GENETICS. Established, January, 1916. Bimonthly. Subscription, \$6.00 a year. Circulates in 37 countries.

MAY 13 1930

BROOKLYN BOTANIC GARDEN RECORD

VOL. XIX

MAY, 1930

NO. 3

VIEWS IN
BROOKLYN BOTANIC GARDEN
1930-1935



PUBLISHED BIMONTHLY
AT PRINCE AND LEONON STS., LANCASTER, PA.
BY THE BROOKLYN INSTITUTE OF ARTS AND SCIENCES
BROOKLYN, N. Y.

Entered as second-class matter in the post-office at Lancaster, Pa., under act of August 24, 1912.

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** RUTH M. TATE, *Stenographer*
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EVELYN M. WILLIAMS, *Stenographer*

† Resigned, March 31, 1930.

* Resigned, April 30, 1930.

** Resigned, April 30, 1930.

VIEWS IN BROOKLYN BOTANIC GARDEN

1930-1935

THE PURPOSE OF THESE ILLUSTRATIONS

The development of every institution represents the realization of ideals. The more vividly these ideals are conceived, the more prompt and assured is their realization likely to be.

The most important ideals for a scientific and educational institution, such as the Brooklyn Botanic Garden, have reference to the work which it was organized to accomplish. Secondary to these, but nevertheless of prime importance, are the ideals with reference to the buildings, setting, and equipment for carrying on the work.

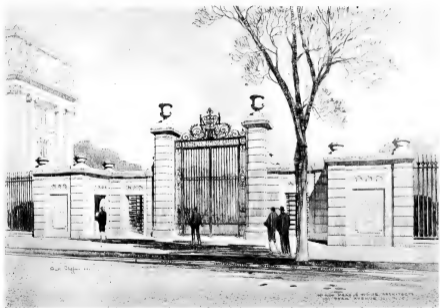
We have frequently given public expression to our plans, not only to develop an effective program of research and public education, but also to make the grounds of the Brooklyn Botanic Garden the most beautiful spot in Greater New York.

While much of the cost of developing the grounds has been met by municipal appropriations, nevertheless this work affords attractive opportunities for private benefactions. In fact, some of our most beautiful major features, such as the Japanese Garden, the Rose Garden, the Lily Pools, the Richard Young Gate, and the Hills and Jenkins Bridges, and all of the planting have been made possible by contributions from citizens interested not only in the Botanic Garden but in all that tends to make this city a beautiful and attractive place.

The following "Views in the Brooklyn Botanic Garden, 1930-1935," are here presented for the purpose of helping others to visualize with us, some of our ideals for the development of the Garden.

It is hoped that all of these may be realized, either by municipal appropriations or by private gifts, before the close of the five year period. The director will be glad to confer with anyone who may be interested to learn more about the features here illustrated and the work and needs of the Botanic Garden as a whole.

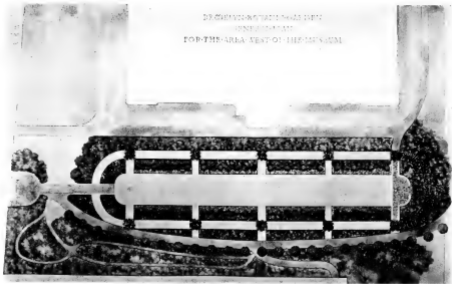
In the meantime, we should not lose sight of the need of additional endowment for the enrichment and extension of our scientific and educational work.



PROPOSED MAIN ENTRANCE, EASTERN PARKWAY

The estimated cost of this gate, including architect's fee, is approximately \$50,600.00.

DECEMBER 1914
GENERAL PLAN
FOR THE AREA WEST OF THE CITY HALL



HORTICULTURAL SECTION

This is on the so-called "North Addition" of the Botanic Garden, comprising about three acres lying between Brooklyn Museum property on the east and Mt. Prospect Reservoir on the west, with the north front on Eastern Parkway.

The proposed new Main Entrance, shown in the preceding illustration, opens directly to this area which has been formally designed as a suitable setting for the Brooklyn Museum Building; also to serve for the display of horticultural collections and to provide a dignified and beautiful approach to the Botanic Garden.

Estimated cost, including landscape architect's fee, is \$24,500.00.



SOUTH WASHINGTON AVENUE GATE

This is for the entrance near the Children's Building.

Estimated cost, including architect's fee, approximately \$9,000.00.



Copyright 1900

W. KIM MEAD & WHITE, ARCHITECTS
101 WALL STREET, N. Y. C.

NORTH WASHINGTON AVENUE GATE

The entrance is opposite the Japanese Garden, and this fact has largely determined the design.

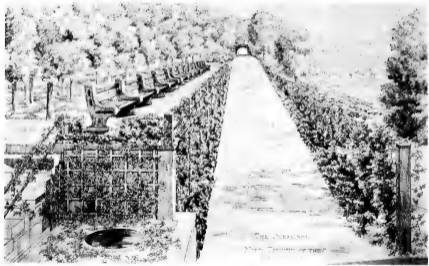
Estimated cost, including architect's fee, approximately \$9,000.00.



FOUNTAIN FOR CONSERVATORY PLAZA

This fountain is to stand in front of the main entrance to the Conservatories, between the two existing Lily Pools.

Estimated cost, including designer's fee, approximately \$5,000.00.



THE OVERLOOK

This design is for the treatment of the embankment immediately north of the Rose Garden. It will not only be a beautiful feature in itself, but will be the most advantageous place from which to view the Rose Garden, Esplanade, Cherry Walk, and, in fact, the Botanic Garden as a whole.

Estimated cost, including landscape architect's fee, not to exceed \$3,000.00.



GARDEN SEAT

Fourteen of these seats have already been donated. They were designed specially for the Brooklyn Botanic Garden. Several more are greatly needed.

Cost, including designer's fee, \$150.00.



ENTRANCE TO NATIVE WILD FLOWER GARDEN

The Native Wild Flower Garden (Local Flora Section) contains only plants that grow without cultivation within a radius of approximately 100 miles of Brooklyn. This is, roughly, the Local Flora Area as defined by the Torrey Botanical Club.

Several years ago it became evident that the greatest success of this collection would require a closer approach to an open "woods" than was then available, and so, about 1916, a small grove of native deciduous and evergreen trees was planted in the northern third of the so-called "Local Flora Valley." Shortly thereafter came the World War, accompanied by diminished income and gardening personnel. This condition continued, and the Native Wild Flower Garden, originally the most attractive and popular part of the Botanic Garden, had to be temporarily abandoned.

It is hoped that we may re-install this garden by not later than 1931, but under existing conditions it will be necessary to enclose it with a separate fence, just as in the cases of the Rose Garden and the Japanese Garden. The figure on the opposite page is the Landscape Architect's design for the eastern entrance, opposite Lilac Triangle.

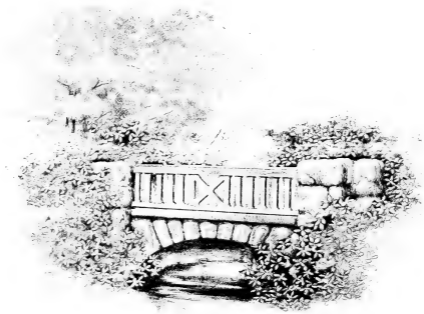
The estimated cost of the gateway and the adjacent planting, including architect's fee, is \$350.00. The cost of the woven wire fence (approximately 1000 feet) is approximately \$1650.00, making a total cost to enclose the Wild Flower Garden of \$2000.00.



PLANTING AT NORTH FLATBUSH AVENUE ENTRANCE

With the increase of population in the vicinity of the Botanic Garden this entrance, like all of the others, is being used more and more each year. The area just inside the gate has never received any attention, beyond routine maintenance, since the Botanic Garden was established. This entrance will become still more important when the new building of the Brooklyn Public Library, now under construction near this entrance, is completed.

It is estimated that the contemplated planting with necessary regrading and soil improvement and reconstruction of the walk, can be accomplished for not more than \$1800.00.



FOOT BRIDGE OVER THE BROOK NEAR THE OUTLET TO THE LAKE

Estimated cost, including architect's fee, \$1,500.00.

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ECOLOGY. Established, January, 1920. Published quarterly in cooperation with the **ECOLOGICAL SOCIETY OF AMERICA**. Subscription, \$4.00 a year. Circulates in 48 countries.

GENETICS. Established, January, 1916. Bimonthly. Subscription, \$6.00 a year. Circulates in 37 countries.

BROOKLYN BOTANIC GARDEN RECORD

VOL. XIX

JULY, 1930

NO. 4

THE JAPANESE GARDEN OF THE BROOKLYN BOTANIC GARDEN GUIDE NO. 4



PUBLISHED SEMI-MONTHLY
AT FRANCE AND LEMON STS., LANCASTER, PA.
BY THE BROOKLYN INSTITUTE OF ARTS AND SCIENCES
BROOKLYN, N. Y.

Entered as second-class matter in the post-office at Lancaster, Pa., under act of August 24, 1912.

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FIG. 1. Yukimi Stone Lantern and Storks. (Photo. by Harry B. Shaw.)

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THE JAPANESE GARDEN OF THE BROOKLYN BOTANIC GARDEN

BY BUNKIO MATSUKI

Introduction

The Japanese Garden of the Brooklyn Botanic Garden is a charming spot in this great metropolis where visitors may temporarily forget their western thought and enjoy a glimpse of the Land of the Rising Sun. At least so it impresses a native Japanese who enters into this garden. It is a great pleasure to me, therefore, to write out and explain the various interesting features in this unique Japanese garden in the midst of the great occidental city. There are many books which have been written about Japanese gardens, but reading them and actually seeing a garden are two different matters. It is my hope that this guide book may clarify and explain the delightful features to those who visit this place.

The garden was designed by Mr. Takeo Shiota, and was first opened to the public on Sunday, June 6, 1915. Since then, from the Japanese point of view, the garden has shown a very marked improvement in adding a patina to the tone of the garden complex through the processes of natural weathering.

This Japanese garden, or *Niwa*, is a landscape garden and, in order to keep its aspect constant all the year round, the transitory flowering plants are greatly restricted; preference is given to evergreen trees (such as the pine) and shrubs, in association with rocks and water. A yearning for nature exists in every nationality, but the demonstration of such intimacy with nature as was created in landscape garden making in Japan is a distinct aesthetic contribution of the Japanese to the world.

The earliest record of garden making in Japanese history is found in the twentieth year (602 A.D.) of the reign of Empress



FIG. 2. Gate and Fence at Tea House with flowering cherry (6202).

Suiko. Among the Korean immigrants there was a man named Roshiko, whose face and body were profusely covered with unpleasing freckles. So unbecoming was his aspect that he was ordered to be deported and would have been had he not made a special appeal to the Empress, stating: "Though hideous I may be to look at, I possess a humble talent for composing landscape gardens. If her August Majesty will retain the faithful new subject it will benefit her domain." The Empress Suiko granted his request and caused him to set up a landscape garden in the southern enclosure of the palace. Roshiko's name soon became famous and a few years later he made another garden for Soga-no-Umako, near the Asuka River in the Yamato Province, where he employed a running streamlet. This garden had a small lake with an island in it, and the people called the owner of the garden *Shima-no-Omi*, or Great Minister of the Island. The word *Shima* (Island) came to be applied for a garden in ancient Japan.

As in calligraphy, painting, flower arrangement, and other branches of Japanese art, various elaborate formulae for application in gardening have been developed and their different aspects of treatment will be explained later. In a general way, Japanese gardens may be classified in four main styles: Palace Garden, Shinto and Buddhist Temple Gardens, and *Cha-no-yu* or Tea Cult Garden. One of the interesting aspects of this garden in Brooklyn is that it embraces some features of all of these four garden types.

The Entrance and the Water Pavilion

The entrance to the Botanic Garden at the North Washington Avenue gate leads to the roofed board fence, with gateway enclosing the Japanese Garden on the east, and gives visitors a sensation of approaching a Japanese tea house, for the style here represents *Cha-no-yu*, or Tea Cult.

The timbers employed for making the fence and gate are the white cedar (*Chamaecyparis thyoides*), a common tree along the Atlantic Coast in New Jersey. It is the practice of the Japanese gardener to char the surface of the wood to a certain degree and then polish with a dry brush made of rice straw in order to produce an attractive natural grain of the timber in low relief, and at the same time to preserve against exposure to the weather.



FIG. 3. Tea Pavilion (2440).

Certainly this method of treatment is more artistic than a coat of paint.* The intervening spaces between the charred cedar boards are filled with bamboo strips for the artistic effect. The fence posts at intervals have cross pieces and brackets at the top which carry a light boarded roof of graceful projection. The roofed fence gives a touch of dignity to the enclosure and serves also to shut out distracting sights and sounds.



FIG. 4. Madam Okuda serving tea (6798).

The pair of hinged door panels on the entrance gate (*Omote-mon*) have ovate openings cut out at the top which are called Lotus Window, or *Ren-so*, a popular ovate form of opening in Japanese architecture. The gate leads by a short path to the tea house, past a beautiful white flowering Japanese cherry (Fig. 2).

On the right, just inside of the entrance gate, there stands a wooden post lantern known by the name of Who Goes There?

* Since the above was written the original fence of charred boards has been replaced with a new fence in which the same effect has been obtained by another method.

(*Tasoya?*). This style of lantern is commonly illustrated in Japanese color prints. A light from this post lantern serves to guide the way from the gate to the entrance of the tea house.

The tea house, which is really a Water Pavilion, or *Sui-ro*, is constructed on the small lake. In Japan, *Mat-cha* (pulverized tea whipped in hot water in a tea bowl) or *Sen-cha* (tea leaves steeped in hot water in a teapot) may be served (Fig. 3). This Water Pavilion is built with great skill, with refined taste, and in exquisite proportion. In conformity with the tea ceremony, this superb simplicity in architecture is intended to arouse sensations in harmony with the spirit of tea, and conducive to a meditative frame of mind.

On the south wall of the pavilion there is a circular window (*Yen-so*), provided with bamboo lattice work. This is a very popular feature in a Japanese house and generally has a square paper screen (*Sho-ji*) fastened on the wall inside, upon which the silhouette of trees and shrubs planted nearby is cast in a moonlight night. The rows of narrow verandas with balustrades on the south and west sides are intended to make possible the enjoyment of a view of the large goldfish in the lake. The low broad benches, or *Koshi-kake*, in the house are for the guests to seat themselves on and to have their cup of tea. The shelf by the bamboo boarded window on the north side is the place for keeping the tea utensils.

A small wing, its trellis roof entwined with wisteria, extends toward the right and is admirably modeled after a part of the tea pavilion of the Gold Palace (*Kinkakuji*), in a suburb of Kyoto, and built in the 14th Century.

The Panorama from the Water Pavilion

From this tea villa a panoramic view of the entire garden, covering over an acre, may be had across the water. Immediately in front is a series of high hills or Constructed Mountains (*Tsukiyama*), which are never more attractive than during the first part of May, and will become increasingly beautiful at that season from year to year as the flowering cherry, plum, and apple trees and the azalea bushes become larger.

The highest point in the far background is known as the Distant

Peak, *Toyama*. Beginning near its top and extending down the slope, there is a deep gorge or ravine, through which the water glides, falling over four cascades which are overhung by pine trees, wisteria, and maples, and emptying into the lake at the foot of the gorge (Fig. 5). There the stream, just before it enters the lake, is spanned by a wooden bridge with a balustrade. Slightly



FIG. 5. Three Cascades near the summit of the "Distant Peak"
(*Toyama*) (2442).

in front of the Distant Peak, and more toward the left, is the Companion Hill, *Soe-yama*. It is further distinguished by the presence of a large Japanese flowering crab. Just across the ravine from this tree is a leaning pine tree. In the foreground, across the lake to the right of the ravine, there is another elevation, the Near Hill, *Chika-yama*. It can be readily located by the fine pine tree growing on its peak.

The wooden structure standing in the water is the *Torii-mon*, an entrance gate to the Shinto Shrine which is built on the hill above. A *Torii* always indicates an approach to a temple or shrine. To the left of the *Torii* is the Shinto Pine Grove, or *Sho-rin*. To the right of the ravine with the cascading water, near the center of the hill, there is a large stone lantern fashioned of granite. At the foot of the hill to the right of the stream of water entering the lake there is an island connected with the main shore path by a wooden drum bridge. On the front of this island, nearest the observer, stands a large-roofed stone lantern, casting its inverted reflection upon the water. Beyond the island and a little further toward the right is the Waiting Pavilion (*Machi-ai*).

From the vantage point of the Tea Pavilion one can observe the application of the three forces of nature—Heaven, Earth, and Man (*Ten-chi-jin*) to the garden. The highest point, or Constructed Mountain, represents Heaven, the island (or the Companion Hill) represents Man, while the Earth is represented by the two large boulders, on the south shore of the lake. There is a necessary artistic rhythm in the relative heights of these points in the arrangement of the garden, the Earth being represented by the lowest point, Man by an intermediate, and Heaven by the highest place in the garden.

The Lake (Ike)

A most attractive feature is the small lake, or *Ike*, which furnishes a splendid habitat for aquatic and semi-aquatic plants. As I have already stated, the feature of the hills and water (*San-sui*) must be employed in a Japanese garden; without water or the suggestion of water a garden is not artistic. The small lake in this garden gives a calm dignity, and the waterfall at a distance gives the garden a feeling of perpetual life. Western art is outspoken and objective (impressions from the outside), whereas Eastern art is subjective and based on continuity—something doing or going on constantly. Thus, to the Japanese mind, the water in a garden must be moving, though quietly, denoting constant change.

There is a certain glamour attached to the fact that the shape of this lake happens to be in the form of the Chinese letter for



FIG. 6. Rustic *Torii*. The words over the arch mean, "Enter to the Flowers" (3726).

"heart," in the abbreviated style of calligraphy. It must have been an ancient Japanese ideal to care for this form in making a lake. As early as 1010 A.D., in the Tale of Genji, Lady Murasaki, the authoress, described a palace garden: "'Heart' of lake is deftly constructed, expanding joyously far." Later, in the 14th Century, Muso, a famous Buddhist priest, designed many well-known gardens near Kioto. One garden he had built in Saihoji Temple with its lake in the form of the Chinese letter for heart, which, in Zenism, means "meditating center."

From the Tea House to the Waiting Pavilion

Leaving the tea house one passes under a rustic Torii. The Japanese characters over the arch mean, "Enter to the flowers" (Fig. 6). Walking along the lake shore, toward the right, one may look back upon the Japanese wisteria entwining over the trellis roof of the wing of the tea house. Shading the path, there are a number of double-flowered cherry trees (*Yae-zakura*), pine trees, and various shrubs. Just beyond these there is a planting of the Japanese Iris on the edge of the lake below. These varieties have come from Japan, where they are grown in special gardens, and large numbers of people view them in the flowering season. Near to the walk, a little beyond, is the Sleeve Fence (*Sode-gaki*), used to screen off a certain part of the garden. The term is derived from its resemblance to the sleeve of a girl's kimono, which was often a means of a bashful maiden for concealing her secret expression in an amorous dilemma. Its coquettish use gives character to the garden. The ropes for these fences in Japan are made either of palm fibers (*Shuro*) or wild wisteria vine (*Fuji-zuru*), in order to withstand exposure to the weather. On the bank at the right side of the walk there are a number of beautiful trees and shrubs, including pines, laurels, and birches.

A little further along the walk there stands the Waiting Pavilion (*Machi-ai*). It is a narrow rectangular building with a shingled roof supported by one frame wall, at the center of which there is a square window (Fig. 7). The cross pieces and brackets at the top of the wall posts carry the projecting roof, which shelters a long narrow veranda constructed with the device of cedar planks



FIG. 7. Waiting Pavilion (*Machi-ai*) (6992).



FIG. 8. View from Waiting Pavilion over the Lake. Laboratory Building in distance (4092).

and bamboo between. This is furnished with polished log balustrades at each end. The support of the roof is further strengthened with carved bent brackets and reinforced with bamboo rods over the posts at each end. It is used in Japan as the waiting place for the guests for *Cha-no-yu* party until the host, in the house far off, summons them by ringing a resonant gong. On such occasions round straw mats (*Yen-za*) would be provided for each guest, to be used on the veranda seat. In the Japanese *Cha-no-yu*, the summoning gong sounds seven numbers in varied tones, and the waiting guests pay their respects by keeping a perfect silence, tipping their heads slightly toward the host, who is to receive them shortly at the entrance of the tea house beyond.

Over the window of the Waiting Pavilion is the inscription, *Tsuki-mi-tei*, meaning Moon View Pavilion. From this place, at certain periods, the moon and its reflection in the lake may be seen to advantage in the late afternoon or early evening. From here, also, there is a beautiful view over the Drum Bridge and across the Lake.

The Island (Yami-Jima)

The garden lake generally has an island, and the one adopted here is the Mountain Island, or *Yami-jima*. It has the form of a mountain rising from the water, upon which are planted various small trees and evergreen shrubs. A wooden bridge (*Ki-bashi*), which is made with logs of wood in the form of a Drum Bridge (*Taiko-bashi*), spans across from the main shore to the island (Figs. 9 and 10).

A stone protruding in the water below the Drum Bridge is termed Cormorant Feather-Drying Stone (*Uha-hoshi*). Here the aquatic birds may gather on the rock and dry their wings.

On the south side of the island is the White Pebbled Beach (*Shira-hama*), and at the edge, facing the tea house on the shore opposite, stands the Snow View Stone Lantern (*Yukimi*). The large boulder just south of the lantern is called the Waiting Stone (*Machi-ishi*), and is carefully arranged in relation to the highest level of water. A rock cave (*Hora*) at the back of the *Shira-hama* is for the retreat of the aquatic birds which inhabit the lake. The pair of green bronze cranes are represented as wading about the edge of the beach.



FIG. 9. The Island (*Yami-Jima*), showing Drum Bridge, Stepping Stones, Storks, Cave, Stone Lantern (*Yukimi*), Pebble Beach, and, beyond the Drum Bridge, the original Waiting Pavilion, now replaced by the one described in the text. In the lower left hand corner are the Idling Stones (*Tobi-ishi*) (2446).



FIG. 10. Drum Bridge (*Taiko-bashi*), and the five Stepping Stones (*Sateishi*) to the Island (4713).

Two large stones on the opposite bank, across the water, are called Cast Away Stones or Idling Stones (*Sute-ishi*); the two combined, the upper and lower, give character to the edge of the water.

The waterway between the White Pebbled Beach and the main shore may be traversed on stepping-stones (*Tobi-ishi*). The device is considered one of the great achievements of a *Cha-no-yu* garden, that is, the planting of each stone in the water, irregularly, like a flight of wild geese or plovers, just as the style was innovated by some tea master in the 17th Century.

Stone lanterns are among the chief accessories of the Japanese garden. The Snow View Lantern (*Yukimi*), imported from Japan, is a very fine specimen, made out of Mikage granite. It has a broad hexagonal roof surmounted with a pointed jewel top, or *Giboshi*, the fire globe (*Hi-bukuro*) has six square windows and base with six facets. It is supported by four curved legs. When it is laden with snow it gives a charming effect to the landscape (Fig. 11). It stands at the edge of the island nearest the Tea Pavilion. The old original Yukimi Lantern is in Yusenji Temple, in Kioto.

The Waterfalls (Taki)

The path southward, along the edge of the water from the Waiting Pavilion, leads to the wooden bridge with the balustrade (Fig. 12). Here a full view of the two lower of the four cascades may be enjoyed, overhung with and partly concealed by the beautiful wisteria vines and maples (Figs. 13 and 14). These cascades are known as the Layer Falls (*Kasane-ochi*), so named because the water flows down in four repeated falls. The three upper cascades can be seen from the path above the lower one (Fig. 5).

This rock formation on the right side of the lower fall symbolizes the Guardian or Dedicated Stone (*Taido-seki*) of the garden, and on the left side, counterbalancing this stone, is the Low Vertical or Cliff Stone (*Reijo-seki*).

From the aspect of the lowest fall or cascade, it is also called Linen Spreading Falls (*Nuno-biki*). Below this cascade various stones or rock columns are placed among the rapids. They are

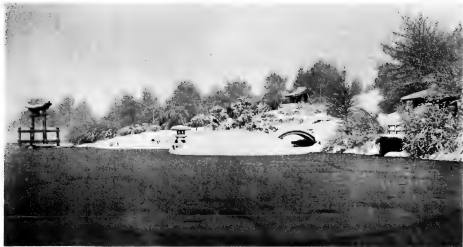


FIG. 11. Snow scene, showing Drum Bridge, Island and Cave, Stepping Stones, and Snow View Stone Lantern (*Ynkimi*) (2439).



FIG. 12. Wooden Bridge, with Sleeve Fence at right (Cf. Fig. 13); Shrine beyond the bridge; Waterfalls in distance at the right. Note the Pine, Azalca, and Boulder at the right of the Bridge, forming the trinity, heaven, man, and earth (3706).



FIG. 13. Wisteria in bloom near lower waterfall. Sleeve Fence and Wooden Lantern at left (5787).

Separate Stream Stone (*Mizu-wake*), Fleeing Stone (*Nige-ishi*), and Chasing Stone (*Oi-ishi*), being carefully arranged in accordance with the art of garden making. All these names symbolize their life when the rapids give them apparent motion by the agitation of the water in a whirlpool. This cascade is so located that the beauty of sunshine and moonbeam reflecting upon it gives infinite charm at certain times of the day or evening. Indeed, the skill in devising this cascade constitutes a remarkable feature of this garden. The caves in the rockwork are resonating, magnifying, somewhat, the sound of the falling water.

Toward the right, from the foot of the bridge, there are three natural stone steps (Fig. 13), leading down to an enchanting retreat, a recess or *cul-de-sac*, representing an abandoned stream course with a waterfall formerly at the upper end. This is like inaccessible spots suitable for meditation, which we often see in ancient Buddhist paintings, giving a profound impression to pictorial art lovers, as if a majestically robed Deity of Mercy (*Kwan-non*) had just left the seat.

A large flat rock, lying on the edge of the water, is called the Worshipping Stone (*Shin-tai-seki*) (Fig. 14). This is one of many religious names given to the stones in the garden and has reference to a certain Buddhist conception. The garden is created by the labor of man, but when completed, it is recognized as one phase of living nature; therefore, when one stands upon this stone and faces the garden he may have impressed upon his mind a sense of reverence. Hence the name of Worshipping Stone has been derived.

The position of the Worshipping Stone is generally in the center of the foreground or on the edge of the lake in the garden. However, the tea house has the location of the Main Residence and is partly built out on the water; accordingly, it was necessary to rearrange the position of the Guardian, Cliff, and Worshipping Stones, and place them in their present positions.

The Kasuga Lantern

On the right side of the ravine with the cascades there is a winding path, skirting Near Hill and leading to an upper road. Part way up the path, in a recess, is a tall stone lantern (Fig. 15),



FIG. 14. Wisteria in bloom near lower waterfall. Note the resonating caves in the rock. The large stone in the water is the Fish Stone. Wisteria petals are floating on the water (5788).

also from Japan. This is of the *Kasuga* type, so termed from the hundreds of stone lanterns which adorn the Kasuga Temple yard beneath the entrancing *Cryptomeria* grove in Nara, an ancient capital of Japan.*

The oldest stone lantern in Japan of this type is in the Tachibana Temple in Yamato, which was fashioned with the design of the images of Buddha and the twelve zodiac animals, creatures carved out in relief around the lantern. The granite lantern in this garden is an example of a very elaborately wrought Kasuga type. It has a thick hexagonal base, around whose edges there is a carved design of a series of rabbits and waves and at the top of it, the lotus flower medallion. Upon this base stands a tall cylindrical column with a bulged annulet at the center. This supports the hexagonal base of the fire globe, which is ornamented with the lotus medallion carvings on both the upper and lower parts. Each of the six facets of this fire globe base has the carvings of the zodiac animals: Rat and Bull, Tiger and Rabbit, Dragon and Serpent, Horse and Lamb, Ape and Rooster, Dog and Wild Boar, similar to the one in the Tachibana Temple in Japan.

Near the Kasuga lantern, to the south, there is a fine double flowered cherry tree. The path from the lantern leads on upward, past beautiful azalea bushes on one side and a Japanese barberry hedge on the other, to the main path. On the crest of Near Hill there are two white flowering Japanese plums, two magnolias and two Ginkgos or maiden hair trees.† Turning to the left on the main path we pass on the left the barberry hedge, near which there are two small *cryptomeria* trees (*Cryptomeria japonica*), just above the Kasuga lantern. On the right-hand side there is a fine group of Japanese yews. Just above the lower falls one may obtain a fine view of the upper cascades of the stream, the banks covered with beautiful azaleas and Japanese maples; near the beginning of the stream the leaning pine is seen. Further down the hill on the left there are two weeping mulberry trees, additional Japanese barberries, and flowering crabs.

*The Kasuga lantern was given in 1914 by Messrs. Yamanaka & Co., of New York City, through Mr. D. J. R. Ushikubo.

†This tree (*Ginkgo biloba*) was probably saved from extinction by being cultivated in the temple grounds in Japan and China. It has never been found growing wild within historic times.—C. S. G.



FIG. 15. Stone Lantern, *Kasuga*. On the six facets under the fire box are the twelve signs of the Zodiac (6897).

The fire globe has two large perforated windows, two geometrical lattice windows, and the two intervening sides have a lion and peony carving in high relief. It is crowned with a stone roof with a double curve, having corner scrolls. It is surmounted with a pointed ball in the form of a lotus bud.

The stone lantern is said to have originated in ancient Japan in order to protect the wayfarers in Kawachi Province, but the types of the lanterns now in existence are probably derived from the Buddhist stupes or pagodas, which were erected for the commemoration of the teaching of Buddha. These structures must have been transported from Corea along with Buddhism, which was introduced into Japan in the 6th Century. In the gardens, especially the tea garden, the various types of stone lanterns are adopted mainly for the decorative effect and, whether they are lighted or not, they signify light dispelling darkness.

In the temples, however, it is a common thing to light up the lanterns, and for a small sum any traveler may ask the temple attendant for *Sotomyo*, or for the entire illumination of the lanterns. Then all the stone lanterns in the temple compound, as well as the shrine lanterns within the temple itself, will be lighted up with candles at night, giving an enchanting panorama, enabling one to realize fully the nocturnal scene of a Shinto Temple. In the Japanese temple yards they have a simple device for keeping lighted the candles or oil lamps in the fire globes of these lanterns. The method is to wrap around the fire globe a long sheet of paper, the overlapping ends of which are held in place by a bent bamboo strip which is so arranged as to act as a spring.

The Shinto Shrine

A short distance beyond the stream one comes to a wood-post lantern, Honorable Deity Lantern (*Go-shin-to*). Here a path leads up to the Shinto Shrine.

This shrine is constructed of California coast redwood and put together with wooden pins; nails are not used except for holding the shingles on the roof. In Japan these shrines are very common, not only in the temple yards, but often in an alley or a lane of the streets. They generally contain cut white paper emblems known as *Gohei*, and round metal mirrors on stands which



FIG. 16. Shinto Shrine, devoted to the Protector of the Harvest (*Inari-myōjin*) (2447).

represent various deified *Kami* or Shinto divinities. This particular shrine is devoted to the Protector of Harvest (*Inari-myōjin*). This type is supposed to be the oldest form of Sacred Abode of ancient Japan. The horizontal curved beam across the entrance pillars is called the Rainbow Dragon (*Ko-ryō*). This is often elaborately carved with the design of dragons and the pilgrims pay homage right beneath this arch. The two stone foxes on either side of the entrance gate are the messengers of the deity. Just below the shrine is the beautiful pine grove (*Sho-rin*) (Fig. 16).

The Torii

Passing down the path to the lake shore, the visitor approaches the *Torii-mon*, a large wooden structure standing in the lake and facing in the direction which leads up the hill to the Inari Shrine. The front view of the Torii is obtained from the tea house or the adjacent lake shore. Ordinarily, one would approach the Torii in a boat and pass beneath its arch to the landing. The inscription on the front side is Great Illuminating Deity (*Dai-myō-jin*), or Spirit of Light.

The *Torii-mon* is of uncertain derivation, but undoubtedly means Bird-perching Gate. Just when it was first introduced is not known, but probably very early in Japanese history. The Torii may be built of wood, stone, or bronze. Some of the wooden *Torii* are painted red, while others are roofed, having a top with an upward curvature on both ends, usually bearing a framed sign of the temple at its center. All these styles are for the Shinto Shrines amalgamated with Buddhism. The pure Shinto Shrines, particularly those at Ise, Atsuta, Izumo, or Meiji, have the *Torii-mon* constructed with plain Hinoki wood (Japanese cypress), with the horizontal beams perfectly straight, unpainted, and without signs.

The *Torii-mon* in this garden is modeled after the famous camphorwood one erected at Miyajima, which stands in the water of the sea, and is the only one in Japan placed in such a position. It is admirable in proportion, gives an air of great dignity, and harmonizes most beautifully with its surroundings (Fig. 17).

Miya-jima, or Temple Island, is in the western part of the Inland Sea of Japan, not far from the city of Hiroshima. Although



FIG. 17. The *Torii* (2442).

small in area, nature has wrought it out with numerous mountains, cascades, and valleys, which are thickly wooded. The highest mountain is about 1800 feet. In the reign of Empress Suiko (A.D. 593-628) this island was dedicated to the Shinto Goddess Ichiki-shima-hime, and from this the alternative name of *Itsukushima*, or Island of Magnificence, is derived.

In the 12th Century, Kiyomori, who was the most powerful of the Taira Clan, and practically ruled Japan during this era, greatly glorified this temple in such a manner that it soon won the reputation of one of the Three Chief Sights (*San-kei*) of Japan. The other two sights were the Pine Island (*Matsushima*) in the Province Rikuzen, and *Ama-no-hashidate* in the Province Tango.

The beautiful valleys of Miya-jima trend down to the sea and, among groves of maple trees, there nestles a little village with inns and tea houses for the pilgrims. An ancient religious rule forbade all births or deaths on this island. No dogs were allowed to be present and every effort was made to keep it entirely free from all contamination.

The temple itself, being partly built out over the sea on piles, appears at high tide to float upon the surface of the water. Not far from the main landing veranda of the shrine, the huge camphor-wood Torii stands in the water. If a pilgrim asks the temple priest, offering a few dollars, for the entire illumination for the night (*Sotomyo*), a temple attendant early in the evening would call for the pilgrim and his party in his rowboat and convey them to the temple, rowing them beneath the great Torii to the temple veranda. The waiting priest would then lead them to the inner shrine and offer a prayer, with the Shinto music. The Floating Temple is situated in the recess of an inlet. The myriad of faintly flickering lights from the stone lanterns standing on extensive shores on both sides, narrowing gradually into the temple shrine or vanishing point, and also the lights from the bronze lanterns hanging down from the long row of galleries, all casting their reflections upon the water in the dusky evening, give a gossamer-like aspect of peculiar charm as gorgeous and free and colossal as one's grandest dreams.

The Lotus (Hasu-No-Hana)

As I have stated before, this garden has a characteristic feature of a Buddhist Temple garden, namely, the Lotus (*Nelumbo nucifera*). It is indeed a rare treat on this Western Hemisphere to see the genuine Lotus flowers. In this garden they grow profusely, having spread from a small area under the Torii (Fig. 17) until now they almost fill the lake (Fig. 18). In Japan, the cultivation of the Lotus flowers was originally confined to the Buddhist Temple gardens, for it is regarded by them as a sacred flower. It has, however, escaped from cultivation and grows extensively in marshy places, where its rootstocks are gathered and used as food.

I have often been asked by the admirers of oriental art why so many phases of Buddhist art are associated with the Lotus flower and why the Buddhist considers the flower sacred. The Lotus flowers in remote time were transported into China, Corea, and Japan from India. We call this flower by the single word *Lotus*, but in ancient India it had three separate terms applied, according to the stage in the life of the flower. When it was in the bud it was called *Kumara*, when in full bloom *Pundarika*, and when the petals were falling from the developing seed pod it was called *Kamara*.

The Lotus at the stage of *Pundarika*, or full bloom, discloses the pod holding the seeds all ready for their renewing of life. The root in the water is the past, full bloom is the present, and the seed pod is the future. Of all flowers in the world, the Lotus is the only blooming plant that clearly demonstrates the past, present and future, all at one time. It thus symbolizes the immortality of the soul. It was for this reason that Sakamuni-Buddha adapted the name of Lotus and applied to his most important doctrine "The Covenant of Eight Years," preaching *Saddharma-Pundarika* or "The Supreme Law of the Lotus Flower," which is of great and central interest in Chinese and Japanese civilization. Buddha often quoted in his scripture:—"Emanating from dirt through the water and seeking the light of the sun—Immaculate purity."

The real lovers of Lotus flowers watch them at midnight from the edge of the pond when the whole universe is solemn and quiet, not only to inhale their fragrant odor, but also to hear the fascin-



FIG. 18. Lotus (*Nelumbo nucifera*) in the Lake (5621).

ating tones of the breaking buds, or toward sunrise, the low rustling sounds of the petals of the reopening blooms, which are often compared by Oriental poets to the swishing of the dancing skirts of celestial angels.

The Rear Gate (Ura-Mon)

The way along the lake shore, skirting the edge of the pine grove, leads the visitor to the Rear Gate. This is constructed in a typical tea garden style, with the double-barred hinged doors and open bamboo sleeve fence at each end. The side posts have cross pieces and bracketing at the top which carry a projecting board roof. An antique looking tablet of wood bearing the inscription Lakeside Terrace (*Chihan*) is placed overhead between the two lintels (Fig. 19).

General Observations on Gardens in Japan

It is interesting to know that the primary knowledge of Japanese children for landscape gardens is obtained by actual contact with various gardens in their tutelary Buddhist temples. The children visit these temples and gardens accompanied by their parents on many occasions, such as the anniversary of the birth of Buddha, the celebration of Buddha's Nirvana, and the propitiation of *Kuan-non*, Goddess of Mercy, or the memorial rituals performed for the spirit of departed ancestors. On such days the visitors are received by the chief priest of each temple at the Drawing Hall (*Sho-in*) of the Monastery. From its spacious veranda they may obtain the full view of the garden—its lake, rocks, trees, and shrubs. The garden varies according to the size of the village, but there are three to seven Buddhist temples in nearly every village all over Japan, each having distinctive gardens.

These landscape gardens in Japan are costly in their production. From one standpoint, they are the product of luxury, but they have resulted from the intense desire of the Japanese people to enjoy nature. This has further resulted in the expenditure of enormous sums of money for the creation of these gardens.

The large landscape gardens are associated either with the temples or with the palaces of the Mikado and the higher nobility. In the feudal days of Japan, many fine gardens were constructed



FIG. 19. The Rear Gate (*Ura-Mon*).

by the feudal lords. Many of these have been destroyed and others have been converted into public parks.

There are two main styles of the landscape garden, the Artificial Hill or *Tsuki-yama*, in which mountains, ravines, waterfalls, and other natural features are represented. The other type is the Level Garden or *Hira-niwa*.

In the 15th Century, three styles of elaboration, finished, intermediary, and sketch, or *Shin*, *Gyo* and *So*, in other words, formal, semi-formal and informal, came into vogue in the art of garden making. Their applications vary according to the usage of quantities in stones, streams or lakes with hills, depending chiefly on the degree of elaboration, any definite line of demarkation being a task impossible to draw here. The Brooklyn Japanese Garden may be called a semi-formal or intermediary type (*Gyo-no-niwa*).

Tea garden (*Cha-niwa*) is another distinct type attaching to the tea villa (*Cha-seki*). It is generally confined to a small area, but it is most tastefully designed, deft in grouping rocks with trees and shrubs, producing a fascinating bit of nature, which is a source of genuine admiration. The style was originated by Soami, a master painter and favorite associate of Shogun Yoshimara (1436-1490) in the Silver Pavilion Temple (*Ginkakuji*), in a narrow space partitioned off from the garden proper. Later, Sen-no-Rikyu perfected its style. The stones and all accessories for the tea garden are selected with great care as to their form, color and patina. A green moss-covered stone is highly desired, for the garden must look natural and ancient with quiet refinement.

Miniature Landscape Gardens

In Old Japan a small open space surrounded by buildings was called Secluded Yard (*Tsubo*). At the present time, trees or shrubs arranged in an open space are frequently called the Front Planting (*Senzai*). These are in contrast to the large gardens in the Buddhist temples with their vista of natural landscape with running water and other artificial features. Such a garden is called a Forest and Spring Garden (*Rinsen*).

Esteem for the Japanese garden is so high that the expenditure for the garden is often much greater than that for the residence. Even where there is only a small amount of space, a characteristic

miniature landscape garden is constructed. A few square feet of ground, so long as rain falls on it and dew moistens it, will serve as a garden. It is common to observe, in the small quarters occupied by a family, a wonderful glimpse of Japanese gardening, devised in a small space by digging deeply and setting selected rocks, thus creating the illusion of a ravine.

Flower Gardens (Hana-Yashiki)

The viewing of flowers is a festival occasion in Japan. The plum and cherry trees and the azalea shrubs in masses in the fields or on the banks of the river, are visited by throngs in the flowering season. There are special places in which the peony, azalea, iris, wisteria, chrysanthemum, *Hagi* (bush clover), and morning and evening glories are cultivated. These are known by the name of *Hana-Yashiki*. Excellent restaurant accommodations are provided, and anyone can enjoy these flowers according to their seasons. Plum blossoms at Kamata, peony flowers and azalea at Okubo, iris flowers at Horikiri, lespedeza at Sumida, and chrysanthemum flowers at Hongo.

One great recreation enjoyed by the mass of Japanese people is Fête Day of local deity (*En-nichi*); on that evening hundreds of street stalls open up their bazaars along the main thoroughfare and most conspicuous are the arrays of *Uekiya* or nurserymen. The whole local streets are transformed into open flower gardens; the articles range from a tiny potted plant to large trees, all kinds of flowers in season, dwarf trees, miniature gardens and shrubs. For instance, in the city of Tokio these Fête nights take place almost every evening in at least ten to fifteen different localities; no vehicles are allowed to enter into the Fête limit after dark. No well-to-do merchant is allowed to open a street stall; the license is limited only to the merchants of small means.

Winter Decorations

A Japanese landscape garden retains its beauty throughout the winter. Ephemeral plants, so far as possible, are eliminated from its construction. Instead, the pines and firs and other evergreens are conspicuous features. The stones, ravines, and ponds are alike beautiful in the winter season (Fig. 20).



FIG. 20. Snow scene, showing the *Yuki-Yoke* (Snow Protection), consisting of a bamboo pole projecting up through the crown of the pine tree with ropes extending down and fastened to the branches near their tips (4408).

Very often special features are provided, such as the *Yuki-Yoke* (snow protection). The Moon, Snow, and Blossom (*Tsuki-Yuki-Hana*) is a delightful combination of nature. Many poems and odes have been composed in connection with them. It is common to construct a straw rope awning in the form of a half-open parasol over a leaning pine tree. This, when partially covered by the wet snow, is very ornamental. The device, of course, has some value as a protection for the tree in winter. The snow view lantern also has a special beauty in the winter season when covered with snow (Fig. 11).

GLOSSARY OF JAPANESE NAMES

Cha-niwa	.....Tea garden
Cha-no-yu	.....Tea Cult
Cha-seki	.....Tea villa
Chihan	.....Lakeside terrace
Chika-yama	.....Near Hill
Dai-myo-jin	.....Great Illuminating Deity
En-nichi	.....Fete Day
Fuji-zuru	.....Wisteria vine
Giboshi	.....Pointed jewel top of lantern
Gohei	.....White paper emblems
Go-shin-to	.....Honorable Deity lantern
Gyo	.....Intermediate
Hana-yashiki	.....Flower gardens
Hasu-no-hana	.....The lotus
Hi-bukuro	.....Fire globe
Hinoki	.....Japanese cypress
Hira-niwa	.....Level garden
Hora	.....Cave
Ike	.....Lake
Inari-myojin	.....Protector of the Harvest
Itsuku-shima	.....Island of Magnificence
Kasane-ochi	.....Layer falls
Kasuga	.....Tall type of lantern
Kibashi	.....Wooden bridge
Ko-ryo	.....Rainbow dragon
Koshi-kake	.....Benches
Machi-ai	.....Waiting pavilion
Machi-ishi	.....Waiting stone

Mat-cha	Pulverized tea whipped in hot water in tea bowl
Mizu-wake	Separate stream stone
Nige-ishi	Fleeing stone
Niwa	Landscape garden
Nuno-biki	Linen spreading falls
Oi-ishi	Chasing stone
Omote-mon	Entrance gate
Reijo-seki	Cliff stone
Ren-so	Lotus window
Rinzen	Forest and spring garden
San-kei	Three chief sights of Japan:—Miya-jima, Matsu-shima and Ama-no-hashida-te
San-sui	Mountain and water landscape
Sen-cha	Tea leaves steeped in hot water in tea pot
Senzai	Front planting
Shima	Island
Shin	Elaborated
Shin-tai-seki	Worshipping stone
Shira-hama	White pebbled beach
Sho-in	Drawing hall
Sho-ji	Paper screen
Sho-rin	Pine grove
Shugo-seki	Guardian Stone
Shuro	Palm fibers
So	Abbreviated
Sode-gaki	Sleeve fence
Soe-yama	Companion Hill
Sotomyo	Entire illumination
Sute-ishi	Cast away stones or idling stones
Sui-ro	Water pavilion
Tobi-ishi	Stepping stones
Taiko-bashi	Drum bridge
Taki	Waterfall
Tasoya	"Who goes there" lantern
Ten-chi-jin	Heaven-earth-man
Torii-mon	Torii gate
Toyama	Distant Peak
Tsubo	Secluded yard
Tsuki-mi-tei	Moon-view pavilion
Tsuki-yama	Constructed mountain
Uekiya	Nurseryman
Uha-hoshi	Cormorant feather-drying stone
Ura-mon	Rear gate
Yae-zakura	Double petaled cherry

Yami-jima	.....	Mountain island
Yen-so	.....	Circular window
Yen-za	Straw mats
Yukimi	Snow view stone lantern
Yuki-Yoke	Snow protection

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GENERAL INFORMATION

MEMBERSHIP.—All persons who are interested in the objects and maintenance of the Brooklyn Botanic Garden are eligible to membership. Members enjoy special privileges. Annual Membership, \$70 yearly; Sustaining Membership, \$25 yearly; Life Membership, \$500. Full information concerning membership may be had by addressing *The Director, Brooklyn Botanic Garden, Brooklyn, N. Y.* Telephone 6773 Prospect.

THE BOTANIC GARDEN is open free to the public daily from 8 a.m. until dusk; on Sundays and Holidays open at 10 a.m.

ENTRANCES.—On Flatbush Avenue, near Empire Boulevard (Malbone Street), and near Mt. Prospect Reservoir; on Washington Avenue, south of Eastern Parkway and near Empire Boulevard; on Eastern Parkway, west of the Museum Building.

The street entrance to the Laboratory Building is at 1000 Washington Avenue, opposite Montgomery Street.

TO ASSIST MEMBERS and others in studying the collections the services of a docent may be obtained. This service is free of charge to members of the Botanic Garden; to others there is a charge of 50 cents per person. Arrangements must be made by application to the Curator of Public Instruction at least one week in advance. No parties of less than six adults will be conducted.

TO REACH THE GARDEN take Broadway (B.M.T.) Subway to Prospect Park Station; Interborough Subway to Eastern Parkway-Brooklyn Museum Station; Flatbush Avenue trolley to Empire Boulevard; Franklin Avenue, Lorimer Street, and Tompkins Avenue trolleys to Washington Avenue; St. John's Place trolley to Sterling Place and Washington Avenue; Union Street and Vanderbilt Avenue trolleys to Prospect Park Plaza and Union Street.

PUBLICATIONS
OF THE
BROOKLYN BOTANIC GARDEN

RECORD. Established, January, 1912. An administrative periodical issued quarterly (1912-1928); bimonthly beginning with 1929. Contains, among other things, the *Annual Report* of the director and heads of departments; special reports, announcements of courses of instruction, seed list, guides, miscellaneous papers, and notes concerning Garden progress and events. Free to members of the Garden. To others \$1.50 a year, 25 cents a number. Circulates in 41 countries.

MEMOIRS. Established, July, 1918. Published irregularly. Circulates in 47 countries.

Volume I. *Dedication Papers*: comprising 33 scientific papers presented at the dedication of the laboratory building and plant houses, April 19-21, 1917. 521 pages. Price \$3.50, plus postage.

Volume II. The vegetation of Long Island. Part I. The vegetation of Montauk: A study of grassland and forest. By Norman Taylor, June 11, 1923. 108 pages. Price \$1.00, plus postage.

Volume III. Vegetation of Mount Desert Island, Maine, and its environment. By Barrington Moore and Norman Taylor, June 10, 1927. 151 pages. Price \$1.60.

CONTRIBUTIONS. Established, April 1, 1911. Papers originally published in periodicals, reissued as "separates," without change of paging, and numbered consecutively. This series includes occasional papers, as well as those embodying the results of research done at the Garden, or by members of its staff or students. Twenty-five numbers constitute one volume. Price 25 cents each, \$5.00 a volume. Circulates in 34 countries.

54. *The vegetation of the Allegany State Park.* 121 pages. 1928.

55. *Physiologic races of bunt of wheat.* 14 pages. 1928.

56. *The inheritance of resistance of oat hybrids to loose and covered smut.* 48 pages. 1928.

57. *New physiologic races of oat smuts.* 22 pages. 1930.

LEAFLETS. Established, April 10, 1913. Published weekly or biweekly during April, May, June, September, and October. The purpose of the *Leaflets* is primarily to give announcements concerning flowering and other plant activities to be seen in the Garden near the date of issue, and to give popular, elementary information about plant life for teachers and others. Free to members of the Garden. To others, fifty cents a series. Single numbers 5 cents each. Circulates in 28 countries.

GUIDES to the collections, buildings, and grounds. Price based upon cost of publication. Issued as numbers of the *Record*; see above.

Guide No. 2. Gardens within a Garden: A general guide to the grounds. Views and folded map. Published, May, 1929. (Brooklyn Bot. Gard. Record, 18^o: 153-188.) Price, 25 cents.

Guide No. 3. The story of our metate: A chronicle of corn. Illustrated. Published, December, 1929. (Brooklyn Bot. Gard. Record, 18^o: 283-307.) Price, 25 cents.

SEED LIST. (*Delectus Seminum*) Established, December, 1914. Since 1925 issued each year in the January number of the *Record*. Circulation includes 143 botanic gardens and institutions located in 42 countries.

AMERICAN JOURNAL OF BOTANY. Established, January, 1914. Published, in cooperation with the BOTANICAL SOCIETY OF AMERICA, monthly, except during August and September. Subscription, \$7.00 a year. Circulates in 48 countries.

ECOLOGY. Established, January, 1920. Published quarterly in cooperation with the ECOLOGICAL SOCIETY OF AMERICA. Subscription, \$4.00 a year. Circulates in 48 countries.

GENETICS. Established, January, 1916. Bimonthly. Subscription, \$6.00 a year. Circulates in 37 countries.

BROOKLYN BOTANIC GARDEN RECORD

VOL. XIX

SEPTEMBER, 1930

NO. 5

PROSPECTUS

OF COURSES, LECTURES, AND OTHER EDUCATIONAL
ADVANTAGES OFFERED TO MEMBERS AND TO
THE GENERAL PUBLIC

1930-31

PUBLISHED BIMONTHLY
AT FRINCE AND LEMON STS., LANCASTER, PA.
BY THE BROOKLYN INSTITUTE OF ARTS AND SCIENCES
BROOKLYN, N. Y.

Entered as second-class matter in the post-office at Lancaster, Pa., under act of August 24, 1912.

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GENERAL INFORMATION ABOUT THE NATURE AND ACTIVITIES OF THE BROOKLYN BOTANIC GARDEN

THE BROOKLYN BOTANIC GARDEN, established in 1910, is a department of the Brooklyn Institute of Arts and Sciences. It is supported in part by municipal appropriations, and in part by private funds, including income from endowment, membership dues, and special contributions. Its articulation with the City is through the Department of Parks.

By an Agreement with the City of New York, the functions of the Garden have been defined as two-fold, and may be summarized as follows: first, the advancement of botanical science through original research; and second, the dissemination of a knowledge of plants.

The first of these activities is carried on by director, curators, resident investigators, fellows, and others, who devote all or a part of their time to independent investigation.

The second, the dissemination of botanical knowledge, is accomplished in the following ways:

- I. By the teaching of classes—
 - a. of children who come voluntarily outside of school hours;
 - b. of children who come with their teachers from public and private schools for special lessons on plant life and closely related subjects;
 - c. of adults who are interested in some phase of pure or applied botany.
- II. By lectures at schools and elsewhere by the various staff members.
- III. By broadcasting.
- IV. By loan sets of lantern slides accompanied by lecture text, for use in the schools.
- V. By the distribution to schools of study material for classes in botany, biology, and nature study.
- VI. By public lectures and educational motion pictures at the Botanic Garden.

- VII. By maintaining labelled collections of living plants, arranged systematically and otherwise on the grounds and in the Conservatories of the Garden.
- VIII. By the herbarium, containing specimens of preserved plants from all parts of the world.
- IX. By maintaining a reference library on plant life and related subjects, open free to the public daily (except Sundays and holidays).
- X. By the following periodicals, published by the Botanic Garden:
1. *American Journal of Botany*.
 2. *Ecology*.
 3. *Genetics*.
 4. *Brooklyn Botanic Garden Record*, including *Guides*.
 5. *Leaflets*.
 6. *Contributions*.
 7. *Memoirs*.
- XI. By popular and technical articles in journals and the public press.
- XII. By the maintenance of a Bureau of Public Information on all phases of plant life.
- XIII. By providing docents to accompany members and others who wish to view the collections under guidance.
- XIV. By cooperating with City Departments and other agencies in the dissemination of botanical knowledge.

The Brooklyn Botanic Garden is also taking an active part in the State-wide movement for legislation for the conservation of our native American plants.

A brief summary and report of the public educational work of the Garden from 1910 to 1928, with some attempt to set forth the fundamental principles upon which it is based, was published in the *Brooklyn Botanic Garden RECORD* for July, 1929. On request, copies will be sent gratis to those engaged in educational work.

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VOL. XIX

SEPTEMBER, 1930

NO. 5

PROSPECTUS: 1930-31

I. COOPERATION WITH LOCAL SCHOOLS

The Brooklyn Botanic Garden aims to cooperate in every practicable way with the public and private schools of Greater New York in all matters pertaining to the study of plants and closely related subjects. The purpose of the Garden in this connection is to supplement and enrich the school work in the way of instruction, demonstration, methods, study material, etc., which otherwise would not be available.

Geography classes, as well as classes in nature study and botany, are finding the collection of useful plants in the economic plant house, and also the Japanese Garden, valuable adjuncts to their class work. Arrangements may be made by teachers of geography to have their classes study these collections under guidance. Illustrated lectures for geography classes may also be arranged for at the Garden.

The systematic collection in the main part of the Garden, where the living plants are arranged by orders and families, is proving of great value for demonstration to visiting high school classes in botany.

A. Talks at Schools.—The principals of public or private schools may arrange to have lantern talks given at the schools on various topics related to nature study, such as garden work with children, tree planting, and Arbor Day. If an illustrated lecture is desired, the lantern and operator must be provided by the school, but slides will be furnished by the Botanic Garden. Address the *Curator of Elementary Instruction* for a list of talks and for appointments.

B. School Classes at the Garden.—(a) Schools not provided

with a stereopticon, and other schools, may arrange for classes, accompanied by their teachers, to come to the Botanic Garden for lectures either by the teacher or by a member of the Garden Staff.

(b) Notice of such a visit should be sent at least *one week* previous to the date on which a talk is desired. Blank forms are provided by the Garden for this purpose. These talks will be illustrated by lantern slides, and by the conservatory collection of useful plants from the tropics and subtropics. Fall and spring announcements of topics will be issued during 1930-31.

(c) The Garden equipment, including greenhouses, plant material, lecture rooms, lantern, and slides, is at the disposal of teachers who desire to instruct their own classes at the Garden. Arrangements must be made in advance so that such work will not conflict with other classes and lectures. For High School classes address the *Curator of Public Instruction*. For Junior High and Elementary School classes address the *Curator of Elementary Instruction*.

(d) The principal of any elementary or high school in Brooklyn may arrange also for a series of six lessons on plant culture to be given during the fall or spring to a class. A small fee is charged to cover the cost of the materials used. The plants raised become the property of the pupils. The lessons will be worked out for the most part in the greenhouse, and the class must be accompanied by its teacher. This is adapted for pupils above the third grade.

C. Seeds for School and Home Planting.—Penny packets of seeds are put up by the Botanic Garden for children's use. In the early spring, lists of these seeds and other information may be secured on application to the *Curator of Elementary Instruction*.

D. Conferences.—Conferences may be arranged by teachers and principals for the discussion of problems in connection with gardening and nature study. Appointments must be made in advance. Address Miss Ellen Eddy Shaw.

E. Study and Loan Material.—To the extent of its facilities, the Garden will provide, on request, various algae and protozoa, as well as living plants, leaves and twigs, or other plant parts for study. When containers are necessary, as in the case of the algae and protozoa, they must be furnished by the school. Petri dishes will, on request, be filled with sterilized nutrient agar ready for use in the study of bacteria and molds. They should be delivered to the Garden, *clean*, and in general one week before the

agar is desired. In all cases arrangements must be made by the teachers for calling for such material. Address, by mail or telephone, Miss Hester M. Rusk.

MATERIAL USUALLY AVAILABLE

1. Protozoa: Paramoecium and others.
2. Pleurococcus.
3. Spirogyra.
4. Vaucheria.
5. Blue-green algae: Oscillatoria and others.
6. Moss plants: gametophyte and sporophyte, with capsules.
7. Liverworts: Conocephalum and Lunularia.
8. Fern prothallia. For these, a Petri dish with a cover is the best container to bring, since the prothallia dry out quickly.
9. Fern sporophylls (with sori).
10. Geranium, Coleus and Tradescantia—variegated green and white, loaned for photosynthesis experiment.
11. Cacti, pitcher plant, Selaginella and others—loaned for demonstration.
12. Elodea—to show movement of protoplasm.
13. Various collections loaned for exhibit: *e.g.*, lichens, fungi, plant diseases, fruits, modified leaves, demonstrations of Mendel's law.

F. Demonstration Experiments.—Teachers may arrange to have various physiological experiments or demonstrations conducted at the Garden for the benefit of their classes. Communications in regard to these matters should be addressed to the *Curator of Public Instruction*.

G. Loan Sets of Lantern Slides.—Sets of lantern slides have been prepared for loan to the schools. Each set is accompanied by a short syllabus of explanatory nature. In all cases these sets must be called for by a special messenger and returned promptly in good condition. The subjects now available are as follows. Other sets are in preparation.

1. Plant Life
2. Spring Wild Flowers
3. Common Trees

4. Fall Wild Flowers
5. Forestry (2 sets)
6. Conservation of Native Plants

II. BUREAU OF PUBLIC INFORMATION

Each year hundreds of requests for information about plants are answered by the various members of the Garden staff, personally, by mail, or telephone. These questions, many of them most unusual and interesting, extend into practically every field of pure and applied botany, and the information sought is gladly given wherever possible. Inquiries should be directed to the *Curator of Public Instruction*, preferably by letter. If the identification of plants is desired, it is best to enclose as large a specimen as possible of the plant in question. If diseased plants are concerned it is advisable to enclose a representative specimen of the part diseased.

III. DOCENTRY

To assist members and others in studying the collections the services of a docent may be obtained. Arrangements must be made by application to the Curator of Public Instruction at least one week in advance. No parties of less than six adults will be conducted. This service is free of charge to members; to others there is a charge of 50 cents per person. For information concerning membership in the Botanic Garden see page 3 of the cover of this PROSPECTUS.

IV. TEACHING STAFF

MARGARET MAXWELL DORWARD, A.B., Acting Assistant Curator of Elementary Instruction.

A.B., Smith College, 1927; Assistant in Botany, Smith College, 1928; Instructor, Brooklyn Botanic Garden, 1930; Acting Assistant Curator of Elementary Instruction, Brooklyn Botanic Garden, 1930-.

MONTAGUE FREE, Horticulturist.

Botanic Garden, Cambridge, England, 1899-1906; Warley Place Gardens, 1906-1908; First Class Certificate, Royal Horticultural

Society, 1910; Royal Botanic Gardens, Kew, (Certificate) 1908-1912; Dept. of Floriculture, N. Y. State College of Agriculture, Ithaca, N. Y., 1912-1913; Instructor in Floriculture, School of Horticulture for Women, Ambler, Penna., 1913; Head Gardener, Brooklyn Botanic Garden, 1914-1920; Horticulturist and Head Gardener 1920-24; Horticulturist, 1924-.

ARTHUR HARMOUNT GRAVES, Ph.D., Curator of Public Instruction.

A.B., Yale, 1900; Ph.D., 1907; University of London, 1914-1915; Assistant in Botany, Sheffield Scientific School and Yale School of Forestry, 1902-1904; Instructor in Forest Botany, Yale School of Forestry, 1904-1906; Instructor in Botany, Sheffield Scientific School, 1906-1909; Assistant Professor, 1909-1914; Associate Professor of Biology, Connecticut College for Women, 1916-1917; Pathologist and Collaborator, Office of Investigations in Forest Pathology, U. S. Department of Agriculture, 1918-; Curator of Public Instruction, Brooklyn Botanic Garden, 1921-.

ALFRED GUNDERSEN, Docteur de l'Universite (Paris), Curator of Plants.

A.B., Stanford University, 1897; A.M., Harvard University, 1907; Docteur de l'Universite, Paris, 1910; Teacher, secondary schools, Boston, Mass., 1898-1903; Assistant, Arnold Arboretum, 1910-1913; Herbarium Assistant, Brooklyn Botanic Garden, 1914-1915; Assistant Curator of the Herbarium, 1916-1919; Associate Curator of Plants, 1920-1924; Curator of Plants, 1924-

H. DOROTHY JENKINS, A.B., Instructor.

A.B., Mt. Holyoke College, 1927; Assistant, Newark Museum, 1929-1930; Instructor, Brooklyn Botanic Garden, 1930-.

FRANCES M. MINER, A. B., Instructor.

A.B., Smith College, 1927; Local Director, Elmira Council Girl Scouts, Elmira, N. Y., 1927-1930; Director, Elmira Girl Scout Camp, 1928-1930; Instructor, Brooklyn Botanic Garden, 1930-.

HESTER M. RUSK, A.M., Instructor.

A.B., Columbia University, 1912; A.M., 1917; Instructor in Botany, Nebraska University Agricultural High School, 1913-1915; Assistant in Botany, Barnard College, 1915-1918; Instruc-

tor, 1918-1920; Technical Assistant, New York Botanical Garden, 1920-1926; Curatorial Assistant, Brooklyn Botanic Garden, 1926-1927; Instructor, 1928-.

ELLEN EDDY SHAW, B.S., Curator of Elementary Instruction.

B.S., Tufts College, 1902; Tufts Medical School, 1902; Supervisor of Nature Study and Head of Science Dept., High School, Wayland and Cochrane, Mass., 1902-1905; Supervisor of Nature Study Dept., State Normal School, New Paltz, N. Y., 1905-1906, 1907-1909; Supervisor of Nature Study, Rochester City Training School, 1905-1907; Lecturer in Nature Study, State Board of Education, New York, 1907-1910; Supervisor of Nature Study, Ethical Culture School, New York City, 1910-1913; Lecturer in Spring Garden Course at Pratt Institute Kindergarten, 1912-1916; Lecturer in Nature Study, State Board of Education, West Virginia, 1912; Curator of Elementary Instruction, Brooklyn Botanic Garden, 1913-.

HENRY KNUTE SVENSON, Ph.D., Assistant Curator of Plants.

A.B., Harvard University, 1920; A.M., 1922; Ph.D., 1928; Assistant, Arnold Arboretum, 1920; Instructor in Biology, Union College, 1922-1925; Assistant Professor, 1925-1927; Assistant in Gray Herbarium, Harvard University, 1928-1929; Editorial Work on Biological Abstracts, 1929; Assistant Curator of Plants, Brooklyn Botanic Garden, 1930-.

V. COURSES OF INSTRUCTION

Courses of instruction are offered in Botany, Gardening, and Nature Study, and are divided into 4 classes:

- A. For the general public ("A" courses, p. 241)
- B. For teachers ("B" courses, p. 244)
- C. For children ("C" courses, p. 246)
- D. Other courses of a special nature ("D" courses, p. 248)

No course will be given when less than ten persons apply for registration. Tuition is free, but for the majority of courses a small fee is charged to cover the cost of the materials used. Since registration in many of the courses is restricted to a fixed number on account of the limited space available in the greenhouses, and

for other reasons, applicants are urged to send in their entrance fee to the Secretary, Brooklyn Botanic Garden, several days in advance of the first exercise. This avoids delay at the beginning of the first exercise, ensures a place in the course, and enables the instructor to provide adequate material for the class.

The following equipment is available for the courses:

1. Three *Classrooms* (in addition to the Boys' and Girls' Club Room in the Laboratory Building), equipped with stereoscopes and views, a stereopticon, plant collections, economic exhibits, models, and other apparatus and materials for instruction.

2. Two *Laboratory Rooms*, with the usual equipment for plant study.

3. *The Instructional Greenhouses*, three in number, for the use of juvenile as well as adult classes for instruction in plant propagation and related subjects.

4. *The Children's Garden*, on a piece of land about three-quarters of an acre in extent, in the southeast part of the Botanic Garden, divided into about 150 plots which are used throughout the season for practical individual instruction in gardening.

5. *The Children's Building*, near the north end of this plot, containing rooms for consultation and for the storage of tools, seeds, notebooks, special collections, etc.

6. *The Auditorium*, on the ground floor, capable of seating 570 persons, and equipped with a motion-picture lantern and stereopticon.

In addition to these accommodations, the dried plant specimens in the herbarium and the living plants in the conservatories and plantations are readily accessible, while the main library and children's library, which contain a comprehensive collection of books on every phase of gardening and plant life, may be consulted freely at any time.

A. Courses for the General Public.

The following courses are open to any one who has a general interest in plants. Teachers are welcome. They are *free to members of the Botanic Garden*; * for others a small fee is required, as specified.

* For information concerning membership in the Brooklyn Botanic Garden consult the third page of the cover of this PROSPECTUS.

1. *Full Year Course*

A15. Field Botany.—Thirty sessions. This is mainly an outdoor course, given in the Botanic Garden and Prospect Park, having for its chief object an acquaintance with the plants one meets with commonly in Greater New York and vicinity, including seed plants (trees, shrubs, and herbs), ferns, mosses and hepatics, algae, and fungi. *Fee* \$5. *Thursdays*, 4 p.m. (Not offered in 1930-31.)

2. *Fall Courses*

A4. Gardening in the Fall.—Five lessons, with practical work in the greenhouse, on the methods of making cuttings, the various kinds of bulbs for fall planting, their treatment and care, the proper management of house plants, and a discussion of the kinds suitable for cultivation. *On account of restricted space in the greenhouse, this class must be limited to 40. Registration according to the order of application. Fee, \$5. Mondays*, 4 p.m., *October 6 to November 3.* Mr. Free.

A5. Trees and Shrubs in their Winter Condition.—Eight outdoor lessons in the Botanic Garden and elsewhere in Greater New York on the characteristics of our common trees and shrubs, both native and cultivated, emphasizing their distinguishing features in the winter condition. *Fee, \$4. Saturdays*, 2:30 p.m., *October 4 to December 6. (Omitting October 11 and November 29.)* Dr. Graves.

A13. Flowering Plants of Greater New York: Fall Course. Four sessions. Field identification of the flowering plants of Greater New York, with special reference to fall-flowering species and methods of seed dispersal. *Fee, \$2. Saturdays*, 2:30 p.m., *October 18 to November 8.* First exercise at the Brooklyn Botanic Garden. Dr. Svenson and Miss Rusk.

3. *Spring Courses*

A7. The Story of Plant and Animal Evolution.—The parallel progress of plant and animal life through the ages, outlined in four illustrated lectures: (1) Water plants and water animals. (2) The transition from water life to land life. (3) Mesozoic life:

gymnosperms and reptiles. (4) Cenozoic life: flowering plants and mammals. (*Not offered in 1930-31.*)

Dr. Graves, Dr. Gundersen, and Dr. Svenson.

A17. Glimpses of the History of Botany.—Four illustrated lectures, with subjects as follows: (1) Pre-Linnaean botanists. (2) Some early plant physiologists. (3) Early botanical exploration in North America. (4) Modern trends in systematic botany. *Fee, \$2. Fridays, 4 p.m., January 30 to February 20.*

Dr. Gundersen, Dr. Graves, and Dr. Svenson.

A1. Plants in the Home.—How to grow them. Five talks with demonstrations. Practice in potting, mixing soils, making cuttings, etc. This course deals with the principles to be followed in raising plants. The members of the class have the privilege of keeping the plants they have raised. *On account of restricted space in the greenhouse, this class must be limited to 40. Registration according to the order of application. Fee, \$5. Fridays, 4 p.m., February 27 to March 27.* Mr. Free.

A8. Plant Families.—Eight outdoor lessons in the Botanic Garden, taking up the structure of flowers and the characteristics of the more important plant families. (*Not offered in 1931.*)

Dr. Gundersen.

A9. Trees and Shrubs of Greater New York.—Ten outdoor lessons at the Garden and elsewhere in Greater New York, the principal object being to gain a ready acquaintance with the common trees and shrubs of the eastern United States, which are well represented in this region. The species are considered in systematic order, and the features pointed out by which they may be most easily recognized; also their habits, rate of growth, economic value and use, methods of planting and propagation; importance in forestry, horticulture, and landscape art. *Fee, \$5. Saturdays, 2:30 p.m., March 28 to June 13. (Omitting April 4 and May 30.)*

Dr. Graves.

A18. Ornamental Shrubs.—Eight weekly field trips dealing with the shrubs used in ornamental planting, their habits, uses, and botanical relationships. The classes are held out-of-doors, weather permitting, in the Botanic Garden and in Prospect Park. *Fee, \$1. Wednesdays, 4 p.m., April 22 to June 10.* Dr. Gundersen.

A11. Flowering Plants of Greater New York: Spring Course.—A field course of eight lessons in the parks and woodlands of Greater New York. The common native and naturalized wild flowers are studied as they come into flower, and their distinguishing features pointed out. *Fee, \$4. Saturday afternoons; April 25 to June 20. (Omitting May 30.)* Dr. Svenson and Miss Rusk.

A16. Plant Geography.—A course of six lectures and conferences on the chief geographic areas of the eastern United States, and their representative vegetation, with occasional excursions Saturday afternoons. *Fee, \$3. Tuesdays, 4 p.m., May 5 to June 9.* Dr. Svenson.

B. Courses for Teachers: Given in Cooperation with the Brooklyn Teachers Association

These courses have been accepted by the Brooklyn Teachers Association, and appear in its Syllabus of Courses. On satisfactory completion of each course, the student is awarded a certificate by the Brooklyn Teachers Association, in cooperation with the Brooklyn Botanic Garden. The courses are also accepted by the New York Board of Education for credit toward higher teaching licenses, one credit being granted for each 15 hours (with the exception of "B8, Plant Culture"). Credits may also be used toward advanced standing in colleges or universities. Nature materials used in the courses, and plants raised become the property of the student.

Members of the Garden are entitled to a 50 per cent discount from the regular fee for all "B" courses; from other persons the indicated fee is required. *No course will be given when less than ten persons apply.*

B1. General Botany.—Thirty sessions. A course on the structure and functions of plants. About half of the time is spent on seed plants. The rest of the course deals with the lower groups, bacteria, algae, fungi, lichens, mosses, and ferns, their life histories and relationships. Optional laboratory work with the compound microscope. *Fee, \$5. Tuesdays, 4 p.m., beginning October 7.* Miss Rusk.

B2. Nature Study.—Thirty sessions. This course is based on the New York City outline of nature study for grades three to

six inclusive. Mounts, charts, and diagrams are made. The student becomes familiar with actual material. The course is entirely practical, work being done in both field and laboratory. *Fee, \$10. (Not offered in 1930-31.)* Miss Shaw.

B3. Principles of Agriculture and Horticulture.—Thirty sessions. This course is especially helpful to teachers. The principles of horticulture are considered and applied in a practical way through greenhouse, laboratory, and lecture work. The greenhouse work includes the following subjects: plant propagation by means of bulbs, rhizomes, roots, seeds, etc.; the care of the greenhouse; house plants; window-box materials; fertilizers. Insect and fungous pests, grafting, and pruning are also included from both a practical and a theoretical point of view. *Class limited to 60 members. Fee, \$15. Wednesdays, 4 p.m., beginning October 1.* Miss Shaw and Mr. Free.

B4. Pedagogy of Botany and Educational Principles of Children's Gardening and Nature Study.—(Not given in 1930-31.)

B5. Children's Garden Practice.—Fifteen sessions. This course is entirely practical and includes all the outdoor work of the student in his own garden, applying the principles of agriculture and gardening, work with children in the garden. Open only to those who have taken the spring course in 1930. *No fee. Mondays, 4 p.m., beginning October 6.* Miss Shaw and Miss Dorward.

B6. Field Botany.—Thirty sessions. This is mainly an outdoor course, given in the Botanic Garden and Prospect Park, having for its chief object an acquaintance with the plants one meets with commonly in Greater New York and vicinity, including seed plants (trees, shrubs, and herbs), ferns, mosses, and hepatics, algae, and fungi. *Fee, \$5. (Not offered in 1930-31.)*

Dr. Graves and Miss Rusk.

B7. Greenhouse Work.—Thirty sessions. A course for those interested in the propagation and care of house plants. Lessons in repotting ferns; forcing blooming plants; shaping plants; plant insects and diseases; making window boxes, Wardian cases, and desert gardens, will be carried on in the greenhouses. Emphasis will be laid on problems of a practical nature. Limited to those who have taken B3. *Fee, \$15. Thursdays, 4 p.m., beginning October 2.*

Miss Shaw and Mr. Free.

B8. Plant Culture.—A course of twenty weeks duration for those who have taken B3 and B7. *No credits are given for this course.* *Fee, \$15. Tuesdays, 4 p.m., beginning October 21.*

Miss Shaw.

C. Children's Courses

The following courses are open to all boys and girls. Enrollment in these courses entitles the boy or girl to membership in the Boys' and Girls' Club of the Brooklyn Botanic Garden. This club, having an active membership of about 1,000, meets twelve times a year for discussion of subjects related to plant life. Papers, by members, on various botanical and horticultural subjects, are read at these meetings, and the speakers are then entitled to a silver pin, providing they have satisfactorily completed courses of study at the Garden extending over at least six months. For information concerning Children's Room, the Children's Garden Building, and Children's Garden, see pages 253, 254.

C1. Fall Greenhouse Work.—The following courses are for both beginners and advanced students:

Class A.—Open to boys and girls who have never taken any greenhouse work before. *Saturday mornings at 9:15. Fee, fifteen cents. October 25 to December 20.*

Miss Miner and Miss Jenkins.

Class B.—Open to boys and girls over thirteen years of age who have had one year of greenhouse work. Subjects studied: hyacinth, Easter lily, calla lily, the botany of common cultivated plants, etc. *Fee, fifteen cents. Saturday mornings at 9:15, October 25 to December 20.*

Miss Miner.

Class C.—Open to boys and girls who have been in at least two fall greenhouse classes before this. Time of class, 10:30, *Saturday mornings. Fee, fifteen cents. October 25 to December 20.*

Miss Dorward.

Class D.—Open to any boy or girl. Subject: the making of garden Christmas presents. *Saturday mornings at 10:30. Fee, fifteen cents and cost of materials. October 25 to December 20.*

Miss Dorward, Miss Miner, and Miss Jenkins.

Class E.—Silver Pin work as applied to greenhouse and garden work. The members of this class will be selected from students

eligible for this work. Given in January and February, 1931.
No fee. Miss Dorward

C2. Junior Gardeners' Course.—This is a course for boys 14–17 years of age. Lessons are given in the care of border and other flower beds, in the weeding and care of small vegetable gardens, in mowing and watering lawns, repotting plants, etc. Hours to be arranged. *Fee, fifty cents.* Miss Dorward.

C3. Preparation for the Outdoor Garden.—The following classes are open to boys and girls during the spring of each year. The courses are planned for a better understanding of plant life and so that the outdoor garden may become a more intelligent piece of work. On account of limited space in the Children's Greenhouse, classes are limited to twenty. The fee for each course is *fifteen cents* to cover the cost of material.

Boys' Spring Course.—(a) *Saturday* mornings, 9–10:15, *March 7 to April 25.* (b) *Saturday* mornings, 10:30–11:30, *March 7 to April 25.* Miss Dorward and Miss Miner

Girls' Spring Course.—(a) *Saturday* mornings, 9–10:15, *March 7 to April 25.* (b) *Saturday* mornings, 10:30–11:30, *March 7 to April 25.* Miss Miner and Miss Jenkins

C4. Advanced Work for Older Boys and Girls.—How to raise plants, mix soils, transplant, start seedlings for outdoor gardens, etc. Boys and girls who have taken spring courses under C5 are eligible for advanced work. The fee for the course is *twenty-five cents.* Each student may take home his plants and seedlings. This course is open to both boys and girls over twelve years of age. *Saturday* mornings at 9:30, beginning *February 7.* Miss Dorward.

C5. The Beginners' Garden.—Open annually to 50 boys and girls who have never had instruction in gardening at the Brooklyn Botanic Garden. This course takes up the subject of the small garden, what to plant, how to plant it, care, replanting, etc. *Application for plots should be made in person or in writing before March 7.* Size of plots 8 ft. by 10 ft. All crops belong to the individual. *Fee twenty-five cents.* *Saturday* mornings, 9–12, *May 16 to October 3.* Miss Shaw and Assistants.

C6. Second Year Gardens.—Open to 75 boys and girls who

have had one or more seasons at the Brooklyn Botanic Garden—a continuation of Course C5. Registration should be made before January 1 of each year for the ensuing year. *Fee, twenty-five cents. Saturday mornings, 9-12, May 16 to October 3.*

Miss Dorward and Assistants.

C7. Junior Garden Assistants.—Open to older boys and girls, or to those who have mastered Courses C2 and C4. Size of plot 10 ft. by 20 ft. These gardens are for the raising of vegetables. The work is in the nature of a project, "How much can one raise on a plot 10 ft. by 20 ft.?" Hours to be arranged. The student must put in at least two periods a week during the summer vacation, and, if possible, three. Registration date: *April 4. Fee, fifty cents.*

Miss Dorward.

C8. Advanced Nature Work.—A course designed for those older boys and girls who have taken Courses C1-C5. Herbarium specimens will be prepared and the simpler principles of plant classification studied. Projects will be assigned to individuals. *Open only to pupil assistants of the Garden.* Hours to be arranged. *No fee.*

Miss Shaw.

C9. Nature Study for Boy Scouts, Girl Scouts, Camp Fire Girls, Scout Leaders, and Others.—Short courses of at least four periods each, with talks, demonstrations, and field trips in the grounds of the Botanic Garden and Prospect Park to study trees, shrubs, etc. The instruction and schedule dates will be adapted to meet the needs of the various groups that apply. *Open only to groups of at least ten persons.* Hours to be arranged. *No fee.*

Dr. Graves, Miss Miner, and Assistants.

C10. Special Work for High School Pupils.—A course in gardening or greenhouse work adapted for high school pupils. Classes to be arranged for by the high school teacher. *Fee for materials used.*

Miss Shaw and Assistants.

D. Course for Student Nurses

D1. General Botany With Special Reference to Medicinal Plants.—A course of conferences, demonstrations, and field trips for student nurses. The general principles governing the life of plants, as well as the use and care of flowers in the sick

room will be considered. Special attention will be paid to the identification of officinal plants in the field. Hours to be arranged.
No fee. Dr. Graves.

E. Consultation and Independent Investigation

1. Consultation

Consultation and advice, and the facilities of the laboratories, library, and herbarium are freely at the service of members of the Botanic Garden and (to a limited extent) of others with special problems relating to plants or plant products, especially in the following subjects:

1. **Plant diseases** (phytopathology) and classification of fungi (mycology). Dr. Reed.

2. **Plant geography** (phytogeography) and ecology. Dr. Svenson.

3. **Classification and identification of flowering plants** (systematic botany). Special groups studied in the Garden, supplemented by herbarium studies. Dr. Gundersen.

4. **The growing of cultivated plants** and their arrangement; also their adaptation to soils, climate, and other factors (horticulture and gardening). Mr. Free.

2. Investigation*

For the following research courses, open to those properly qualified for independent investigation, there is a charge covering all expenses, including laboratory fee, of \$30 for each full course of 100 credit hours, and \$20 for each half course of 50 credit hours.

E6. Research in Mycology and Plant Pathology.—Independent investigation of problems relating to fungi and fungous diseases of plants. Dr. Reed.

* Courses of graduate rank offered by the Botanic Garden, when approved by the Faculty of the Graduate School of New York University, are listed as courses in the Graduate School, and are given the same credit as other graduate courses. Properly qualified students who take these courses may present them in satisfaction of the requirements for advanced degrees given by the University. Graduate credit has also been allowed elsewhere for such advanced work done at the Garden.

E8. Research in Forest Pathology.—Independent investigation of the diseases of woody plants. Dr. Graves.

E9. Research in Systematic Botany of the Flowering Plants.
Dr. Gundersen and Dr. Svenson.

VI. OTHER EDUCATIONAL FEATURES

Guide Books, Maps, and Souvenir Postcards of the Garden

For those who wish to become acquainted with the various features of the plantations, including the general plan of the systematic section and the nature and location of the various types of special gardens, a guide book is now available entitled "Gardens Within a Garden: a General Guide to the Grounds of the Brooklyn Botanic Garden" (Brooklyn Botanic Garden Record, **18**: 153-188. May, 1929.) "The Story of Our Metate: a Chronicle of Corn" (Brooklyn Botanic Garden Record, **18**: 283-307. December, 1929.) is the title of another guide which gives an illustrated account of the ancient metate (now used as a bird bath) at the northern end of the Rose Garden. "The Japanese Garden of the Brooklyn Botanic Garden" (Brooklyn Botanic Garden Record, **19**: 197-234. July, 1930.) copiously illustrated, outlines briefly the history of Japanese Gardens and explains the meaning of the various features of our Japanese Garden.

These guides have been mailed free to members of the Garden, and are on sale at 25 cents each. Other guides, descriptive of other special features of the Garden, will be published shortly.

A detailed map of the Garden, showing not only the various types of gardens included in the Botanic Garden area, but especially the location of the various orders and families in the Systematic Section, is appended to the General Guide. Copies are on sale at 5 cents each.

A colored picture map of the Garden, $7\frac{1}{2} \times 3\frac{1}{2}$ feet, designed and executed by Miss Helen Sewall, is on view in the Laboratory Building. This map was presented to the Garden at the Annual Spring Inspection, May 14, 1929, as a memorial to the late Dr. Glentworth R. Butler by members of the Woman's Auxiliary and other friends of Dr. Butler. Photographs of this map (in black and white) may be had at 5 cents each.

A set of six souvenir postcards, in colors, may be had at 15 cents a set. The subjects are: Scene in the Children's Garden; The Brook; Daffodils in the Lawn; The Lake; Children's Building and Formal Garden; The Rock Garden (Waterfall and Iris).

Orders for guide books, maps, and souvenir postcards, accompanied by remittance, should be sent to *The Secretary*. They may also be obtained at the Information Desk in the Laboratory Building.

Plantations

The plantations comprise the following sections:

1. General Systematic Section (trees, shrubs, and herbaceous plants arranged according to orders and families).
2. The Local Flora (native wild flower garden).
3. Ecologic Garden.
4. Rock Garden.
5. Japanese Garden.
6. Rose Garden.
7. Iris Garden.
8. Water Garden.
9. Children's Garden.
10. Shakespeare Garden.
11. Horticultural Garden.
12. Experimental Garden.
13. Nursery.

As noted under *Docentry*, arrangements may be made for viewing the plantations under guidance. They are open free to the public daily from 8 a.m. until dusk; on Sundays and holidays from 10 a.m. until dusk.

Conservatories

The Garden conservatories contain a collection of tender and tropical plants. Of special interest for teachers of nature study and geography are the following useful plants from the tropics and subtropics: banana, orange, lemon, lime, kumquat, tamarind, West Indian cedar (the source of the wood used for cigar boxes), eucalyptus, Manila hemp, sisal, pandanus (source of the fiber used

for making certain kinds of fiber hats), fig, grapevines from north and south Africa, date palm, coconut palm, chocolate tree, coffee, tea, ginger, bamboo, mahogany, balsa, cocaine plant, black pepper, annatto (used in coloring butter and cheese), cardamom, olive, pomegranate, logwood, durian, mango, sugar cane, avocado (so-called "alligator pear"), West Indian and other rubber plants, banyan, religious fig of India, and numerous others.

The Conservatories are open April 1 to October 31, 10 a.m.—4:30 p.m. (Sundays, 2—4:30); November 1 to March 31, 10 a.m.—4 p.m. (Sundays 2—4).

Herbarium

The Garden herbarium consists at present of about 188,300 specimens, including phanerogams, ferns, mosses, liverworts, lichens, parasitic and other fungi, algae, and myxomycetes. This collection may be consulted from 9 a.m. until 5 p.m. by those interested, and specimens submitted will be gladly identified.

Library

The rapidly growing library of the Garden comprises at present over 15,000 volumes and over 11,000 pamphlets. This is not a circulating library, but is open free for consultation to all persons daily (except Sundays and holidays) from 9 a.m. until 5 p.m. (Saturdays, 9 to 12). Over 900 periodicals and serial publications devoted to botany and closely related subjects are regularly received. These include the transactions of scientific societies from all quarters of the globe, the bulletins, monographs, reports and other publications of various departments of the United States Government, as well as those of foreign governments; of all state agricultural experiment stations and agricultural colleges; the publications of research laboratories, universities, botanic gardens and other scientific institutions of the world, as well as the files of independent journals devoted to the various phases of plant life. The library is especially rich in publications of foreign countries and has a growing collection of incunabula and other pre-Linnean works.

Bibliographical assistance is rendered to readers by members of the Library staff.

Laboratory Building

The Laboratory Building contains (besides offices of administration and the Library and Herbarium mentioned above) four laboratory rooms, a culture room, three classrooms with stereopticon and other equipment for instruction, a room for the installation of temporary exhibits, six private research rooms, and an auditorium seating about 570 and equipped with motion picture machine, stereopticon and lecture table supplied with water, gas, and electric current for lectures involving experimental work.

Instructional Greenhouses

A range of three greenhouses, each about 20 x 30 feet, is provided for the practical instruction of children and adults in plant propagation and other subjects.

Children's Room

A gift of \$1,500 in 1921 from Mrs. Helen Sherman Pratt, supplemented in 1923 by a further gift of \$500 from Mr. George D. Pratt, has made it possible to provide a beautifully decorated room for the use of the Boys' and Girls' Club. Any boy or girl who is enrolled, or has been enrolled, in any of the children's classes at the Garden is eligible for membership in this club, which now numbers about 1,000 active members. The room contains shelves for a nature-study library, of which a nucleus has already been secured, and is equipped with stereoscopic views, photographs, and preserved and living specimens of plant life, for the instruction and entertainment of boys and girls. The room is open free to all children. Contributions of specimens and of books on nature study and closely related subjects will be most welcome.

Children's Garden Building

This is located in the northern part of the Children's Garden plot and contains a conference room, and rooms for the storage of garden tools and implements. The furniture in the conference room was a gift from Mrs. James H. Post. Various collections of plants, seeds, and insects of economic importance in the garden are accessible here for consultation by the children. A garden library, a gift of friends, has been added. North of the Chil-

dren's Building is a plot planted to ornamental shrubs and herbaceous perennials for the instruction of the children.

Children's Garden

A plot of about three quarters of an acre in the southeast part of the Botanic Garden is devoted to the theoretical and practical instruction of children in gardening. The larger part of this area is laid out in garden plots which will accommodate about 150 children.

Rose Garden

The Rose Garden, occupying about one acre in the northwest part of the Botanic Garden, was formally opened to the public on Sunday afternoon, June 24, 1928. This garden was made possible by a gift of \$10,000, later increased to \$15,000, from Mr. and Mrs. Walter V. Cranford, of Greenwich, Connecticut.

The general plan of the Garden is as follows. At the north end, entrance is gained through a Doric pergola. Three parallel rows of beds extend to the southward from the pergola, as far as the pavilion. In the central row of beds, varieties of hybrid perpetuals have been planted; in each of the two side rows varieties of hybrid teas. In the location of these varieties the older forms appear at the beginning, near the pergola, the most recent productions near the pavilion, with the intermediate forms in chronological sequence between. Varieties of pillar and post roses are planted at regular intervals, on suitable supports, in the beds, with standards between the beds of the side rows. The trellis surrounding the garden as well as the pergola and pavilion furnishes support for climbing roses, while the marginal beds along the trellis are for wild species and their derivatives. South of the pavilion, three additional beds are devoted to historical roses, *i.e.*, those mentioned in ancient literature, and to roses of commercial use.

The Rose Garden is open to the public from 1 to 5 on week-day afternoons, except holidays. Children are admitted only when accompanied by responsible adults.

Japanese Garden

The Japanese Garden, first opened to the public in 1915, was a gift to the city from Mr. Alfred T. White, "the father of the Botanic Garden." Designed by the Japanese architect, Mr. T. Shiota, it represents truly the Japanese idea of a garden. From the tea house (near the east entrance) one can see the *machiiai* or "rest house," the island with the drum bridge, bronze storks, stone and wooden lanterns, the waterfalls, and the wooden Torii standing in the lake. For details and explanations of the meaning of the various features see "The Japanese Garden of the Brooklyn Botanic Garden" (Brooklyn Botanic Garden Record, 19: 197-234. July, 1930.) This garden has been enclosed by a "woven wood" fence, of chestnut poles, imported from France. This fence was presented by a friend of the Botanic Garden.

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GENERAL INFORMATION

MEMBERSHIP.—All persons who are interested in the objects and maintenance of the Brooklyn Botanic Garden are eligible to membership. Members enjoy special privileges. Annual Membership, \$10 yearly; Sustaining Membership, \$25 yearly; Life Membership, \$500. Full information concerning membership may be had by addressing *The Director, Brooklyn Botanic Garden, Brooklyn, N. Y.* Telephone, 6173 Prospect.

THE BOTANIC GARDEN is open free to the public daily from 8 a.m. until dusk; on Sundays and Holidays open at 10 a.m.

ENTRANCES.—On Flatbush Avenue, near Empire Boulevard (Malbone Street), and near Mt. Prospect Reservoir; on Washington Avenue, south of Eastern Parkway and near Empire Boulevard; on Eastern Parkway, west of the Museum Building.

The street entrance to the Laboratory Building is at 1000 Washington Avenue, opposite Montgomery Street.

To ASSIST MEMBERS and others in studying the collections the services of a docent may be obtained. This service is free of charge to *members of the Botanic Garden*; to others there is a charge of 50 cents per person. Arrangements must be made by application to the Curator of Public Instruction at least one week in advance. No parties of less than six adults will be conducted.

To REACH THE GARDEN take Broadway (B.M.T.) Subway to Prospect Park Station; Interborough Subway to Eastern Parkway-Brooklyn Museum Station; Flatbush Avenue trolley to Empire Boulevard; Franklin Avenue, Lorimer Street, or Tompkins Avenue trolleys to Washington Avenue; St. John's Place trolley to Sterling Place and Washington Avenue; Union Street or Vanderbilt Avenue trolleys to Prospect Park Plaza and Union Street.

PUBLICATIONS
OF THE
BROOKLYN BOTANIC GARDEN

RECORD. Established, January, 1912. An administrative periodical issued quarterly (1912-1928); bimonthly beginning with 1929. Contains, among other things, the *Annual Report* of the director and heads of departments, special reports, announcements of courses of instruction, seed list, guides, miscellaneous papers, and notes concerning Garden progress and events. Free to members of the Garden. To others \$1.50 a year, 25 cents a number. Circulates in 41 countries.

MEMOIRS. Established, July, 1918. Published irregularly. Circulates in 47 countries.

Volume I. *Dedication Papers*: comprising 33 scientific papers presented at the dedication of the laboratory building and plant houses, April 19-21, 1917. 521 pages. Price \$3.50, plus postage.

Volume II. The vegetation of Long Island. Part I, The vegetation of Montauk: A study of grassland and forest. By Norman Taylor, June 11, 1923. 108 pages. Price \$1.00, plus postage.

Volume III. Vegetation of Mount Desert Island, Maine, and its environment. By Barrington Moore and Norman Taylor, June 10, 1927. 151 pages. Price \$1.60.

CONTRIBUTIONS. Established, April 1, 1911. Papers originally published in periodicals, reissued as "separates," without change of paging, and numbered consecutively. This series includes occasional papers, as well as those embodying the results of research done at the Garden, or by members of its staff or students. Twenty-five numbers constitute one volume. Price 25 cents each, \$5.00 a volume. Circulates in 34 countries.

54. *The vegetation of the Allegany State Park.* 121 pages. 1928.

55. *Physiologic races of bunt of wheat.* 14 pages. 1928.

56. *The inheritance of resistance of oat hybrids to loose and covered smut.* 48 pages. 1928.

57. *New physiologic races of oat smuts.* 22 pages. 1930.

LEAFLETS. Established, April 10, 1913. Published weekly or biweekly during April, May, June, September, and October. The purpose of the *Leaflets* is primarily to give announcements concerning flowering and other plant activities to be seen in the Garden near the date of issue, and to give popular, elementary information about plant life for teachers and others. Free to members of the Garden. To others, fifty cents a series. Single numbers 5 cents each. Circulates in 28 countries.

GUIDES to the collections, buildings, and grounds. Price based upon cost of publication. Issued as numbers of the *Record*; see above.

Guide No. 3. The story of our metals: A chronicle of corn. Illustrated. Published, December, 1929. (Brooklyn Bot. Gard. Record, 18^o: 283-307.) Price, 25 cents.

Guide No. 4. The Japanese Garden of the Brooklyn Botanic Garden. Illustrated. Published, July, 1930. (Brooklyn Bot. Gard. Record, 19^o: 197-234.) Price, 25 cents.

SEED LIST. (*Delectus Seminum*) Established, December, 1914. Since 1925 issued each year in the January number of the *Record*. Circulation includes 143 botanic gardens and institutions located in 42 countries.

AMERICAN JOURNAL OF BOTANY. Established, January, 1914. Published, in cooperation with the **BOTANICAL SOCIETY OF AMERICA**, monthly, except during August and September. Subscription, \$7.00 a year. Circulates in 48 countries.

ECOLOGY. Established, January, 1920. Published quarterly in cooperation with the **ECOLOGICAL SOCIETY OF AMERICA**. Subscription, \$4.00 a year. Circulates in 48 countries.

GENETICS. Established, January, 1916. Bimonthly. Subscription, \$5.00 a year. Circulates in 37 countries.

BROOKLYN BOTANIC GARDEN RECORD

Vol. XIX

NOVEMBER, 1930

No. 6

EDITED BY
C. STUART GAGER



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PUBLISHED QUARTERLY
AT LANCASTER, PA.
BY THE BROOKLYN INSTITUTE OF ARTS AND SCIENCES
BROOKLYN, N. Y.

Entered as second-class matter in the post-office at Lancaster, Pa., under act of August 24, 1911.

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BOTANIC GARDEN
RECORD

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VOLUME XIX

1930

PUBLISHED QUARTERLY
AT LANCASTER, PA.
BY THE BROOKLYN INSTITUTE OF ARTS AND SCIENCES
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LANCASTER PRESS, INC.
LANCASTER, PA.

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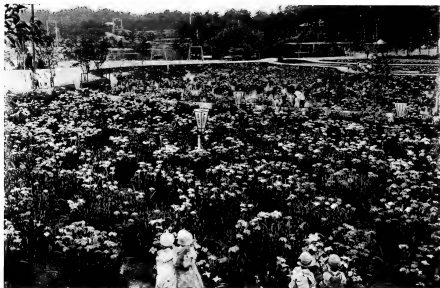


FIG. 1. Part of the Iris display at Ayameike play-ground.

BROOKLYN BOTANIC GARDEN RECORD

VOL. XIX

NOVEMBER, 1930

NO. 6

REPORT ON A TRIP TO JAPAN AND TO THE NORTHWESTERN UNITED STATES

DR. C. STUART GAGER, DIRECTOR,

Sir: I submit herewith a brief report of my trip to Japan and to the Northwestern United States.

The main purpose of the trip to Japan was a study of the Japanese Iris, a term usually applied to the horticultural varieties of *Iris kaempferi*. These Iris constitute one of the largest and most important subdivisions of this group of ornamental plants. Their cultivation in Japan goes back a great many years, and a large number of varieties have been developed. About seventy years ago, introductions were made into Europe and America and, since that time, new varieties have been developed in these countries. It is, however, in Japan that these Iris have reached their highest stage of development. Consequently, it is in that country that we may expect to find the essential information regarding their history.

I arrived in Japan on March third, just at the end of the winter season. At this time the Iris plants are still in a dormant condition, but in a short time showed the renewed growth. I remained until July twenty-second, and thus was able to observe the Iris throughout the growing and flowering period.

The most noted place in all Japan for the Iris is Horikiri, a village situated a few miles from the main center of Tokyo; in fact, it is now practically a suburb of this city, although it lies across the Sumida River. For nearly one hundred years it has been famous for its Iris gardens. The three best known ones are Horikiri-yen, Kotaka-yen and Musashi-yen, all located within a short distance of each other. The latter garden, however, is now practically abandoned, and the others are much more restricted than they were in former days. About a mile away, at Yotsugi, there is located the Yoshino-yen.

All of these gardens are primarily display places where many Iris plants are grown with a view to attracting visitors during the flowering season. Temporary tea houses are erected and various facilities provided for the visitors. Hundreds of people come to these gardens when the flowers are in bloom.

I made several trips at different times during the spring and early summer to these places, and observed the methods of culture. A great deal of useful information from the owners was also secured regarding the history of the gardens and the names and origin of the varieties which are grown there.

In Tokyo there is a fine display of Japanese Iris in the Meiji-jingu. This Shrine, with its beautiful grounds, was erected in commemoration of the late Emperor Meiji. In one part of the large area there is a Secluded Garden which is open to the public only two or three times a year. Within this Secluded Garden there is a narrow winding valley planted with varieties of the Japanese Iris. It is a very unusual setting for these plants in Japan.

At the Botanic Garden of the Imperial University of Tokyo, a number of cultivated varieties are grown. Many different species of Iris are also to be found there. Several visits were made to this garden, especially for the purpose of consulting with Dr. M. Miyoshi, who has contributed more in a scientific way to the Japanese Iris than anyone else. There are many private gardens in Tokyo, most of which are the typical Japanese landscape type. In company with Mr. Kiyoshi Inoshita, Director of the Bureau of Parks and Cemeteries, Municipality of Tokyo, and Mr. H. Kuwashima, many of these were visited and the interesting features observed. Relatively few of these gardens contained Iris; in a few cases, however, excellent plantings were observed.

A good deal of time was spent in the Imperial Library in Ueno Park. Within this library are found many old Japanese books. Some of those which contained references to the Iris were consulted, with the aid of Mr. Bunkio Matsuki, who made translations, and thus was obtained a great deal of very valuable information. Dr. M. Shirai, Professor Emeritus of the Tokyo Imperial University, has a splendid collection of old Japanese books on natural history, and I was privileged to consult his collection. He also very kindly made translations of certain parts of these books which dealt with the Iris.



FIG. 2. Iris at Horikiri-yen, Horikiri.

There are several places of Iris interest in the vicinity of Yokohama. The office of the Yokohama Nursery Company, Ltd., is located within the limits of the town, and the grounds where they grow their plants are found in nearby localities. For many years they have been prominent growers of the Iris. A great deal of information was secured from Mr. Seizo Suzuki, the President of the company, and also from Mr. S. Manami. It was possible to consult many of their old records and also study the various colored drawings of varieties which had been made. These men, as well as other members of the firm, accompanied us to the grounds and supplied us with all possible facilities for making observations on the Iris.

Mr. T. Sakata, the head of the firm T. Sakata & Company, was also helpful in many ways. Some years ago this firm was prominent in the exportation of plants, but in recent years it has devoted itself very largely to seeds. Within recent years, Mr. H. Nishida has started a nursery near Yokohama and is now growing a large number of varieties of Iris. As yet, however, his place apparently is not known outside of Japan. I was able to visit his nursery and observe his varieties when they were in excellent flower.

Not far from Yokohama, at Ofuna, the Kanagawa Agricultural Experiment Station is located. Here, for a number of years, Dr. B. Miyazawa carried on studies of the herbaceous peony and the Iris. Although he is no longer connected with this institution, the studies are being carried on. I visited this station at peony time in company with Mr. T. Sakata, and again at Iris time with several members of the Yokohama Nursery Company. There is not only a good collection of named varieties, but many new seedlings.

About three weeks were spent in the vicinity of Kyoto. At the Kyoto Botanic Gardens there is a collection of about sixty varieties of Iris which make a fine display by the edge of the brook. In company with Dr. T. Hemmi and Dr. Isawo Namikawa, members of the Faculty of the College of Agriculture, Kyoto University, many of the temple gardens, as well as the Imperial Palace grounds, were visited. Most of these gardens are the usual Japanese landscape type and very few of them have any large plantings of Iris. In the Heian Shrine, however, there is a fine collection of the Iris by the edge of the pond.

Not far from Kyoto, at Ayameike, there is an extensive planting



FIG. 3. Iris at Kotaka-yen, Horikiri.

of Iris. This place is really a playground which is being developed by one of the electric railroad companies of Osaka. There is a large pond with many bays or inlets, the margins of which are planted with hundreds of clumps of Iris. Various other Japanese ornamental plants are found in different parts of the same area, and facilities are provided for the enjoyment of visitors throughout the year. A somewhat similar development is to be found at Suniyoshi Park near Osaka. At this place also there is a very large area devoted to the Iris and, although the development is comparatively new, the flowers already make a fine display.

Not far from Kobe, in the heart of the Yamamoto nursery district, the Chugai Nursery Company is located. It grows a few Iris, but still obtains most of its plants from other sources.

The Botanic Garden at the Imperial University of Tokyo has a branch garden at Nikko for alpine plants. Here there is a good collection of horticultural varieties of the Iris, as well as a good many plants of the wild type.

One of the most interesting features of the trip was the collecting of the wild *Iris kaempferi* in the northern part of Japan. About two weeks were spent in going to various places where the wild plant was known to grow. On this trip I was accompanied by Mr. S. Tanaka, a student of the Kyoto Imperial University. The wild plant is very common at Senjo-ga-hara, a plain among the mountains not far from Nikko. Northward from this point several stops were made and the wild Iris collected. At Morioka, we were accompanied by Dr. G. O. Shinji, Professor of Entomology in the Morioka Agricultural College, to several places in that vicinity. At Aomori, Mr. T. Susa, Horticulturist of the Aomori Agricultural Experiment Station, accompanied us to various places nearby.

After leaving the Main Island, we went across to Hokkaido, and at Sapporo we met Dr. S. Ito and Dr. K. Miyabe. Dr. Ito is head of the Botanical Institute of the College of Agriculture of the Hokkaido Imperial University and also Director of the Botanical Garden, and Dr. Miyabe is a Professor Emeritus of the same institution. These two men furnished us with a great deal of interesting information and also accompanied us to some places nearby. There is a good collection of horticultural varieties in the Botanic Garden. The Toko-en is located in Sapporo, and this nursery has



FIG. 4. Iris bordering a pool—Kumamoto.

a great many horticultural varieties, many of which have been developed there.

The wild species of *Iris kaempferi* occurs abundantly at Horomui, a few miles north of Sapporo. A day was spent collecting specimens at this place, in company with members of the staff of the Botanical Institute. From Sapporo south to Hakodate the wild *Iris* is relatively common, and usually may be found at the borderline between the rice-growing areas and the lower slopes of the mountains. In some cases, land which was formerly cultivated with rice has been abandoned, and in such places the wild *Iris* has established a very secure foothold.

In addition to the cultivated varieties of *Iris kaempferi*, several other species of this genus were also to be found in Japan. Of these, the most important one is *I. laevigata*, which occurs as a cultivated plant over large areas. Usually, the typical blue-purple form is grown, but there are several distinct varieties to be found. It is commonly grown around Tokyo for use as a cut flower in the Flower Arrangement. The species may also be found in many of the old temple gardens, especially in the vicinity of Kyoto.

The Roof *Iris*, *Iris tectorum*, may be observed growing on the thatched roofs of houses and other buildings in various places. In the village of Hodagaya, south of Yokohama, the Roof *Iris* is very common on dwellings. Northwest of Tokyo, in the vicinity of Kiriu, there are many small villages in which the thatched roofs bear this *Iris*. A day was spent in this region in company with Professor H. Yoshioka of the Kiriu Higher Technical School. He took us around to a number of the villages and we were able to see many places with the *Iris* on the roofs.

In the parks of Tokyo, such as Ueno and Hibiya, there are large quantities of *Iris japonica*. This plant grows vigorously and blooms abundantly during the month of April.

Opportunities were afforded for the observation of many of the other ornamental plants of Japan. The cherries were in bloom from the latter part of March to nearly the end of April. The celebrations of Japan at the cherry blossom time are famous, and thousands of trees may be found in all parts of the Empire. There is a special society which has been organized for the development of interest in the cherry, and I attended the annual meeting which was held in one of the gardens of Tokyo on April twentieth.



FIG. 5. Iris at Kyoto Botanic Gardens.

There are several very fine collections of tree peonies in the vicinity of Tokyo. Famous arbors of wistaria may also be found within comparatively short distances of this city. The azalea is common everywhere in the parks and private gardens.

Opportunities were also afforded for observing the culture and diseases of various cereals. We commonly think of rice as the main cereal crop of Japan. To a great extent this is true, but a



FIG. 6. Iris at Meiji-jingu, Tokyo.

surprisingly large quantity of both wheat and barley are grown throughout the Main Island. In May and early June these are conspicuous crops, and many areas were visited and observations made as to the occurrence of various diseases. The loose smut of wheat usually occurred in very small quantities; some rust and mildew were also observed on this plant. In almost every field of barley the loose smut could be found and, in a few cases, relatively high percentages of the plants were infected. On the other hand, the covered smut of barley was comparatively rare. In the northern part of the Main Island and in Hokkaido, oats are grown to a

considerable extent. In most of the fields the loose smut was found.

On my return to the United States, several days were spent in California. At the Agricultural Experiment Station, Dr. F. N. Briggs is carrying on interesting experiments with the bunt of wheat. His investigations deal primarily with the inheritance of the smut-resistant quality. The results which he has so far obtained are extremely interesting in comparison with our own stud-



FIG. 7. Roof Iris on thatch roof of farm house, Kiriu.

ies on inheritance of smut resistance in oats. He is also confronted with the problem of physiologic races of the smut.

Opportunity was afforded for collecting the native *Iris* species of California. Most of these were observed in their natural habitat and plants and seed were secured. A brief stop was also made at Portland, Oregon, and a visit made to the *Iris* garden of Mr. Howard Weed. He has a very good collection of Japanese varieties, and they were growing in excellent condition; although it was out of season, a very few plants were in bud and flower.

At the North Dakota Agricultural Experiment Station, Dr. L. R.

Waldron and Dr. W. E. Brentzel are engaged in the investigation of certain problems of wheat bunt. Dr. Waldron is primarily interested in the practical problem of breeding bunt-resistant varieties. The studies are concerned with the question of inheritance of the bunt-resistant quality and also with the existence of physiologic races of the parasite. The importance of a complete knowledge of the existence and extent of specialization of these races is fully recognized.

Arrangements were made in Japan for obtaining different species and varieties of *Iris*. It was inadvisable to ship growing plants to the United States during the summer. The only time that they can be shipped with reasonable certainty of success is during the dormant period of the plants. It is, however, quite feasible to send the rhizomes of *Iris* comparatively short distances. Accordingly, arrangements were made with the Yokohama Nursery Company, Ltd., whereby the varieties and species obtained from different sources were sent to them for immediate planting and proper care until February or early March, 1931. At that time, when the plants are in a fully dormant condition, the Nursery Company will forward them to us. Quite a number of varieties and species were secured at different localities. Collections of the wild *Iris* were also made at various points. All of these have been sent to the Yokohama Nursery Company for care and later shipment.

Horticultural varieties of *Iris* were selected at some of the gardens, and arrangements were made with the owners so that these can be forwarded to the United States at the proper time. Approximately two hundred varieties were selected, and these will make valuable additions to the varieties of Japanese *Iris* in America.

Respectfully submitted,

GEORGE M. REED,
Curator

REPORT ON A BOTANICAL EXPLORATION TRIP TO THE GALAPAGOS ISLANDS

DR. C. STUART GAGER, DIRECTOR,

Sir: I take pleasure in submitting herewith my report as botanist of the Astor Expedition to the Galapagos Islands, March 23 to May 2, 1930, and express my gratitude to you and to Mr. Vincent Astor for the privilege of accompanying the expedition. This report covers, in general, the itinerary of the expedition from a botanical point of view. It will be followed by a detailed enumeration of species collected when the material, now in our herbarium, is fully studied. The expedition was successful in attaining most of its objectives. Primarily, these were the exploration of the unknown interior of Indefatigable Island, twenty-five miles across and the second largest of the Galapagos group; the capture of specimens of the huge land tortoise (*Testudo porteri*) known to inhabit Indefatigable Island; and the transportation of living reef fishes from the Pacific Islands to the New York Aquarium. The party on board the *Nourmahal* during the cruise included Commodore Astor, Kermit Roosevelt, Suydam Cutting, Robert Huntington, Dr. Eugene Pool of the New York Hospital, Clarence L. Hay of the American Museum of Natural History, James P. Chapin, ornithologist, American Museum of Natural History, Wilfred S. Bronson, Artist, Dr. Charles H. Townsend, New York Aquarium, who acted as director of the expedition, and Elwin R. Sanborn, photographer, New York Zoological Society (Figs. 1 and 2).¹ A general account of the expedition copiously illustrated has appeared in the *Bulletin* of the New York Zoological Society, Vol. xxxiii, No. 4, 1930.

The Astor Expedition to the Galapagos Islands left New York on the morning of March 23 in a special car for Miami. Spring had not commenced in New York, and the night before our departure was decidedly wintry, but as we proceeded southward the vegetation gradually became green. In Virginia plum trees were in flower. Early morning of the next day found us in a rainstorm

¹ With the exception of Figures 1 and 2, the illustrations are from photographs by the writer.



FIG. 8. On board the *Nourmahal*. Left to right: Mr. Wilfred S. Bronson, artist; Dr. James P. Chapin, ornithologist; Mr. Vincent Astor; Dr. Eugene Pool; Dr. H. K. Svenson, botanist; Mr. Suydam Cutting; Dr. Charles H. Townsend; Mr. Clarence L. Hay; Mr. Robert Huntington. Below: Tortoises of Indefatigable Island (*Testudo porteri*). (Photograph by Kermit Roosevelt and E. R. Sanborn.)

amid the pines and palmetto barrens and Cypress swamps of southern Georgia. Recent heavy rains had inundated the countryside. Clearing weather, as we raced on through Florida, gave us glimpses of sandy shores, of water hyacinths, huge palmettos, scarlet *Hibiscus* flowers, and a sandy bog vegetation similar in many respects to that of Cape Cod. The palatial yacht, *Nourmahal*, was awaiting us at Miami, and in remarkably short time we were under way past the long breakwater and out into the broad Atlantic.

Next morning mirage-like palms outlining the low coast of Cuba appeared far off to the right. We skirted this low coast for a whole day, and on the second day the land gradually became more elevated, ending in the high mountains of southeastern Cuba. These were covered with a luxuriant vegetation—especially the cavern-like lower cliffs, which gave the impression of stalactites and appeared inviting to the botanist. Nightfall and a choppy Caribbean Sea in the narrow passage between Cuba and Haiti dispelled any further interest in the Cuban coast.

In the morning the deep blue waters of the Caribbean were claiming our interest. We spent much of the following two days on the upper deck observing flying fishes, birds, and the enormous sharks which occasionally drifted past. Late in the afternoon appeared the mountains of Panama, and the steel-work of ship yards indicated our proximity to the city of Colon. Very soon we took on a pilot crew and were proceeding through the locks, an operation carried out with astounding rapidity. The murky green waters of Gatun Lake are a decided contrast to the flashing blue of the Caribbean. Projecting stumps and little islands, through which only an experienced pilot can find his way, are strewn about. We were passing through in the dry season. The skeletons of trees alone remained, and brush fires burned incessantly along the parched hillsides. Only on Barro Colorado Island (which has a biological laboratory that we were to visit on our return) did we get a glimpse of the huge undisturbed tropical forest with bright lavender flowers now and then appearing in enormous masses. Darkness was falling, and the myriad-lighted village of Chagres, the precipitous black slopes of Culebra Cut, and the long locks of Miraflores passed like visions. Daybreak found us at the docks of Balboa.

Chapin, Dr. Townsend and I paid a visit next morning to the

extensive government offices at Balboa, where some further supplies were obtained. The beautifully planted grounds and parkways are an inspiration. Chapin took me in tow and we visited his old friend, Dr. Patterson, in Panama City. With the beautiful city at hand waiting to be seen, it was difficult for him to understand why two people such as ourselves should want to visit the Tapia River, some fifteen miles outside the city, especially in a season when the forest was alive with ticks. We finally reached this delightful place, where Chapin had previously spent several weeks collecting birds. Although the forest had been partly cut off, it still brought to me the first glimpse of epiphytic orchids and large-leaved bromeliads, of *Cecropia* trees, sugar cane, and cashew nuts. Surrounding the little hacienda, which was occupied only by an aged caretaker, were brilliantly pink and red Bougainvillias, mingled with breadfruit, lemon, and orange trees. Enormous butterflies, and crested lizards, that walked rapidly over the stream on their hind legs in dinosaur fashion, were of equal interest. The promised ticks were there in abundance. At dusk we returned and immediately sailed out past Balboa Hill and the islands. Long lines of pelicans, majestically flying over the water, gave us our last contact for some days with land and its inhabitants.

We sailed on the long, soft swell of the Pacific. The abundant flying fishes, somewhat larger than those of the Atlantic, a bird now and then, the phosphorescent wake of the ship, and the approaching brilliant constellations of the South kept our attention. The library was well stocked with adventures of the sea.

On the morning of April first, I sighted a pyramidal peak on the cloudy horizon, followed by a stretch of low-lying land and a mountain area. This was the hopelessly barren northern part of Chatham Island in the Galapagos. We passed closely enough to see the famous Kicker Rock, through the cleft of which a boat can be sailed, and soon came to the much smaller but even more precipitous Barrington Island, its sides densely covered with brush a few feet in height. The breeze was fragrant, and it was hard to believe that Indefatigable would be merely the desert island of reports. In another hour the low-lying Indefatigable, shaped like an immense inverted basin, occupied much of the horizon, its summit hidden by clouds. After careful sounding, the yacht anchored off Academy Bay, and a landing party set forth to investigate the

expected Norwegian colony. The clouds now parted disclosing the summit of the island, an unknown region which, with good fortune, we hoped to explore within the next few days. Through a glass the distant mountains appeared covered with vegetation, with a few rocks to the northeast reflecting the sunlight, and a black lateral crater below the summit. Close at hand the waves broke high against a little island at the entrance of Academy Bay. Indefatigable looked very green, except for the trunks of cacti which dotted the landscape with a deep brown.



FIG. 9. Cocos Island. The *Nonmahal* at Wafer Bay.
(Photograph by E. R. Sanborn.)

Sea cliffs surmounted by cactus form the southern boundary of Academy Bay. They would seem to be the outward projection of a small escarpment, and had an aspect more precipitous than any other coastal formation noted on *Indefatigable*. The bay ends landwise in deep crevices and an impenetrable mangrove swamp. On landing, my first impressions of the island were of a hawk

sitting unperturbed within a few yards of the landing party, of numerous species of sedges (*Cyperus*) in the reddish soil, of rank *Cryptocarpus* vines strangling the racks for fish-drying, and of the all-pervading smell of fish long dead. Rusted remains of canning machinery, a Ford tractor and other hauling devices, and a large pressure cooker littered the outside of one of the two remaining buildings. I had made notes in a copy of Stewart's "Flora of the Galapagos Islands," and had had the opportunity of examining the splendid representation of Galapagos plants at the Gray Herbarium, but it took little experience to note the most luxurious growth



FIG. 10. Cactus (*Cereus*) at Indefatigable Island.

that I have ever seen of our common all-pervading weed *Portulaca oleracea*. A few straggling squash vines were intermingled. In the upper story of the fish house where we piled our belongings cockroaches were plentiful, and the placing of provisions in Chapin's screened bird-box did not prevent the infiltration of hordes of small red ants.

The day was clear and the far off summit and intervening forest of Indefatigable were well-defined. Outside in the blazing sun the heat was intense. Of the shrubs, *Cordia lutea* in full bloom pro-

vided the only brilliant color to be seen along the coast, each sulphur-yellow flower more than an inch across and fifteen or twenty in a cluster. The ovate leaves are rough to the touch and the trunks of large shrubs or trees assume an almost muscular aspect. The most conspicuous objects along the coast were, of course, the enormous cactus trees. One of these giants stood a few yards from the fish house with reddish trunk a foot thick. It reached up to 20 feet, and the drooping pad-like branches, worthy of the name, *Opuntia myriacantha*, were things to leave severely alone. Outside of the little semi-cleared area progress could be made only along the trail which had been cut out of a jungle of interlaced cactus trees, *Lantana*, *Cordia*, and *Croton* bushes. The spiny *Discaria pauciflora*, as well as the spinescent *Acacia* bushes, were both as impenetrable as the cactus. The flowering season here must be extraordinarily short. Nearly every shrub was in full bloom when we arrived, but so inconspicuous were the flowers, in general, with the exception of *Cordia* and an occasional cotton bush, that they added little or nothing to the color of the landscape. Three crosses near the shore, their graves overrun by weeds, were in perfect harmony with the surroundings. Yet the shrubs and insignificant plants covering the ground were of extraordinary interest. The majority of them are confined to the Galapagos Islands, and represent a flora which has had its development parallel to that of the finches, iguanas, and huge tortoises. Each island often has its own clearly marked species.

Several families of plants are especially represented, the Boraginaceae, Verbenaceae, Euphorbiaceae, Amaranthaceae, and Leguminosae being most conspicuous. Such large families of the temperate regions as the Rosaceae, Ranunculaceae, and Ericaceae are entirely lacking. Except for cactus, the coastal terrain has the appearance of burned-over New England brush land. Along the coast fresh water is obtained from roof drippings, and only during the rainy season. A drought may appear even in the usually moist interior. From two survivors of the colony we learned that such a drought happened during the first year (1926) of the Norwegian colonization, during which drinking water had to be carried in kegs from the summit of the mountain. The brackish pool at Academy Bay appeared salt to us, but was used for drinking water by the Norwegian fishermen who said that in the course of time the water

had become palatable. Add the swarms of mosquitoes appearing at sundown, the absolute lack of tillable soil, and the stifling heat, and their statement that the coast was considered uninhabitable is readily believed.

After a day and a half of reconnoitering, Roosevelt and Cutting discovered the plantation with its overgrown trail. Following a night of heavy showers, we all set forth along this trail, the trees dripping with moisture. Such rainfall must be of great rarity in this desert country. The trail, constructed with infinite labor, picked its way through tumbled lava and among cactus trees, now and then bridging crevices of unknown depth. Deviation from the path was unthinkable. Amazingly tame mocking-birds and black finches fluttered almost within arm's reach or picked at the red fruits on the candelabra-like *Cereus*. Doves flew from under our feet to alight a few yards farther along the pathway. Hay and I alternated in carrying a two gallon canteen of water to be placed far inland as a reserve supply. Vistas of cactus trees no less than 40 feet in height now and then opened up, and the pathway itself was covered here and there with the bright yellow and purple flowers of small leguminous vines. The lava country was now in its very greenest state, yet had a sombre grayish tinge. Small narrow leaves were the rule. The path wound slowly but steadily upward. Grass became abundant, and with it a forest of large broad-leaved trees. These were *Pisonia floribunda*, a member of the Nyctaginaceae and the largest tree of the island, usually with several spreading trunks, each up to two feet in diameter; *Erythrina velutina*, a heavy-leaved leguminous tree; and *Psidium gollapageium*, a native guava tree with white flowers and small green fruits. We approached the moist zone, and each little valley brought greater luxuriance in growth. By peering through the dense growth of vines covering the ground, ferns were seen occupying the crevices between the boulders. Trees were now festooned with ferns, bromeliads, orchids, and dangling roots of *Parira* vine. Here and there *Scalesia* trees occurred in almost pure stands. Like the tortoises and finches, *Scalesia*, a genus of the Compositae confined to the Galapagos Islands, runs into distinct species on individual islands. The smooth gray trunks of *S. pedunculata* run straight up to about 40 feet in height, surmounted by a branching top bearing leaves resembling those of the sun-

flower plant. The wood is soft. I cut down a trunk 22 inches in circumference with a machete to get the flowers. This forest, to me, seemed like a tropical rain forest, but Chapin considered it as really xerophytic. Two extremely hot and dry days confirmed his opinion; ferns, orchids, and vines began to curl under the influence of the drought.

The plantation emerged suddenly at 700 feet. In contrast to the region which we had traversed, where lava was everywhere,



FIG. 11. The brackish lagoon at Academy Bay. Cactus trees (*Opuntia*) are the dominant feature of the landscape.

here only the richest of black soil was to be seen. Bananas, papayas, sugar cane, squashes, and coffee were growing luxuriantly. The origin of such a soil is not satisfactorily explained, but I incline toward the belief that it is formed by humus carried down from the steep slopes by rains during the wet season. The banana crop was far more than could be utilized; scores of bunches of ripe bananas lay rotting on the ground. Fruit flies (*Drosophila*) appeared in millions.

Roosevelt, Hay, and Cutting, with the help of one of the survivors of the Norwegian colony, started off up the mountain on

the following day, while Chapin and I stayed behind and collected about the plantation. The mountaineering party returned late in the afternoon after a gruelling day of thicket-chopping in a sweltering sun and with a deficient supply of water. Our drinking water was limited to half a barrel of rain water of dubious quality. Next day Chapin and I accompanied the party up the mountain, the route being the dry bed of a stream which the previous year (1929) had been a raging torrent. We passed through the luxuriant second growth which had tested the endurance of the mountaineering group on the previous day. Boulders, some water-worn, heaped upon one another were common, and from between them and under the projecting banks were large numbers of ferns, especially species of *Adiantum*. The ascent became wilder. At 1000 feet by our barometers the leading man called out "Niagara Falls." Before us at the head of a canyon was an unscalable wall of black lava which at times must have had an interesting water fall. Overhanging the canyon appeared a handsome purple-flowered shrub, which I recognized as a member of the great tropical family Melastomaceae. This plant is undoubtedly *Miconia Robinsoniana*. On an overhanging shelf far above could be seen a dense clump of goldenrod-like plants, *Erigeron tenuifolius*. Four more Niagaras of smaller size impeded our ascent, and the brook bed became a hopeless tangle of *Miconia*, 5-20 feet in height, which required the most strenuous cutting in order to break through. At 1450 feet welcome showers cooled us. The brook became a flat and swamp-like area of *Miconia*, so we veered to the right and upward. The *Miconia* thickets continued. Here and there were *Xanthoxylon* trees and a few of the vines and shrubs noted in the *Scalesia* forests below. The ground had become soft and somewhat boggy underfoot, due probably to the great accumulation of humus. Our direction was wholly by compass. The vegetation was too tall to see over, and the view obtained by climbing offered nothing but the same shrubby landscape. We turned back over the slippery trail.

On the following day we climbed to our previous point of departure. From a hillside at 1670 feet we got our only glimpse of the ocean. Far off in the distance could be seen heavy white surf about the entrance to Academy Bay. Again we plunged into the thicket of *Miconia* and ferns, cutting this time to 2100 feet. The

shadows began to lengthen and mist obscured the summit. Before us stretched rolling country covered by *Miconia* apparently as difficult to traverse as the region we had come through. Beyond, at only a slightly greater height, lay, as far as we could judge, the highest point of the land. We seemed to be on the upper edge of the lateral crater visible from Academy Bay. It would have been interesting to see what lay at the very pinnacles of the island, but from our observations it seems probable that few outstanding variations in the vegetation occur. Our precipitous scramble downward to the plantation in the dusk was fortunately uneventful, and on the morning we descended to Academy Bay and to the luxury of the *Nourmahal*.

The next day I joined Dr. Townsend and Mr. Sanborn in a trip to the tortoise country, in company with Messrs. Wold and Edwardsen, the survivors of the Norwegian Colony. They had a pony with them to transport tortoises. An hour's travel along the Fortuna trail, and we turned sharply to the westward. Here the vegetation became a little more open, with trails made by wild burros criss-crossing in all directions. It was folly to stay behind the remainder of the party to examine plants, as I learned almost immediately, for it was impossible to pick up the trail. A person lost in this waterless region would be unlucky. Four hours more of constant travel brought us to the tortoise country, in which several small ponds were located. Here the mosquitoes were equally as vicious as those on the coast, of seemingly twice the size, and present in just as countless numbers. After midnight it rained, but by morning the sky had cleared, and we cooked more coffee and boiled water for our canteens. This water, after the scum had been removed in boiling, had a rich coffee color and a very smoky taste. Two tortoises, each weighing about 40 pounds, had been captured and brought in, making a tremendous load for the little horse on our returning journey. Although we left at 11 o'clock, we reached Academy Bay at nightfall, the party being delayed every now and then by my collecting.

Dr. Townsend wished to see a spineless cactus which he had previously discovered on Charles Island, so on the following day the *Nourmahal* steered for Charles Island, 30 miles to the south, and anchored off the lava rocks of the Black Beach Roads. The appearance of Indefatigable and Charles Islands is strikingly dif-

ferent. No cactus was to be seen in the vicinity of our anchorage, and all trace of the spineless tree had unfortunately disappeared. Charles Island is dominated by a symmetrical volcanic peak, rounded at the top and rising to about 2000 feet, showing clearly the vegetative zones. Its bare summit appeared green. A plain-like area extends almost to its foot. Near the coast the well-spaced leguminous bushes included the fantastic *Parkinsonia aculeata*. The small herbaceous plants were of different species than those encountered on Indefatigable Island, and the gravelly soil gave the general impression of cedar glades or oak barrens of the southern United States. We did not remain long enough on the island to reach the springs located at the base of the mountain. Other members of the expedition had visited the famous post office at Post Office Bay. There is no postmaster, and letters dropped in a barrel are collected by passing ships. During the days of the whaling industry it was an important means of communication.

The yacht anchored off Charles Island for the night and next day sailed back to Indefatigable, where we landed long enough to pick up the remainder of our scattered possessions and bid farewell to our companions who had been of untold assistance in capturing the giant tortoises and in helping the mountain party.

The next morning the yacht made almost a complete circle about Indefatigable, passing Duncan and James and landing at South Seymour Island. Here was a broad sandy beach, with land iguanas basking under the scrubby trees. We stayed only a few moments, long enough to snatch up a few iguanas, and sailed away to Tower Island, one of the outlying islands to the northward.

Our anchorage at Darwin Bay in Tower Island was the submerged crater of an extinct volcano. Its sides are precipitous save for a little sandy area at the head of the bay, occupied by thousands of nesting sea birds which flew in hundreds over the ship and perched in every available thicket. They were largely Man-o'-War birds. The balloon-like red throats of the males could be seen for a long distance. Tower is a splendid example of an island with a xerophytic environment; I doubt if there is a hatful of real soil on the island, and the dwarfed vegetation is reduced to about a dozen species which struggle for existence on the dry lava. None of the trees rise above a dozen feet. The *Bursera* trees are characterized by swollen branches, and trees only six feet high may be

seen bearing fruit. The *Croton* trees likewise have much thickened stems. Leaves of the sprawling shrub *Waltheria reticulata* are firmer and coarser than those of the same shrub on Indefatigable Island, and the flowers of *Cordia lutea* seem smaller in size and of a paler color. The cactus *Opuntia Helleri*, rarely found elsewhere, is here mostly confined to sea-cliffs and lava slopes, and is rare inland. The branches of this species have very few spines and can be taken by hand, something which no person



FIG. 12. Looking into the interior of Charles Island from the landing at Black Beach Roads.

could do with the species on Indefatigable Island. I picked my way up over the two cliffs adjacent to the harbor, and followed the almost imperceptible slope to the westward. The flow structure of the reddish lava was much in evidence, yet it was with much surprise that I suddenly burst upon the great crater, which lies a mile or so in the interior. It was an inspiring sight, a circular opening nearly a half mile in width, with a blue lake at the bottom surrounded by mangrove trees. The precipitous descent was difficult, perhaps 150 to 200 feet. Passing over the last great pile of lava fragments I found myself at the lake, crawled through

the mangroves, and found the water only slightly brackish. A belt of pondweed, *Potamogeton pectinatus*, occupied the open water just beyond the mangroves. These two species (the mangrove and the pondweed) seemed to be the only vegetation. The straight course which I took back to the yacht cut through masses of loose-lying lava rocks, which slid about when stepped upon. Everywhere deep crevices were in evidence, and it was with a feeling of relief that I reached the edge of the cliffs and saw the *Nourmahal* below. Compared with Tower Island, the desert portion of Indefatigable is a well-developed forest.

Our next stop, on the way northward, was at the well-watered Cocos Island, a small island not more than three or four miles across. Numerous waterfalls leap out from among the thickly forested slopes. The enormous trees were covered with great masses of bromeliads, ferns, and orchids; the reddish masses of bromeliads especially standing out. The sandy beaches were bordered by coconut palms. Thousands of small fish were attracted to the lights of the boat in the evening. For a whole day Hay and I made a reconnaissance of the stream which flows into Wafer Bay, proceeding inland (until the stream became a mere trickle) to a height estimated at between 1000 and 1200 feet. We did not have time to reach the peak, which rises to about 2800 feet, but found no change in the character of the vegetation as far as we ascended. Ferns were here in profusion, chiefly the omnipresent tree fern, *Hemitelia*, with a trunk often 8-12 feet in height. Slender lianas, 30-40 feet in length, reached down to the water from the lowest branches of the great forest trees. When pulled sufficiently these lianas came down like great coils of telegraph wire, sometimes bringing masses of bromeliads, ferns, and orchids. The broad-leaved sedge, *Hypolytrum nicaraguense*, and various representatives of the Melastomaceae were especially representative of this brook area. Wild hogs have made additional trails which are sometimes easily followed. A lean, long-tusked fellow crossed the brook only fifteen to twenty yards ahead of us.

We returned at dusk and in the evening sailed for the Perlas Islands off the coast of Panama. This extensive group of islands we approached in the midst of the dry period, and they were at the time bare of leaves and lacking in interest. However, in an-

ticipation of the rainy season, the tree cotton (*Bombacopsis Fendleri*) was in full bloom. The purple flowers of Bignoniaceous vines were also abundant.

On returning to Panama, Hay, Chapin, and I paid a visit to the biological station at Barro Colorado, in Gatun Lake. Mr. Higgins of the Experimental Gardens at Summit met me for a moment or two en route. I turned over to him several live specimens of



FIG. 13. Cactus (*Opuntia Helleri*) at Tower Island. A distinct and almost spineless species.

cactus which we had secured in the Galapagos, and he informed us that some of Dr. Townsend's spineless cactus was still growing. The aquatic vegetation in the pools along the railroad seemed fascinating, but we had no opportunity to stop. The laboratory launch was an hour or two late at Frijoles, and from an impatient but very false start which we had made in a dugout of Herculean size, we were fortunately rescued by the launch. Disaster would otherwise surely have been our lot on the rough waters of Gatun

Lake. Barro Colorado is, indeed, a paradise. It is one's idea of what the tropics should be. The laboratory buildings set in the midst of the uncleared jungle form the center of numerous trails radiating out to various parts of the island. I was much interested in Dr. Zetek's experiments on resistance of wood to termite attacks, as well as in the enormous growth of trees here preserved in their primeval luxuriance. Tall Bignoniaceous trees were in bloom, the trunks sometimes adorned by orchids. Now and then scarlet passion-flowers could be seen in the undergrowth. From the observation tower at the center one obtained a good view of the island, occupying some six square miles. On our return to Frijoles, the *Nourmahal* was seen coming through Gatun Lake, and our attempts to get on board in rough water furnished a good deal of amusement to the company. At nightfall we were again in the Caribbean, shifting our course this time to the west of Cuba. We dropped anchor near the ruins of Fort Jefferson, in the Dry Tortugas, the westernmost of the Florida Keys, where the sandy beach provided a number of plants new to me. The immense flocks of terns nesting on Bird Island were fully as impressive as the rookeries on Tower Island. On the next day we landed at Miami, and arrived in New York on the morning of May 2.

Botanical results of the expedition are represented by about 500 numbers, with many duplicates, of flowering plants and ferns collected chiefly on Indefatigable Island and Cocos, including at least fifty species that have not previously been reported from these islands.

I am especially grateful to Mr. Astor for the kindly interest he showed in our collecting, in addition to his solicitation for our welfare. Dr. Pool and Mr. Hay were a tremendous help to me in drying plants aboard ship. Messrs. Roosevelt and Cutting made a path through the jungle, without which, collecting in the interior would have been impossible. Dr. Chapin's extensive knowledge of tropical botany was a constant revelation, and my thanks are especially due to Dr. Townsend, who directed the scientific work and looked out for our welfare on shore.

Respectfully submitted,

HENRY K. SVENSON,
Assistant Curator

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THE BOTANIC GARDEN is open free to the public daily from 8 a.m. until dusk; on Sundays and Holidays open at 10 a.m.

ENTRANCES.—On Flatbush Avenue, near Empire Boulevard (Malbone Street), and near Mt. Prospect Reservoir; on Washington Avenue, south of Eastern Parkway and near Empire Boulevard; on Eastern Parkway, west of the Museum Building.

The street entrance to the Laboratory Building is at 1000 Washington Avenue, opposite Montgomery Street.

TO ASSIST MEMBERS and others in studying the collections the services of a docent may be obtained. This service is free of charge to *members of the Botanic Garden*; to others there is a charge of 50 cents per person. Arrangements must be made by application to the Curator of Public Instruction at least one week in advance. No parties of less than six adults will be conducted.

TO REACH THE GARDEN take Broadway (B.M.T.) Subway to Prospect Park Station; Interborough Subway to Eastern Parkway-Brooklyn Museum Station; Flatbush Avenue trolley to Empire Boulevard; Franklin Avenue, Lorimer Street, or Tompkins Avenue trolleys to Washington Avenue; St. John's Place trolley to Sterling Place and Washington Avenue; Union Street or Vanderbilt Avenue trolleys to Prospect Park Plaza and Union Street.

PUBLICATIONS
OF THE
BROOKLYN BOTANIC GARDEN

RECORD. Established, January, 1912. An administrative periodical issued quarterly (1912-1926); bimonthly beginning with 1929. Contains, among other things, the *Annual Report* of the director and heads of departments, special reports, announcements of courses of instruction, seed list, guides, miscellaneous papers, and notes concerning Garden progress and events. Free to members of the Garden. To others \$1.50 a year, 25 cents a number. Circulates in 41 countries.

MEMOIRS. Established, July, 1918. Published irregularly. Circulates in 47 countries.

Volume I. *Dedication Papers*: comprising 33 scientific papers presented at the dedication of the laboratory building and plant houses, April 19-21, 1917. 521 pages. Price \$3.50, plus postage.

Volume II. The vegetation of Long Island. Part I, The vegetation of Montauk: A study of grassland and forest. By Norman Taylor, June 11, 1923. 108 pages. Price \$1.00, plus postage.

Volume III. Vegetation of Mount Desert Island, Maine, and its environment. By Barrington Moore and Norman Taylor, June 10, 1927. 151 pages. Price \$1.60.

CONTRIBUTIONS. Established, April 1, 1911. Papers originally published in periodicals, reissued as "separates," without change of paging, and numbered consecutively. This series includes occasional papers, as well as those embodying the results of research done at the Garden, or by members of its staff or students. Twenty-five numbers constitute one volume. Price 25 cents each, \$5.00 a volume. Circulates in 34 countries.

55. *Physiologic races of bunt of wheat.* 14 pages. 1928.

56. *The inheritance of resistance of oat hybrids to loose and covered smut.* 48 pages. 1928.

57. *New physiologic races of oat smuts.* 22 pages. 1930.

58. *A new method of producing and detecting sorghum hybrids.* 12 pages. 1930.

LEAFLETS. Established, April 10, 1913. Published weekly or biweekly during April, May, June, September, and October. The purpose of the *Leaflets* is primarily to give announcements concerning flowering and other plant activities to be seen in the Garden near the date of issue, and to give popular, elementary information about plant life for teachers and others. Free to members of the Garden. To others, fifty cents a series. Single numbers 5 cents each. Circulates in 28 countries.

GUIDES to the collections, buildings, and grounds. Price based upon cost of publication. Issued as numbers of the *Record*; see above.

Guide No. 3. The story of our metate: A chronicle of corn. Illustrated. Published, December, 1929. (Brooklyn Bot. Gard. Record, 18^o: 283-307.) Price, 25 cents.

Guide No. 4. The Japanese Garden of the Brooklyn Botanic Garden. Illustrated. Published, July, 1930. (Brooklyn Bot. Gard. Record, 19^o: 197-234.) Price, 25 cents.

SEED LIST. (*Delectus Seminum*) Established, December, 1914. Since 1925 issued each year in the January number of the *Record*. Circulation includes 143 botanic gardens and institutions located in 42 countries.

AMERICAN JOURNAL OF BOTANY. Established, January, 1914. Published, in cooperation with the **BOTANICAL SOCIETY OF AMERICA**, monthly, except during August and September. Subscription, \$7.00 a year. Circulates in 48 countries.

ECOLOGY. Established, January, 1920. Published quarterly in cooperation with the **ECOLOGICAL SOCIETY OF AMERICA**. Subscription, \$4.00 a year. Circulates in 48 countries.

GENETICS. Established, January, 1916. Bimonthly. Subscription, \$6.00 a year. Circulates in 37 countries.