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CONTENTS OF VOL. XVI.



	PAGE
ON THE EFFECTS OF URBAN FOG UPON CULTIVATED PLANTS. By Prof. F. W. OLIVER, M.A., D.Sc.	1
ON SOME EFFECTS OF GROWING PLANTS UNDER GLASSES OF VARIOUS COLOURS. By the Rev. G. HENSLOW, M.A., F.L.S., &c.	59
FLOWERS OF THE FRENCH RIVIERA. By MONS. H. DE VILMORIN, F.R.H.S.	80
“RAMBLES WITH A TROWEL.” By Mr. H. SELFE LEONARD, F.R.H.S.	104
ALPINE PLANTS AND THEIR TREATMENT. By MONS. H. CORREVEON. ...	116
CHEMICAL DETERMINATIONS CONCERNING THE SOIL WITHOUT THE AID OF CHEMISTRY. By Prof. F. CHESHIRE, F.L.S., F.R.H.S.	128
HARDY RHODODENDRONS AND AZALEAS. By Sir JOHN T. D. LLEWELYN, Bart., F.R.H.S.	133
AMERICAN BLIGHT, AND ITS SUCCESSFUL TREATMENT. By Mr. L. BURGoyNE PILLIN, L.D.S.Eng., F.R.H.S., &c.	143
THE ANTIQUITY OF THE CITRON-TREE IN EGYPT. By Dr. E. BONAVIA, F.R.H.S.	146
EXAMINATION IN HORTICULTURE, AND CLASS LIST	151
NOTICES OF BOOKS	156
HOUSES FOR ALPINE PLANTS. By Mr. H. SELFE LEONARD, F.R.H.S.	161
THE SPECIES AND GARDEN FORMS OF CANNA. By Mr. J. G. BAKER, F.R.S., &c.	178
PENTSTEMONS AND PHLOXES. By Mr. JAMES DOUGLAS, F.R.H.S.	188
CAUSES OF FAILURE IN EUCHARIS CULTURE. By Mr. W. IGGULDEN, F.R.H.S.	194
PEARS. By Mr. W. CRUMP, F.R.H.S.	200
THE ONION. By Mr. A. DEAN, F.R.H.S.	209
CHRYSANTHEMUMS. By Mr. R. PARKER, F.R.H.S.	220
LATE-KEEPING GRAPES. By Mr. T. H. CRASP, F.R.H.S. ...	227

	PAGE
REPORT ON GARDEN PHLOXES AT CHISWICK.....	
" " VIOLAS " 	246
" HYBRID CANNAS " 	247
" GARDEN IRISES " 	248
" CELERY " 	249
" ENDIVES " 	251
" ONIONS " 	253
" POTATOS " 	257

EXTRACTS FROM PROCEEDINGS OF THE SOCIETY:—

GENERAL MEETINGS, ANNUAL REPORT, AND FELLOWS ELECTED, 1893	i-xv and cxvii-cxix
INNER TEMPLE SHOW, 1893	xiii
SCIENTIFIC COMMITTEE MEETINGS, 1893.....	xvi-xxxi and cxx-cxxx
FRUIT COMMITTEE MEETINGS, 1893.....	xxxi-xlii and cxxxi-cxlviii
FLORAL COMMITTEE MEETINGS, 1893	xlii-lxxx and cxlix-cciii
ORCHID COMMITTEE MEETINGS, 1893	lxxxi-cx and cciv-ccxxxi
NARCISSUS COMMITTEE MEETINGS, 1893	cxi-cxvi
BOOKS, &c., PRESENTED TO THE LIBRARY, 1893.	ccxxxi
PLANTS, SEEDS, &c., PRESENTED TO CHISWICK, 1893	ccxxxi

JOURNAL

OF THE

ROYAL HORTICULTURAL SOCIETY.

VOL. XVI. 1893.

PART I.

ON THE EFFECTS OF URBAN FOG UPON CULTIVATED PLANTS.

*The Second Report presented to the Scientific Committee of
the Royal Horticultural Society, February 14, 1893,*

By Professor F. W. OLIVER, M.A., D.Sc.

(With the assistance of Professor F. E. WEISS and
Miss M. F. EWART).

[NOTE.—In the work of this investigation, of which this is the second report, I have become indebted for assistance and advice to many persons. Till March of last year I received the unstinted support of my assistant at University College, Mr. F. E. Weiss. It had been my intention that he should share with me all the responsibilities of the work, but his translation to the Chair of Botany at the Owens College, Manchester, has rendered the realisation of this intention impracticable. I cannot, however, let this opportunity pass without expressing my appreciation of his services. To my former pupil, Miss Ewart, B.Sc., I am greatly indebted for her share in the examination of injured tissues and help generally upon the experimental side of the investigation. I owe my hearty thanks to Dr. Edward Schunck, F.R.S., for the assistance which he has willingly rendered upon points requiring the knowledge of an expert in the spectroscopic investigation of chlorophyll and its derivatives. Dr. G. H. Bailey, who is associated with the Manchester investigation, has been

ever ready to give help and information on matters touching the chemistry of fog, which he has made his own. It has always been my regret that from the special nature of my work I have been unable to render any adequate return to him in kind. To Mr. H. J. Veitch we are under singular obligations. He has not only placed his rich collections of stove and greenhouse plants at my service for observational purposes, but has also been good enough to construct a small experimental laboratory at his nurseries in the King's Road, Chelsea, to forward the purposes of the investigation. Finally, I must thank the Director of the Royal Gardens, Kew, and the Assistant-Curator, Mr. Watson, as well as many friends, including my colleagues on the Scientific Committee, for help in various ways.—F. W. O.]

In my first report* the general scope of the investigation, which the Committee desired me to undertake, was explained, and some of the early results of the inquiry described. Of the actual effects of our London fogs upon vegetation I have had ample opportunity for study. During the winter of 1890–91, as has been alluded to in my former report, two spells of fog were experienced of almost unprecedented severity; last winter the Christmas fogs alone call for special mention; whilst this winter, up to the date of presenting this report, though foggy weather has been certainly prevalent, the damage to plants has been relatively slight, or at any rate only locally severe. I have thus been able to compile an exhaustive list of those cultivated plants which suffer from this cause, with notes on the nature of the injuries incurred.

The extension of the work of recording the effects of separate fogs upon the same collections of plants, during several winters, has ensured the possibility of comparing the effects of fogs which differ from one another in essential respects. Physiological experiments on so gigantic a scale could not have been obtained by any other means, and the comparative results have made it possible for me to speak with conviction on at any rate one important question. This will be entered upon in due time.

A constant source of difficulty arises from the fact that we are so ignorant of the exact nature of the substances which are

* *Journ. Roy. Hort. Soc.* vol. xiii. p. 139.

present in the air in foggy weather. An enormous number of different substances are discharged into the air in the destructive distillation of coal, but it is only a few of these that can be actually detected and demonstrated to exist in smoke. Good work has been done in this department by the late Angus Smith and by Dr. W. J. Russell; whilst latterly Dr. G. H. Bailey, of the Owens College, Manchester, has carried out the most systematic analyses of the air of his own town that have ever been attempted. But all these observers have dealt with those substances, like ammonia, carbonic acid, sulphurous and sulphuric acids, hydrochloric acid, &c., which are relatively easy of detection, and the fluctuating amounts of which in the air they have determined. But of the organic matters, distilled from coal, which are present in the air there is little certain information, except as to their aggregate amounts. The organic matter which contributed 14·3 per cent. of the deposit left by the fog upon the glass roofs of Orchid-houses at Chelsea* is composed of hydrocarbons and their derivatives (12·3) and organic bases (2·0). Amongst the unspecified hydrocarbons are no doubt many of the less volatile tarry substances such as anthracene, naphthalene, and the phenols. The organic bases will include bodies of the pyridine series. It would be interesting to know what may be the fate of the more volatile hydrocarbons which must pass into the air. Are they represented in these deposits in some altered form? And do the less volatile ones assist in their precipitation—acting as collectors, as has been suggested? Still, even the fact that such bodies are present in large quantity in fog is exceedingly interesting. For I have been able to show that many of them are, even in small quantities, most injurious to vegetation. But the details of this investigation will appear below. I cannot state the circumstances more tersely than has been done by Dr. Hugo Müller, F.R.S., a chemist of great experience, in a letter addressed to me.† He says: “I have become more and more convinced that, apart from the identification of the sulphurous acid, it will be next to impossible to obtain exact chemical evidence of the presence of the other suspected obnoxious substances present in fog, unless very large quantities of fog-washings can be dealt with. Indeed, the minuteness of the quantity of the deleterious substances, sufficient to

* February 1891.

† February 16, 1891.

produce so marked an effect upon the living protoplasm, makes the latter itself a reagent with which chemical tests cannot compete."

The questions which have occupied my attention, and which are discussed here, are the precise nature of the injuries to plants caused by fog, and the participation in these results of the various conditions unfavourable to vegetation which are incident to fog.

It is advisable to include here a few analyses of the deposits left by fogs as giving an indication of the impurities with which we have to deal.

And first I will give the analyses of the deposits left on the glass roofs of plant-houses at Chelsea and Kew during the severe fogs in February 1891:—

	Chelsea.	Kew.
	39 per cent.	42·5 per cent.
Carbon	12·3	4·78
Hydrocarbons	2·0	"
Organic bases	4·33	4·0
Sulphuric acid	1·43	0·83
Hydrochloric acid	1·37	1·14
Ammonia	2·63	"
Metallic iron and magnetic oxide...	"	41·15
Other mineral matter, chiefly silica and ferric oxide	31·24	"
	Water not determined.	

Detailed analyses of soot, taken from London and Glasgow, were published * more than twenty years ago. These I append for comparison with the deposits. They are the only analyses of the kind which I have been able to discover:—

	London.	Glasgow.
Carbon	53·18	35·7
Tar and oil	18·00	15·0
Ammonia	1·75	2·8
Potash	·20	0·3
Soda	·34	0·3
Lime	1·00	0·8
Magnesia	0·30	Trace
Phosphate of lime and alumina	2·08	3·2
Iron	0·40	0·7
Sulphuric acid	4·60	7·9
Chlorine	Trace	0·4
Sulphocyanogen... ..	0·25	None
Carbonic acid	0·70	Trace
Sand	14·40	25·7
Water	2·80	7·2
	100·00	100·0

* W. R. Hutton, *Chemical News*, vol. xx. p. 307.

The general aspect of the question of the relation of fog to vegetation was very lucidly stated by Mr. W. T. Thiselton-Dyer, Director of the Royal Gardens, Kew, in a letter to me, dated Oct. 16, 1890. From this letter I make the following extract:—

“Roughly, I think the matter stands in this way:—

“i. *Sulphuric acid* is the principal cause of injury to *trees* and *shrubs* because their parts are permanent and it is *cumulative* in its action. It perpetually parts with and acquires water. If you write on a piece of wood with dilute H_2SO_4 there is no immediate apparent effect. Hold the board before a fire, and wherever the H_2SO_4 has touched the wood it is charred. The reason is that the dilute H_2SO_4 first parts with its water, and when it has reached a certain concentration immediately dehydrates the wood. The H_2SO_4 deposited by fog and smoke on trees acts during warm weather as a persistent and gradual caustic; the same H_2SO_4 acts again and again; it eats into the tissues, and as it is perpetually being added to in amount by fresh deposits, it probably gains upon the loss due to the washing action of rain.

“ii. *Sulphurous acid* acts in an entirely different way, and is mostly injurious to herbaceous and so-called soft-wooded plants. It is a powerful deoxidiser. It enters into the intercellular passages and probably acts *directly* on the protoplasm. It may do this by stealing oxygen from it and, so to speak, asphyxiating it, or it may have some direct toxic effect not understood. Anyhow, in the case of flowers I believe it acts by killing the protoplasm and destroying the turgescence of the cells. To this may be ultimately due the falling of the flowers and the disarticulation of parts of the inflorescence. The phenomenon is so rapid that I can hardly believe there is a normal formation of a zone of ‘abscission.’

“iii. Fog is no doubt injurious to trees by the actual deposit of a coating of finely divided carbon.

“iv. The more obscure part of the phenomenon is the part played by the various products of the destructive distillation of fuel which are present in it. Of these there are probably a large series.

“a. Frankland has shown that in so-called ‘dry fog’ the watery particles are inclosed in an envelope of hydrocarbons.

“ β . When we have a severe fog at Kew a greasy deposit is left on the glass which is by no means easy to remove without considerable friction. Fortunately, last year a fall of sleety snow did the scrubbing for us; mere rain will not remove it. This deposit is in great part carbon cemented with some of the less volatile hydrocarbons.

“ γ . The toxic influence *in this connection* may be due to the presence of more volatile bodies. This is a part of the inquiry where novel and interesting results may particularly be looked for.

“I think our first task must be to ascertain something a little more definite about the *actual* constitution of fog. I rather lament the disposition of chemists to assume that they know all about it. I don't agree that they do.”

In view of the uncertainty existing as to the action of the various substances present in a foggy atmosphere upon vegetation, and the complication introduced by the fact that these noisome fogs are also accompanied by a not inconsiderable reduction of light, I have made it my business to trace the effects of a number of fog impurities upon stove plants under varying conditions. I know very well that the effects on vegetation of many of the noxious vapours present in coal smoke, or liable to escape from alkali works, have been studied from time to time by many persons both in this country and upon the Continent. But, so far as I have been able to ascertain by consulting the literature, neither the microscope nor the spectroscope has been hitherto applied to investigation in this field. I mean by the experts who have given evidence before Royal Commissions and the like. Further, in a very essential point, the circumstances of our inquiry differ from those which have preceded it. This is the reduction of light consequent on the suspended matter in the air. No inquiry can probe this difficult question, unless the action upon plants of prolonged gloom or darkness be held in view. But more of this anon.

Of the known impurities of urban fog I have traced the action of the following, which, for one reason or another, I have suspected to be inimical to plant life. These are: Sulphuric acid, sulphurous acid, hydrochloric acid, ammonia, metallic iron, ferric oxide, magnetic oxide of iron, several hydrocarbons and their derivatives, a number of the pyridine series and

phenol. The experiments with each substance (except in the case of hydrochloric acid and ammonia) were continued over long periods, and in some instances renewed. With the few experimental chambers at my command, the investigation has, of course, been a protracted one. But even with unlimited resources of this kind, the necessarily concurrent examination of the tissues of these plants would have been more than we could have coped with successfully.

I propose to deal with the material at my disposal in the following manner. First, a brief *résumé* of the salient features of the injuries caused by fog, deferring for the present any exhaustive list of the plants in which these have been found to occur. Then, an account of the results obtained by exposing plants to the various substances present in fog. Finally, a discussion of the whole matter.

I. THE EFFECTS OF FOG.

It is a matter of common observation that a plant may exhibit a gradual yellowing of its leaves, progressing from below upwards, followed by the dropping of those leaves in the order in which they showed the change in colour. Indeed, this is what generally happens when a plant "goes wrong." This effect—which is, broadly speaking, the same in all cases—may be due to a variety of causes. It may be due to over-watering or to under-watering; to a check caused by removal from a stove to a greenhouse, or from a humid to a dry atmosphere, or the reverse. Or, again, it may be caused by the attack of some worm or insect upon the subterranean parts of the plants; or to continuous deficient illumination, or to the lack of nutritive matters generally. Sometimes the phenomenon is very rapid in its development, as in the following instance. I had acquired, a few summers ago, a fine healthy plant of the common India-rubber Fig, intending to make certain physiological experiments upon it. One morning, early, it was syringed, and whilst still wet the untempered rays of a powerful sun shone full upon it for several hours. Before evening five or six of the lowest (and oldest) leaves had turned yellow, whilst those above showed blotches of the same colour. Next day these also succumbed; at a touch they all disarticulated perfectly, leaving the bare stem with its terminal bud. Thick, filth-laden fogs produce much the same

series of events in some plants with almost equal celerity; whilst in other plants their development is much more gradual. The discoloration of the leaf, which is the first sign in many cases which catches the attention, is really only the last of a series of changes, the first of which even an expert histologist, aided by a high power of the microscope, would have difficulty in detecting. These changes, due to profound molecular disturbance of the living substance of the leaves, lead up to two very noticeable events. On the one hand, there is the destruction of the chlorophyll pigment; and on the other, the production of a definite layer of separation at the point of insertion of the petiole. In what may be called a normal case, both these things happen. But often enough we meet with cases in which the leaf falls green and apparently uninjured. Thus we have Mr. Watson's statement (relating to some recent fogs) in the *Gardeners' Chronicle*,* that "in the Palm-house bushels of healthy-looking leaves were gathered up almost every morning." On the other hand, instances occur in which no layer of separation is produced, though the other changes referred to are exhibited, and the leaves hang dead upon the stem.

These two extreme cases are quoted at the outset to show that it is upon a very complex question we enter when we try to understand the meaning of the destructive changes produced in plants by urban fog.

I will now proceed to give in a summarised form a short account of the general nature of the injuries that are associated with fogs. But, first of all, it will be well to definitely establish the fact that no injury of note results from mist uncontaminated by smoke. Correspondents from various parts of the country assure me that no harm accrues from these mists. Thus towards the close of the winter of 1890-91 the Rev. F. D. Horner, of Kirkby Lonsdale, not only communicated his own experiences, but was so kind as to obtain reports from several other cultivators in his locality. Their united testimony was that the mists which from time to time prevailed were quite harmless. Nor did the keen frost of that winter do any damage among stove and greenhouse plants, notwithstanding the increased fire-heat needed to maintain a suitable temperature. From Kent, Sussex, and Essex I have many assurances of the non-injurious character of the sea-

* November 28, 1891, p. 650.

fogs. Some of these correspondents, who are within the range of the London fog-area, contrast the hurtful nature of the latter sort of fog with the harmlessness of the former. Purely negative evidence of this character could be indefinitely extended, but the above is perhaps sufficient to establish the fact that country mists are harmless.

We may now return to injuries due to fogs. I have limited this inquiry to plants cultivated under glass. This I have done because this class of vegetation affords very striking examples of the effects of fog; because greenhouse plants are always under observation, and information concerning them is readily obtained; finally, because outdoor plants are liable to injury by frost, and the problem is thus complicated.

Nature of the Injuries.

General Characters.—The injuries to foliage are of wide occurrence amongst Dicotyledons, both stove and greenhouse plants. Many so-called hard-wooded, as well as the softer, and apparently more delicate, herbaceous plants are reduced after a severe spell of foggy weather to an unsightly residue of almost bare stems, blotched and discoloured leaves, and fallen foliage. Amongst certain groups even the soft stems disarticulate at the nodes.

For the purposes of this report we may distinguish broadly two principal classes of injury to foliage, produced by distinct causes.

A. Cases in which the leaves exhibit local discolorations, particularly at the tips and margins. *A speedy disarticulation of the leaf does not occur*; but when the fog is of long duration, and the local discoloration gradually involves a considerable portion of the area of the leaf, it may do so. But in an average case the unaffected parts of the leaf remain fully functional, and the leaf is retained. Instances are very common. Amongst Ferns I have noticed various species of *Pteris* and *Gymnogramme schizophylla*; amongst Monocotyledons, *Odontoglossum crispum*, *Freesia*, *Areca lutescens*; amongst Dicotyledons, from an almost endless list I will only instance two very pronounced examples, *Dalechampia Roezliana* and *Pavonia Wiotii*. In a great many cases injuries of this purely local character co-exist with others

of a more fundamental nature. Under these circumstances the leaf will probably fall, though this result is not due, or at any rate only in a minor degree, to the class of injury included under this paragraph.

B. Cases *in which leaves fall*, showing either a complete discoloration (brown or yellow), or only a partial discoloration, limited to the apex, or margins or base, or in which the discoloration is restricted to minute specks or to irregular patches scattered over the surface, or the leaf may fall green and apparently uninjured. We must include here also cases in which the lamina is affected in any of the ways just indicated, but in which the leaf does not disarticulate, but remains, withered and attached to the plant. Instances of disarticulating leaves are innumerable, but whether this is preceded by local or general change in colour, or whether the leaf falls quite green, depends upon a variety of circumstances. Plants in which the leaf does not fall, but remains attached as described, are rare. *Bouvardia* and *Centropogon Lucianus* may be quoted.

I shall distinguish between these two classes of injury, because I believe them to be due to distinct causes.

The injuries to flower-buds and flowers I have described and discussed under Section III.

Further Notes on Class of Injuries A.

The local blotchings indicated under A are due, I apprehend, to the action of an acid upon the upper surface of the leaf. The leaf here presents all the characters of being attacked from without. In the first instance these markings are limited to the upper surface, or if they involve the lower surface also, this is strictly confined to the portions immediately adjacent to the apex of the leaf. The fogs deposit a layer of dirt upon the surface, which may or may not include sufficient poisonous substances to effect a general corrosive action upon the upper epidermis. But in horticultural practice the frequent wetting of the leaves leads to certain constituents of the deposit being taken up by the water, which, as is well known, has a tendency to collect at the margins, and especially at the tips of the leaves. One may walk through a conservatory and shake off drops from every plant. The moisture gradually evaporates, leaving behind what was dissolved in it. The process is, no doubt, repeated time after

time, until sufficient acid is collected to cause local lesions. The drops of water, further, doubtless themselves directly absorb sulphurous acid from the air. This will be speedily oxidised into sulphuric acid.

The deposits on the leaves of stove plants contain an appreciable amount of sulphuric acid. The general nature of the deposits is similar to those collected from the glass lights, the analyses of which are given on p. 4. Of the substances there enumerated, the sulphuric acid is the chief one soluble in water; thus it is to this that I attribute these corrosions. If the attached drops of water from a number of plants be shaken off into a vessel and collected in some quantity, distinct traces of sulphuric acid can be demonstrated. The condensed vapour which drips from the roof, and incidentally falls upon the plants, also contains sulphuric acid.

I quoted *Dalechampia Roezliana* and *Pavonia Wiotii* as marked instances, with a special purpose in view. The leaves of these two plants depend from their stems at a considerable angle, perhaps 45° on the average. Consequently moisture very readily accumulates at the apex. It is instructive to note the progress of the discoloration from the tip backwards. The epidermis at the apex is first attacked. The corrosion works on into the deeper-lying tissues until the whole of the substance of the leaf is destroyed in this region. In many cases the tip actually falls away, or is detached by the shaking which the plant undergoes incidental to horticultural operations. From the truncated apex the corrosion travels upwards, and one may see leaves still attached to the plant and performing their functions in which only the lower, *i.e.* proximal, moiety is uninjured; the injured and uninjured portions being separated by a sharp transverse line.

When sections are made of a portion of leaf-surface which has been exposed to this corrosive action from above, and examined under the microscope, certain definite changes may be noted. The upper epidermis is first attacked. The acid appears to traverse the cuticle and to destroy the cells. The contents of these cells at first exhibit a slight contraction from the walls—a plasmolysis; the protoplasm then turns brown, due to the appearance in it of a very finely divided dark precipitate. Then, bit by bit, the same action is continued in the subjacent tissues, till the acid has worked its way right through the thickness of the leaf.

Experiments illustrating the Corrosive Action of Deposits.

In the autumn of 1891 I made a few experiments in order to elucidate the action of these deposits. In the first instance I took some of the Chelsea deposit,* and after shaking it up with a little distilled water, painted the right-hand halves of the leaves of a number of stove plants therewith. These included *Cucurbita Pepo*, *Bouvardia*, *Dalechampia*, *Heterocentron roseum*, *Dendrobium nobile*, and *Hydrangea hortensis*.

From day to day the leaves were moistened with water. Within a week the *Bouvardia* and *Heterocentron* showed slight corrosions, and in ten days the *Cucurbita* and *Dalechampia*. The *Dendrobium* and *Hydrangea* (both possessing highly cuticularised leaf-surfaces) resisted the action. I also determined that even the soluble constituents of the deposit in several instances caused a corrosion.

From the substances contained in the deposits I then selected sulphuric acid, powdered metallic iron, red oxide and magnetic oxide of iron as possible causes of this corrosion. With these I experimented separately.

To the powdered metallic iron and to the oxides a little distilled water was added, and a thin layer of the paste so formed spread upon parts of the upper surfaces of leaves of the following plants: *Cucurbita*, *Ricinus*, *Dalechampia*, *Bouvardia*, *Rose*, *Clerodendron*, *Tecoma*, *Begonia sanguinea* and *B. Haageana*, *Dendrobium nobile*, *Rhododendron*, and *Pteris* sp.

Neither of the oxides had any apparent effect on the subjacent parts of the leaves with the sole exception of the magnetic oxide upon a leaf of *Dalechampia*. But the action here, after fifteen days, was a very slight one indeed. Observations were continued without result for five weeks. With metallic iron the result was totally different. In four days the *Bouvardia* and *Begonia sanguinea* showed a slight discoloration of their epidermal cells. In seven days *Cucurbita* and *Begonia Haageana* exhibited the same symptoms. Within twenty-four days the iron had destroyed the subjacent epidermis in all cases; but I did not find that the action, was continued appreciably deeper into the substance of the leaf, as the iron had become entirely oxidised.

With sulphuric acid I experimented upon the same species,

* Cf. Analysis, p. 4.

and also upon the following additional ones: *Justicia carnea*, *Ruellia macrantha*, *Hydrangea hortensis*, *Conocliniumianthinum*, *Eupatorium odoratum*, and *Impatiens Sultani*. I first applied a very strong solution, 5 per cent., painting the right-hand halves of several leaves of each. Within four hours of applying the acid all the leaves were profoundly affected. The upper epidermal cells and all the cells of the mesophyll and of the lower epidermis as well, showed a very strong plasmolysis and discoloration of their chlorophyll-corpuscles. No general browning of the protoplasm occurred till the next day, when several of the leaves readily disarticulated. The amount of acid applied had powerfully stimulated the leaves, affecting cells in regions not immediately below the painted area of the surface. The same plants similarly treated with a .5 per cent. solution exhibited the same characters within twelve hours; and here again several of the leaves shortly fell away. With a .1 per cent. solution the action was the same, though in some cases (*Centropogon*, *Cucurbita*, *Begonia sanguinea*, and *Hydrangea*) the acid took longer to penetrate the epidermis. With a .05 per cent. solution similar results were obtained, though in many cases four or five days elapsed before any manifest injury became apparent.*

I think it undeniable that a thin coating of sulphuric acid, such as actually occurs in foggy weather, is sufficient to cause such results. Whether, and to what extent, the other substances of the deposit co-operate in this action there is no evidence to show. The metallic iron alone did, as we found in every case, eat into the leaf; still the amount of this present in fog deposits is so minute that its influence in the matter can be neglected. Nor have I any observations upon the hydrocarbons in the deposits. My experiments with them have been in the form of vapours only. Were the corrosive action of the deposits upon the leaves through the epidermis the only mode in which the impurities of fog attacked the plant, there would be little cause for grumbling among horticulturists. The injuries arising from this cause alone are trifling when compared with those which I have assembled together in the next paragraph.

These would seem to constitute the main effect of fog upon plants; and I shall consequently devote considerable space to their elucidation.

* With .1 per cent. and under there was no disarticulation of foliage.

Further Notes on Class of Injuries B.

The changes in the leaf which lead to its speedy disarticulation, with or without the accompaniment of colour change (as described under B, p. 10), are due in great part to an attack upon its delicate unprotected internal tissues. The fog actually effects an entry into the lacunæ or system of intercellular spaces of the leaf through the stomata; and, circulating here, the poisonous substances are brought into immediate contact with the moist, delicate, and uncuticularised cell-membranes of the living cells. These cellulose membranes can offer but little resistance, and the protoplasm is directly attacked. The capacity of any plant to resist such an attack must depend essentially on the constitution of the protoplasm. Many apparently fragile plants exhibit no injury, whilst others, with thick leathery leaves, readily drop their leaves. A thick external cuticle may arrest corrosion from an acid deposit; few and small stomata may render the entry of noxious vapours less rapid than where they are more numerous or larger; but it is upon the constitution of the protoplasm that the production or non-production of injuries will in the main depend. This constitution of the protoplasm is a quality which is inherent in it.

One cannot, either by means of high powers of the microscope or by a chemical investigation of the cell-contents, tell beforehand which plants will suffer when brought in contact with London fog. But one can, by taking into consideration all the circumstances of the environment, understand how in some cases the constitution of the protoplasm may be impaired and the whole plant lose tone, as it were, so that the protoplasm is readily destroyed by the noxious substances present in the air. Nor does it follow that the agent which actually attacks the protoplasm is the same as the one which enfeebles it and reduces its tone. The latter may be distinct, and merely prepare the way for the former. It will be necessary, in pursuing the discussion, to bear in mind all that a fog implies, and not merely to search for some toxic constituent.

I stated on p. 10 that leaves may disarticulate still green, or that they may gradually change to brown or yellow, and then fall, or that scattered discolorations may be developed before this happens. I will now describe the details in a few plants

which may serve as types of the three main varieties. But at the same time I would emphasise the fact that the distinction made is of an arbitrary nature ; transitions from one to the other exist ; and the same species under different circumstances (not yet understood) does not exhibit identical characteristics.

Type 1. The leaf falls green and apparently uninjured. Examples : *Malpighia urens*, *Platonia antioquiensis*, *Rheedia* sp., *Phyllanthus montanus* and *P. angustifolius* (cladodes), *Daphnopsis tinifolia*, *Bignonia* sp., &c.

A microscopic investigation of vertical sections of these leaves shows that the cells, especially in the regions rich in lacunæ (*i.e.* in the spongy parenchyma), are slightly plasmolysed. The protoplasm is not discoloured. The chlorophyll-corpuscles appear normal, and in most cases the green colour is perfectly preserved.

Type 2. There is local discoloration, especially at the margins or towards the apex, or in irregular blotches. This change in colour does not, however, involve the whole area of the leaf before it falls. Included here are the few forms in which the leaf does not disarticulate. Examples are most numerous : *Clerodendron macrosiphon*, *Beaumontia grandiflora*, *Aristolochia tricaudata*, *Bowvardia* (leaf not falling), *Centropogon Lucianus* (leaf not falling), *Ruellia*, *Justicia carnea*, *Conoclinium ianthinum*, *Begonia*.

Microscopic examination of such material shows that the cells throughout are slightly plasmolysed, and this both in the discoloured regions as in those parts apparently unaffected. The green portions show no further change. The cells of the discoloured regions, in addition to plasmolysis, often exhibit a browning of the protoplasm, which may be slight or may be considerable. This is an especially marked character in the epidermis. The chlorophyll-corpuscles present various appearances. They may be green and, as far as can be judged, sound ; or their outline may be broken, indicating an incipient stage of dispersion. They may contain brown-coloured granules or they may be broken up into fragments. Oil-globules, either numerous and minute or large and less frequent, are in many cases found. Sometimes, as in *Beaumontia grandiflora*, where considerable quantities of oil appear to exist in the chlorophyll-containing cells of the healthy

leaf, there is a marked *diminution* of the amount present as injury due to fog becomes apparent. The cells in which destructive changes have taken place are on the whole poorer in protoplasm than in the healthy leaf.

Type 3. The leaves undergo a more or less uniform change in colour (to brown or yellow) before they disarticulate. Examples: *Poinsettia* (and many other Euphorbiaceæ), *Hoya reflexa*, *Dendrobium nobile*.

The destructive changes may be studied by the examination of a series of sections of leaves in various stages.

Poinsettia.—In the uninjured leaf we may note the presence, here and there, of oil-globules. With gradual change in colour the margins of the chlorophyll-corpuscles become interrupted, the contents of the corpuscles granular and yellowish. The cells are plasmolysed, and the oil-globules are both larger and more numerous. In more advanced stages there is an enormous increase in the amount of oil—a number of yellow globules being present in every cell, particularly in the spongy parenchyma. The amount of protoplasm present is less, and the chlorophyll-corpuscles show a marked disintegration and yellowing. It is at about this stage that the leaf disarticulates.

Hoya reflexa.—Here the leaf is more stable, and remains attached till a much larger proportion of its contents have travelled away. In the healthy leaf a small amount of oil is present, but as the chlorophyll-corpuscles turn yellow and disintegrate, the amount of oil is first enormously increased. Later, however, the oil entirely disappears. Up to this point no marked plasmolysis is apparent. At the stage when the leaf falls hardly any protoplasm remains, whilst the chlorophyll-corpuscles are represented by little aggregations of minute yellow granules.

This last instance no doubt exhibits very nearly the same changes as occur in the normal death of the leaf as it might arise from causes quite independent of fog.

Except in the few instances mentioned (*Centropogon*, &c.), the affected leaf falls. The disarticulation is actually brought about by the development, in a transverse zone at the insertion of the leaf, of a definite "absciss layer," or layer of separation. In this zone there is an active production of cells by division, and it is across this zone that the subsequent rupture occurs.

Presumably some ferment is liberated by these cells which dissolves a portion of the membranes, so that the mere weight of the leaf or a slight mechanical shock suffices to produce the rupture. I do not know that the development of the layer of separation as a result of fog-injury to the leaf differs in any essential character from its development when a leaf dies from natural causes. The rapidity with which it arises in the case of fog is certainly remarkable. I have evidence showing that such a layer can arise and the leaf disarticulate within forty-eight hours of the commencement of a fog. Still, in a large number of cases, possibly in a preponderating number—especially in “hard-wooded” plants—the absciss layer is marked out from a very early stage in the history of the leaf’s development. In such cases the solution or rupture of the membranes is alone required to cause disarticulation. The production of these layers, when they are not already present, and the changes in them which lead to rupture of the tissues and fall of the leaves, are the result of circumstances (in fog as in other cases) which render the leaf no longer able to discharge its office.

The Withdrawal of Starch from the Leaves.

Whenever leaves fall from fog, whatever be their appearance, whether green, yellow or blotched, there is one character in which they almost invariably agree. This is in the withdrawal of starch from their tissues. Even in the dull weather of winter small quantities of starch are generally present in the chlorophyll-corpuscles, at any rate of the palisade cells. The leaves seem incapable of withdrawing a small residue, and in this respect offer a point of divergence from their behaviour in bright weather. In clear, sunny weather large quantities of starch are produced, and readily and speedily converted into sugar and withdrawn. In dull weather both these processes seem to be interfered with. Not only is little starch formed, but little is withdrawn from the leaf. I have been astonished to find starch (in small quantities) so often present when the conditions for its formation are unfavourable. I have been gradually led to the view that in prolonged periods of dull weather the whole health of the plant is affected, and that its tone is lowered. Incidentally, I think this pathological condition of the plant

finds expression in its incapacity to utilise all the starch at its disposal. But this point will be raised again in the general discussion under Section V. Here I will simply point out that, although this appears to be the case, directly a leaf is actually affected by fog, the plant, by a special effort perhaps, is able to dissolve its starch and to transfer it to the stem. The leaves belonging to some twenty genera of plants which had fallen under the influence of fog were preserved in alcohol at once. They were carefully examined for starch by means of sections, which were treated with potash for six hours, then neutralised in dilute acetic acid and mounted in a solution of iodine dissolved in potassic iodide. In only one case (*Schlegelia*) was starch found, except in the guard-cells of the stomata. In *Schlegelia parasitica* the starch was not in the chlorophyll-corpuscles, but in some loose parenchyma accompanying the vascular bundles. It was found only in the lower third of the leaf. The leaf had evidently fallen before it had been entirely withdrawn. The presence of starch in the guard-cells of fallen leaves seems to be universal, whatever the cause of death may have been. It is a normal phenomenon demonstrated years ago by Sachs, and probably due to the lack of continuity of the protoplasm between these cells and the adjacent ones of the epidermis. In those cases—especially type 1, and to a less degree type 2—in which matters of nutritive value remain behind (*i.e.* as compared with the residues remaining in the cells when the leaf dies naturally) the actual cause of detention may be the plasmolysis. Assuming that the protoplasm were not at once killed, its withdrawal from the cell-membranes would offer a serious impediment to the out-passage of proteids and the like. I consider that a very interesting line for further investigation arises here.

How are the Leaves attacked?

I stated on p. 14 that I thought it probable that in most cases, which I distinguished from the mere corrosions of an acid deposit upon the epidermis, the impurities of fog had access to the intercellular spaces of the leaf, and that the living substance of the leaf was attacked from within. In the case of thin, delicate, uncuticularised leaves this cannot be proved. All the layers of the leaf, as in *Centropogon* or *Heterocentron*, indicate

that some poison is at work. Nor is it possible to say that any particular part exhibits this earlier than the rest. The cuticle is not effective here in retarding its action from outside, and it is conceivable that the epidermis absorbs the poison directly, or this may be supplemented by its entry into the intercellular spaces. Nor are leaves which fall green, or those which change slowly but uniformly in colour, of much service in determining the point at issue. But in leaves of *Bouvardia*, *Carpenteria*, some *Rhododendrons*, and a few others in which the process has been carefully followed, I find that it is the cells of the spongy parenchyma which are first affected. It is in the lower layers of this tissue—in the parts adjacent to the stomata—that the action commences. It then spreads to the upper regions of the spongy parenchyma and to the palisade layer, and to the epidermis of either surface. When the epidermis is cuticularised it takes longer for the noxious vapour to traverse the cuticle than it does for it to enter by the stomata and reach it this way. But where the epidermis is very soft both methods may prevail. I had come to the general conclusions indicated in this paragraph from the examination of fog-injured foliage only, and before ever I had experimented upon the action of various vapours. It will be seen from what appears below that these conclusions receive confirmation from the observed mode of action of a variety of substances.

Analyses of Injured and Uninjured Leaves. 1

The very greatest care and deliberation is necessary before one can base conclusions on the results of the chemical analysis of foliage, &c.; consequently I have decided, for the present, to keep back the many determinations of this kind which—with Dr. Bailey's co-operation—I have been able to obtain.*

Special paragraphs dealing with changes in the chlorophyll and with the injuries exhibited by flowers are deferred until the action of various vapours has been described.

* Cf. Just u. Heine in *Landwirthsch. Versuchsstat.* 1889, for a discussion of the difficulties attending this method of investigation.

II. THE ACTION OF ACID AND OTHER VAPOURS.

Sulphurous Acid.

That constituent of urban fog, and of coal smoke generally, to which most attention has been directed is sulphurous acid. The injurious action of this substance upon vegetation has been long recognised, and the literature bearing on the question is an extensive one. But it would carry me far beyond the limits of such a report as this were I to enter critically here upon the methods which have been employed and the results which have been obtained by other investigators. I defer any such exhaustive discussion of the work of my predecessors till such time as I am in a position to prepare a detailed memoir on the whole subject of the action on plants of the various atmospheric impurities. It is, therefore, deliberately that I make none but occasional references here to previous work. The action of sulphurous acid is considered first; afterwards that of certain other substances.

The amount of this acid present in London air varies from time to time enormously. Whilst in fine weather traces only can be detected, very appreciable quantities are present in dull weather, whilst in characteristic London fogs the amount is greatly increased. A few determinations made during the latter part of 1891 give some indication of the amounts of sulphurous acid present in London air in foggy weather. The method employed is identical with that in use at Manchester; it is fully described in the "Preliminary Report of the Air Analysis Committee" issued by the Town Gardening Section of the Manchester Field Naturalists' Society, March 1891. Known volumes of air pass through a continuous drip of hydrogen peroxide, which absorbs the sulphurous acid. The determinations are made as sulphuric acid. The locality is University College, Gower Street. The following were simply *dull* days:—

Date (1891).			Weather.			Milligrammes of sulphuric acid per 100 cubic feet of air.
November 5	...	...	Dull	...	...	5.40
" 6	...	...	"	...	...	4.73
" 10	...	...	"	...	...	6.80
" 13	...	...	"	...	...	5.66
" 17	...	...	Slight fog	...	...	8.16
" 20	...	...	Dull	...	...	6.80

The following were *foggy* days :—

Date (1891).	Weather.		Milligrammes of sulphuric acid per 100 cubic feet of air.
November 24	...	Slight fog	... 10.24
„ 30	...	Dark and very foggy	... 17.10
December 21	...	Yellow fog	... 20.52
„ 22	...	Dense black fog	... 39.06
„ 23	...	Yellow fog	... 12.96
„ 24	...	Thick yellow fog	... 20.40

The above may serve as samples.

The sulphurous acid generated in the combustion of coal, and discharged into the atmosphere, is readily oxidised into sulphuric acid. That these two substances co-exist in town air there can be no reasonable doubt. But since most of the exact determinations of sulphurous acid had been made as sulphuric acid, some doubt exists as to the relative amounts present at any given time, and to the rate of natural conversion of the one into the other.

It may be stated at the outset that some only of the characters of injury to plants by fog can be successfully imitated by exposing growing plants to the action of an atmosphere containing SO_2 in appropriate dilution. The method employed has been to place the plants in closed glazed cases into which the sulphurous acid could be supplied continuously or periodically as circumstances demanded. The cases used were the corners of a greenhouse cut off by means of glazed frames so that all joints, as also the door of the case, were air-tight. The amount of free SO_2 present could be exactly determined by drawing off known quantities of the air through a tower down which hydrogen peroxide was always dripping. The amount was then determined exactly as in the case of the fogs just quoted. But most frequently, and for my purpose very convenient, I aspirated the air through 25 c.c. of potassium permanganate in a wash-bottle devised for the purpose. The time occupied by the decoloration of the permanganate was a measure of the amount of SO_2 present, sufficiently accurate for the purpose. Knowing the rate at which the aspirator worked, I could then always determine the number of cubic feet of air that it was necessary to aspirate to obtain decoloration. I could thus obtain and maintain a concentration of SO_2 in the chamber so that it never exceeded any desired limit. The chambers possessed a capacity of about 40 cubic feet. In addition I used large bell-glasses of 6 cubic feet capacity, the contents of which were similarly under control.

When a plant with thin membranous leaves is exposed in this way to an atmosphere containing a large amount of free SO_2 —*i.e.* an atmosphere, let us say, containing ten times as much SO_2 per cubic foot as is contained in an ordinary severe London fog (which we may regard as 20 milligrammes per 100 cubic feet)—certain very definite phenomena are observable.

In the course of half an hour the leaves become limp and flaccid, and exhibit a gradually increasing curvature—a hanging down of the distal parts of the leaf similar to that exhibited by plants in want of water. In the case of leathery leaves, and with xerophilous plants generally, this limpness is obscured by the presence of a thick cuticle and of much sclerotic tissue. In process of time, sometimes within an hour, a change of colour is perceptible. This begins locally, at the apex or base or margins, and gradually extends until the whole lamina is involved. The colour assumed by most plants is an olive-green, or a brown or yellowish brown. These colour-changes occurred within a few hours of starting the experiments. It must be remembered that we are now treating of strong solutions of SO_2 (200 milligrammes per 100 cubic feet), far stronger than ever occur in London fog. Speaking generally, it is the oldest and youngest growths—*i.e.* still growing—which suffer first. Those which are in the zenith of their activity appear to offer a greater resistance to the acid, and are the last to succumb.

It is interesting to note that, in the majority of cases, the leaves of Dicotyledons treated in this way do not disarticulate, but persist, withered, on the stem; or at any rate disarticulation does not supervene until the parts have become entirely desiccated.

The accompanying histological characters are very definite and pronounced; but they do not differ in any qualitative respect from those occasioned by other acid vapours—*e.g.* HCl .

The most marked character exhibited by vertical sections of leaves which have been treated as described is a violent plasmolysis of all the cells. The protoplasmic bodies of the cells are withdrawn from the cell-walls throughout the whole thickness of the leaf. The protoplasm of each cell is massed together in an irregular figure situated at the centre of the cell, or it is attached to the cell-wall at one side. The form of each little mass shows a general resemblance to the form of the

enclosing cell-wall. In those cells which contain them, the chlorophyll-corpuses exhibit a corresponding crowding together. The chlorophyll-corpuses themselves are not at once disintegrated, nor are their margins ragged; but they are frequently bent and distorted by the contraction of the enveloping protoplasm. The pigment itself is profoundly altered. The body of each corpuscle appears yellow or brownish, never bright green, as in uninjured tissues. Very frequently small granules of a brown colouring matter are found attached to the corpuscle or embedded in its substance. If these do not appear within a few hours of performing the experiment, they can generally be relied on to do so if the leaves be kept for twenty-four or forty-eight hours. These are droplets of acid-chlorophyll or chlorophyllan, a product which is produced from chlorophyll by the action of acids. As the chlorophyllan appears, the substance of the chlorophyll-corpuses gradually loses colour, becoming in many cases colourless, and then exhibiting some degree of disintegration.

I was a good deal interested in ascertaining the precise mode of attack of the sulphurous acid on foliage—that is to say, whether the acid passed directly through the cuticle of the surface, or whether it insinuated itself into the lacunar system of the leaf by the stomata. After a very long series of experiments, I have been able to convince myself that the latter is the usual, or at any rate the most important, means of entry. In the first instance, I coated the surfaces of leaves with a mixture of vaseline and wax—some on the upper, others on the under surface—and exposed them to the action of a vapour of sulphurous acid. But this plan I soon abandoned for the following. Two circular discs of wood about eight inches in diameter were taken, and in each two round holes were cut, in such a manner that when the discs were laid together the apertures in question exactly coincided. These holes were about an inch in diameter. Leaves for experiment were placed between the discs, so that the apertures in question were closed by the leaves as with diaphragms. The leaves being inserted in reversed positions, there would be exposed in one direction the upper surface of one leaf and the lower surface of the other. The discs were then clamped on to a vessel of appropriate dimensions, into which the acid vapour was introduced. In this manner the comparative effects of the same

vapour could be studied as it penetrated the upper and lower surfaces respectively. The method is not a new one, but it has only been used previously to show that the destruction of the chlorophyll is much more rapid by the lower than by the upper surface.

I find in the cases investigated by me that, whilst the mesophyll is very readily attacked from below, the action from above is exceedingly slow; whilst in the latter case the thickness of the cuticle has a decided influence. With thickly cuticularised leaves no injury will accrue when the upper surface is exposed for a period quite long enough for the total destruction of the leaf were the under surface the one exposed. With soft, uncuticularised, or very slightly cuticularised leaves, the result is, of course, very different. But still, where stomata are absent from the upper surface, the epidermis always serves as a barrier to very rapid action. When the leaf used possesses stomata on both faces, there is less disparity in the observed action, though, in most cases, the action is more rapid through the lower surface.

By the histological examination of a great number of leaves belonging to various genera, I conclude that the sulphurous acid reaches the interior of the leaf most readily by the stomata. By examining leaves that had been exposed for periods varying from a few minutes to six or eight hours, I was able to show that the soft mesophyll cells in the neighbourhood of the stomata are the first to be affected, the action progressing from these points to the whole of the spongy parenchyma. The first change in these cells, by which contact with the sulphurous acid is signalled, is their plasmolysis. It is only later that their chlorophyll-corpuscles exhibit any change of colour, and later still that the droplets of chlorophyllan make their appearance. In a leaf such as that we are studying—with stomata on the under surface only—the palisade layer is the last part of the mesophyll to be attacked. Very generally, though I cannot say universally, it is the lower extremities of the protoplasmic bodies of these cylindrical cells which exhibit the greatest amount of contraction; the sides are less strongly contracted, whilst the upper extremities are usually found in their original position.* Where there is a considerable development of lacunæ between the palisade cells, so that the acid vapour

* The same phenomenon was frequently observed when experimenting with the pyridines.

has easy access to the elongated sides of these cells, the withdrawal of the protoplasm from below is never so well marked.

Where the upper surface is the exposed one—taking the case of a plant with delicate cuticle and no stomata on this surface—in due time the acid penetrates the cuticle, destroys the epidermal cells, and then attacks the palisade layer. In this instance, the direction of attack being reversed, it is a common observation to find the protoplasm of the palisade cells slightly withdrawn from the end walls which abut upon the epidermis. That this should be so might be anticipated from what has been narrated above.

Amongst the specimens examined spectroscopically for me by Dr. Ed. Schunck were two which had been exposed to a vapour of sulphurous acid, of strength about two milligrammes to the cubic foot, for two hours. They were leafy shoots of *Bouvardia* and *Hydrangea*. The alcoholic chlorophyll-extract of each showed considerable alteration, the change being that which would be produced by a small quantity of acid. The *Bouvardia* extract, though considerably altered, was by no means so much so as that obtained from the same plant treated with hydrochloric acid. The extract of *Hydrangea* leaves, on standing, deposited regular colourless crystals, most likely inorganic in their nature, accompanied by small dark-coloured rosettes, probably a chlorophyll product. Later, there was a further formation of these rosettes, the residual fluid becoming almost colourless. These results show that, at any rate when considerable amounts of sulphurous acid are present, not only is the general cell-protoplasm affected, but that the chlorophyll-corpuscles are reached and the pigment altered.

When the atmosphere contains only small quantities of the acid—about .2 milligrammes per cubic foot—no such rapid action as that described is noted. Ultimately the leaves change colour in blotches; or in some cases, as in *Poinsettia*, a gradual change of the whole area takes place. This gradual change, which in *Poinsettia* may be continued over more than a fortnight, resembles generally the changes which are exhibited when the leaves die normally. It is only when the amount of sulphurous acid present is kept strictly within the limits defined above that this gradual change is brought about. If this limit is overstepped the leaves will be killed rapidly and the characters shown by the tissues will be the same as those already described

for relatively strong sulphurous acid. The point which I want to emphasise is this. The action of small amounts of acid differs from that of more considerable amounts, but neither effect can be regarded as a good imitation of a fog-effect. With large amounts death is rapid; with traces only, death is much prolonged. It is under the latter circumstances that, in a few plants (of which *Poinsettia* is the best example), a normal death of the leaf is brought about. The killing is so slow that many substances of nutritive value can be removed from the cells. I found that when the leaves are killed in this way they often (though not always) ultimately disarticulate.

The reason why the above failed as an imitation of a fog-effect is because due regard was not had to the conditions prevailing in foggy weather. I had selected healthy plants for experiment, and no precautions were taken to darken the chamber in which they were exposed. When, however, plants are used which have been previously rendered unhealthy by being placed in a dark spot, or when the experiment is conducted in semi-darkness, then a rapid disarticulation of the foliage ensues, resembling that occurring in actual fog. This matter is further discussed on p. 48.

*Action of Small Quantities of Sulphurous Acid upon
Transpiration.*

When traces of sulphurous acid are introduced into a chamber containing a transpiring shoot a slight diminution of the rate of evolution of aqueous vapour takes place. I will, however, describe here only one experiment, which may be regarded as typical of the rest. In this experiment, however, rather more acid was introduced ($\cdot 6$ milligramme per cubic foot was the strength employed in this instance) than is ever found in fog. Its effect was marked and decisive.

My procedure was as follows: * A vigorous shoot of *Acer*

* In point of fact I used in these experiments the simple, but very useful, piece of apparatus known as the "potometer." (Cf. Darwin and Phillips, "On the Transpiration-stream in Cut Branches," in *Proceedings of Cambridge Philosophical Society*, vol. v.) This method is admirable for testing the effect upon the rate of transpiration of sudden changes in the environment. In my account above I have simplified the apparatus to save descriptive details. The assumption is, of course, made that the variations in the rate of *absorption*—which are actually recorded by the potometer—stand in direct relation to the variations in the rate of *transpiration*.

Pseudoplatanus was taken, and its cut end fixed into a glass tube by a piece of india-rubber tubing. Into the other end of this glass tube a long capillary tube was fixed by means of a perforated cork. The capillary tube was led through a small aperture in the bottom of the chamber into a small beaker of water. Upon the lower part of the capillary tube two engraved lines indicated a measured length. The transpiring shoot absorbs water from the broad glass tube, and this draws up water from the beaker, through the capillary tube. If the beaker be lowered for a few seconds an air-bubble is drawn into the capillary tube; after the beaker is replaced this bubble slowly ascends the capillary tube. The time which it occupies in traversing the measured length bears a direct relation to the rate of transpiration. By taking the reciprocals of such readings, a series of figures proportional to the amounts of water absorbed by the branch in a given time are obtained. Below I simply give the readings in seconds, an increase in the time of course indicating that absorption has been slowed, and conversely.

The shoot was fitted up as described, and allowed to transpire in the chamber till a fairly constant rate had been attained. A number of readings were made to ascertain that this was so. Precautions were also taken, so that the vapour transpired should not collect in the chamber, making the air humid, and gradually lower the rate of transpiration.

Time	Number of seconds occupied by bubble in traversing the measured length.	
12.0 (noon)	94	(constant). SO ₂ was now introduced into chamber till the concentration was .6 milli- gramme per cubic foot.
12.5 (P.M.)	125	
12.15 „	133	The glass roof of the chamber was cleaned outside, causing the increase in rate indicated by the next reading.
12.30 „	112	
12.40 „	140	The concentration of SO ₂ was now in- creased to 12 milligrammes per cubic foot
12.48 „	660	
1.10 „	705	
2.5 „	700	(approximately). The atmosphere was changed so that only traces of SO ₂ remained.
2.20 „	127	

The last reading indicates a sudden considerable increase in rate, much greater than was usually the case when the air was changed.

The chief point to notice is the sudden depression on the entry of the sulphurous acid—a depression which was aggravated when additional acid was admitted.

I was also able to demonstrate that dilute sulphurous acid causes a slight, but by no means complete, closure of the previously widely distended stomates of *Centropogon* when it is led over the leaf in a special “gas-chamber” placed on the stage of the microscope.

Experiments upon the effect of SO_2 upon *respiration* are not sufficiently advanced to report upon. An account of them is reserved for a future report.

On the Action of Pyridine and of Allied Bodies.

When I inquired of my friend Dr. Bailey, who has been good enough to conduct the analyses of the Chelsea and Kew fog-deposits, as to what might be the more important substances included in the tarry matters of these residues, he replied that “to a considerable extent some form of pyridine” was present. I have consequently experimented with pyridine, and with a number of allied bodies (for which I am much indebted to Dr. Norman Collie, of University College), with the object of ascertaining whether they exert any hurtful action upon the living tissues of plants.

Pyridine being extremely volatile, is readily applied as a vapour. My procedure was to place a few drops upon a filter-paper, and to suspend this in the bell-glass in which the shoots for experimentation were placed. With the smaller bell-glasses (under $\frac{2}{3}$ cubic foot capacity) I found that a single drop sufficed to produce a marked effect; whilst with the larger size (about 6 cubic feet capacity) two or three drops were ample. A considerable number of plants were experimented upon with very uniform results. If a shoot of *Bouvardia* be treated in the way described, a limpness of the leaves is observable within an hour or an hour and a half of the commencement of the exposure. This limpness is first apparent at the margins and apices of the leaves, the area affected gradually spreading to the whole leaf. The only change

in colour is a slight darkening of the green. Microscopic examination shows that all the cells of the leaf are strongly plasmolysed, whilst in the epidermis there is, in addition, a slight browning of the protoplasm. The chlorophyll-corpuscles, though they may be distorted by the contraction of the protoplasm, do not show any indication of breaking up, nor are they altered in colour. The action, then, of pyridine is very different from that of sulphurous acid, which readily affects the corpuscles. Other plants, similarly treated, are in general agreement with *Bouvardia*. These included *Justicia carnea*, *Centropogon Lucianus*, *Dendrobium nobile*, *Begonia sanguinea* and *B. Haageana*, *Conoclinium ianthinum*, *Anona reticulata*, *Hydrangea hortensis*, *Poinsettia*, *Aspidium* sp.

In one or two cases there was a slight yellowing of the chlorophyll-corpuscles—e.g. *Rhododendron* sp. and *Hydrangea hortensis*. In the latter case I attribute the change to the acids of the cell-sap, which attack the corpuscles when the pyridine has killed the protoplasm, the slightly basic pyridine being insufficient in this instance to neutralise the acids of the sap. Dr. Schunck kindly examined spectroscopically several batches of leaves which I had exposed to pyridine in the manner described. He made alcoholic extracts of the chlorophyll and investigated the absorption spectra of these extracts. The extract of *Conoclinium* leaves showed that the chlorophyll was only very slightly altered, and retained its bright colour for several days. In the *Hydrangea* extract a slightly greater change was perceptible, whilst that in *Bouvardia* was still more considerable. I was rather astonished at this result, as I had examined the spectrum of a *Bouvardia* extract immediately after exposure, and found the chlorophyll almost normal. The corpuscles also appeared quite green and unchanged. It is possible that the interval, of at least twenty-four hours, which elapsed between the exposing and the extracting of the chlorophyll may have something to do with the changes occurring in such cases.

The browning of the protoplasm which occurred in the epidermis in some cases may be due to the presence there of tannin. At any rate, I was generally able to verify, by applying the ordinary micro-chemical tests, the presence of tannin in most instances where a brown coloration was produced by pyridine. This browning is very marked in the flower-buds of

Bouvardia.* It originates in patches on the corolla ; but if the exposure is continued long enough, these spread until the whole of the corolla is involved. The presence of much tannin is readily demonstrable in these buds. The scarlet bracts of *Poinsettia* are transformed to a yellowish-brown colour after prolonged exposure to pyridine. The red colour is located in the epidermis, and the long exposure necessary is explained by the fact that these red bracts are quite destitute of stomata. The pyridine produces a copious brown precipitate in these epidermal cells. This again may be on account of the tannin. The scarlet bracts of this plant are of interest because, in my experience, they are never affected by fog. The green leaves of this plant, on the other hand, are very susceptible to it. The cuticularised and slightly waxy epidermis, which is destitute of stomata, probably excludes the toxic constituents of fog, though, of course, it succumbs when any of them are applied in greater concentration—as in the present instance.

To determine the mode of entry of pyridine into the tissues, experiments were made in much the same manner as when investigating this point for sulphurous acid (*cf.* p. 23). The same apparatus was employed. When the under surface is exposed to pyridine a rapid effect is noted. In an hour the mesophyll exhibits plasmolysis. The tissues are affected in the following order: Spongy parenchyma, palisade parenchyma, epidermis. When the upper surface is exposed (to the same vapour and at the same time) for an hour no plasmolysis or other action is observable. After the expiration of three and a half hours' exposure a *Conoclinium* leaf showed here and there in the upper epidermis slight plasmolysis. After twelve hours this was more complete, and the subjacent palisade layer was affected. These and similar experiments indicate that the cuticle exerts a considerable resistance to pyridine, and to its allies. The entry of pyridine is, I believe, assisted by the stomata to a marked degree. What I have said in reference to sulphurous acid is true also of this substance.

The other substances of the pyridine series with which I experimented are lutidine, picoline, piperidine, chinoline, thiophene, and nicotine. All were applied as vapours, and in precisely the same manner as pyridine—*i.e.* one or two drops on

* For full discussion *vide* Section III.

a filter-paper—except in the case of nicotine.* This last was applied by burning tobacco (“coarse-cut Cavendish”), and leading the fumes by a tube into the large bell-glass containing the plants.

The action of all these substances upon foliage is identical with that of pyridine. Perhaps the most violent plasmolysis was produced by thiophene, a substance in which two of the C H groups are replaced by an atom of S. The *Bouvardia* buds were turned brown by picoline and lutidine—the only representatives of the series (except pyridine) to which they were exposed.

The above results are of interest in that they show, beyond a doubt, the exceedingly poisonous nature of some of the “tarry products.” Thus sulphurous acid is by no means the only substance present in fog injurious to vegetation. Though their toxic character may have been suspected (*cf.* p. 6), I am not aware that it has ever been demonstrated before. Another point should not be forgotten. These bodies, compared with sulphurous acid, have little action on the chlorophyll. Now in several instances of foliage injured by fog the extract showed that the chlorophyll was not affected. Some time ago, † specimens A, B, C, being three batches of fog-injured leaves, were submitted to Dr. Schunck, and his account I now quote from his letter to me at the time. “I examined the leaves,” he says, “separating the parts that had turned brown from those that were still green as well as I could, extracting each lot with boiling alcohol as usual. The two liquids could not be distinguished, both having the usual bright green colour and showing the absorption bands of chlorophyll. I quite expected that the extracts of the discoloured parts of the leaves would have shown on spectroscopic examination that those portions had been exposed to the action of an acid of some kind, but this was not the case. The extracts A and C did, however, show indications of the presence of acid of some kind; but in the case of C, this might have been due to the previous treatment with boiling water, by which the chlorophyll was slightly changed. When leaves are discoloured, as these were, this is not necessarily due to acid; there may be other things present in fog besides acid

* The well-known phenomenon in horticultural practice of injury to vegetation through over-fumigation with tobacco is but a special instance of the deleterious action of such substances as are here under discussion.

† Before I had made any experiments with the tarry matters.

which produce the same effect." This will be reverted to under Section IV.

On the Action of Phenol.

This is another organic substance which has a very marked action upon foliage. My attention was first directed to it by Dr. Schunck whilst I was working with the pyridines. He informed me that he found that when he scattered a few crystals of phenol upon leaves, and then sprinkled them with water, in a short time brown spots appeared on the leaves, which gradually spread until almost the whole of the leaf substance became uniformly tinted brown. I repeated his experiment, and found the result as he had described. I then applied the phenol in the form of vapour, and found that in this condition it was even more readily taken up than as a liquid. The method was as follows: A few crystals of phenol were placed in a small porcelain cup, which was slightly warmed so as to volatilise a little of the phenol. This was at once placed under a moderate-sized bell-glass along with the portions of plants which were to be submitted to experiment. Very soon—that is to say in less than an hour—the more delicate foliage begins to change colour, and in two hours more the action is complete. Leathery cuticularised leaves take longer—four or five hours; extreme cases as long as eight to ten hours (*Cælogyne cristata* and Date Palm). With the readily reacting plants (Ferns and stove Dicotyledons) it is sufficient to expose the leaves for only a few minutes to an exceedingly dilute vapour, and then to remove them from its influence. In due time the change in colour appears.

Microscopic examination of the injured leaves shows that all the cells are violently plasmolysed and the chlorophyll-corpuseles much distorted. In the majority of cases there is produced in the protoplasm a finely granular precipitate, brown in colour. This appears both in the epidermal and in the mesophyll cells. In the chlorophyll-corpuseles dark brown bodies are sometimes produced, which do not, however, in every case entirely obscure the chlorophyll-pigment.* The action of phenol upon a con-

* In *Aschynanthus pulcher* the leaves possess, both above and below the chlorophyll-containing cells, many layers of large colourless protoplasm-containing cells. After exposure to phenol the latter show the formation of this brown granulation to a marked degree. The protoplasm of the assimilating tissue exhibits this also; but the chlorophyll-corpuseles remain

considerable number of plants has been carefully followed, but for the purposes of this report I do not think it desirable to enter very fully into the matter. Moreover, our experiments are by no means concluded. My impression is that the action of phenol is entirely parallel to that of aniline, which has been fully investigated by Dr. Schunck in conjunction with Brebner.* With phenol, as with aniline, a dark brown substance is formed in the protoplasm of living tissues of many plants. Different plants, in both cases, vary in the degree in which they react with the poisons, Monocotyledons in general giving a less complete alteration of colour than Dicotyledons. Schunck and Brebner concluded that the aniline was oxidised by some form of "active oxygen" present in the protoplasm, and, so far as my experiments have gone, I am of the same opinion in regard to phenol. This substance has no action upon dead tissues, nor has it upon the leaves of plants which have been kept in an atmosphere of pure hydrogen until the evolution of carbonic acid ceased. With hydrogen peroxide, phenol gives a dark brown precipitate if a little ferric sulphate be present to aid the reaction.

Although in some cases the chlorophyll-corpuseles turn partially or completely brown with phenol, this is by no means universal. Even where the brown colour is produced I doubt if the chlorophyll has much part in the reaction. The marked change in colour in the corpuseles does not necessarily denote that the pigment has been destroyed. The corpuseles are centres of great chemical activity, and may well contain active oxygen. I am indebted to Dr. Schunck for the information that an alcoholic extract of pure chlorophyll exhibits no noticeable change in regard to its absorption spectrum when treated with phenol. I further find that alcoholic extracts of leaves discoloured by phenol give spectroscopic evidence of the presence of pure chlorophyll. Though hardly entitled to express an opinion on this subject, I feel pretty sure that the chlorophyll is only masked by the brown colouring matter, and that it takes no direct part in its production.

It should be added that we find naphthalene, benzene, and unaltered, the pigment in every respect resembling that of uninjured leaves. The production of these granules has a distinct bearing on a recent discussion upon the so-called "proteosomes." With the assistance of Miss Ewart, I hope to deal with this question *in extenso* in another place.

* *Annals of Botany*, vol. vi. p. 167.

nitro-benzene also have a very similar action on living tissues, though the less volatile naphthalene appears to exert this action to only a limited degree.

Having now dealt with the effects of fog upon foliage (I.) and with the action of certain vapours (II.), I introduce a section (III.) treating of the behaviour of flowers towards fog and certain of its ingredients. This is followed by another (IV.) dealing with chlorophyll. After that the general discussion (V.).

III. ON THE BEHAVIOUR OF FLOWERS TOWARDS FOG AND CERTAIN OF ITS INGREDIENTS.

I have dealt with the action of fog and of certain chemical substances upon *foliage* in distinct sections of this report, but I propose to describe the action of all these reagents upon *flowers* here in one section. In a sense the action of fog upon flowers differs from its action upon foliage—in so far, at any rate, as the light factor is concerned. Though I have tried to show that the reduction of light which accompanies our fogs has a considerable effect in rendering the vegetative organs of plants less able to resist the poisonous action of certain atmospheric impurities, I am of the opinion that this generalisation cannot, save in a very modified sense, hold good in regard to floral structures. I explained at some length that when plants are kept for prolonged periods in darkness the leaves in due time exhibit symptoms of disease. Flowers, on the other hand, expand very readily in darkness, and the blossoms which open under these circumstances retain their normal beauty quite as long as in daylight. Certainly nothing corresponding to the fog-injuries so common amongst flowers is observable when flowers unfold or are kept in darkness. Several of the genera, the flowers or buds of which are readily crippled in actual fog, open perfectly in darkness. I have demonstrated this with Orchids, including *Pleione*, *Cattleya*, *Cypripedium*, *Lycaste*, and *Odontoglossum*; whilst amongst other plants the well-known instances of *Rho-*

dodendron, *Begonia* (Winter Gem), and *Justicia carnea* may be quoted. I confess that I was astonished to find how perfectly these flowers opened under these conditions. It should be added that the whole plant was not darkened, but only the inflorescence or flower-bud. Had the supply of food-material—except in those cases in which flowers are formed at the expense of considerable reserves of nutritive matter—been checked by previous darkening of the foliage, the results might have been very different.

Action of Fog.

Speaking generally, flowers and flower-buds are the first portions of a plant to exhibit suffering. In distant suburban localities the detrimental action of fog upon vegetation is, in very many cases, confined to floral injury. The same result is noticed after a town fog of only moderate severity. A fog lasting six or seven hours frequently leaves its traces upon the more delicate classes of flowers. Its effects only differ in degree from the more serious injuries.

The injuries to *expanded flowers* include a loss of substance in the corolla, accompanied by an abnormal translucency; whilst frequently there is a slight browning or blackening of the apices and margins of the organs. Ultimately the affected parts shrivel and become desiccated. Many white flowers become slightly yellowed and translucent, whilst others develop blotches. Others, again, appear to be uninjured. Flowers possessing a delicate pink or blue colour often lose this colour entirely or in part. In this connection may be instanced pink *Calanthes*, pink and mauve *Acanthaceæ*, *Vanda cærulea*, *Bouvardia*, and the like. Finally, there are flowers which readily disarticulate, sometimes showing one of the above forms of injury (*Phalænopsis*) or, occasionally, intact (*Pleroma macrantha*). In general, however, where no specific or noticeable injury is caused, flowers wither sooner than would otherwise be the case if any portion of their period of expansion coincides with a spell of fog. It must be understood that when I speak hereafter of any flower as being uninjured, I mean that no immediate or local lesion is produced.

Injuries to *flower-buds* are most frequent at the stage immediately preceding the opening of the flower. They show discoloration and desiccation much in the same manner as

flowers, and disarticulate. Often a bud is not killed outright, but the outside members alone are injured. This is frequently to be observed in *Phalænopsis Schilleriana*, where the petals and column have not been reached by the poison. In due time such buds expand, the sepals remaining dwarfed and in part uninjured, whilst the inner parts develop normally. I have noticed the same occurrence in *Lælia* and in a few other genera of Orchids. Very young buds are not so liable to injury as those further advanced; whilst flowers and flower-buds of the same plant are by no means always similarly affected. Thus in *Salvia lantanifolia*, whilst buds disarticulate, expanded flowers are uninjured; in *Ixora* (various species) the buds easily succumb, though the flowers are unaffected. Then in *Rhododendron jasminiflorum* the flowers are uninjured so long as the inflorescence remains wrapped in its bud-scales. The expanded flowers also are little affected. But if the buds attempt to open during fog they are almost invariably "caught." The buds push aside or raise the bud-scales, but rarely succeed in freeing themselves from them. It is common to find in a Rhododendron-house scores of inflorescences trapped in this way in their scales. The unexpanded corollas then shortly disarticulate at the point of their insertion on the floral receptacle. But this happens equally even if the buds be disembarassed of their scales. The moment of expansion seems, in this group, to be a very critical one. Possibly this is associated with the fact that the exposure is, in the *Rhododendron*, very sudden. The buds certainly are exceedingly sensitive to toxic influences at this time. I have already stated that these inflorescences expand readily enough in darkness.

In *Angræcum sesquipedale* the bright green buds turn yellow and disarticulate. By comparing the action of fogs of varying intensity I have found that the lateral buds are more sensitive than the terminal ones. The former sometimes drop whilst the latter remain and open later. The terminal bud I conceive to be more favourably situated in respect of nutrition, and to be thus slightly more resistant to poisonous environment, than the laterals. But, of course, it is only fogs which are not the severest that demonstrate this physiological differentiation amongst the buds.

Finally, many flowers do not show actual injuries. Limiting

ourselves to white flowers alone, we find bulbous plants, like *Tulips*, *Allium*, *Narcissus*, and *Hyacinths* very hardy in this respect. The behaviour of these flowers is in accord with that of their foliage towards fog. *Crinum* likewise may be included. Then amongst Orchids I would instance the genus *Angræcum*. Though *A. sesquipedale* (as we have seen) suffers severely, both as regards its buds and flowers, *A. hyaloides* and *citratum* have always passed through fog uninjured. Other white flowers which escape are *Primula*, *Cyclamen*, and *Deutzia*. These inconsistencies are remarked on below.

Further Comments, with Notes on the Action of certain Reagents.

It is not surprising that the fugitive and little protected floral members should suffer so readily as they do in time of fog. Their surfaces are so little furnished with cuticle, that poisonous substances in the air easily penetrate the outer cell-walls. Nevertheless, in the few instances I have worked out in detail, the presence of stomata, other things being equal, is not without noticeable result. Take as an example the expanded flowers of *Cattleya Trianae*. The sepals suffer first; then the two upper petals; lastly the labellum, which is the least sensitive of the organs cited. The distribution of stomates is as follows. Upon the sepals stomates occur in small numbers, but with fairly regular distribution. Upon the two posterior petals they are about half as frequent as upon the sepals. No stomates were found on the labellum.

In *Phalænopsis Schilleriana* similar relations exist, though the disparity in frequency of stomates upon the sepals and petals is more considerable.

The chief histological character of slightly injured petals (of an Orchid, e.g. *Cælogyne cristata*) is a plasmolysis of the cells throughout. With plasmolysis, such very delicate and lacunate tissues as those of the petals of Orchids exhibit collapse, more or less complete. This, combined with the out-passage of water into the lacunæ, causes the translucency of the parts. Where a yellowing of the petals &c. results, this is found to be caused by the production in the cells of droplets of a yellow oil and to a slight yellow colour developing itself in the previously colourless protoplasm; where browning occurs a fine dark precipitate is found in the protoplasm. But any detailed statement at present

of the appearances exhibited in a large number of cases of injury would be rather premature.

To sum up the effects produced in floral organs. There is

- (1) Plasmolysis and consequent collapse and translucency of the tissues.
- (2) A loss of colour or bleaching.
- (3) A yellowing, due to oil and to a generally diffused yellow coloration.
- (4) A browning, due to a fine precipitate in the protoplasm.

Sometimes (3) and (4) are not readily distinguishable, or they may both be present, as may (2) and (4). The plasmolysis (1) is invariably present.

In discussing these four classes of change, I regard whatever is said as tentative. I have not yet sufficiently probed this department of injury.

(1) The plasmolysis and accompanying changes I regard as due to the direct action on the living cells of poisonous vapours in the air. It is the same phenomenon as has been described (p. 28) for foliage, though, from the extreme delicacy of the tissues of the floral organs, its effects are here accentuated. Any poisonous vapour would have this *primary* effect; be it sulphurous acid, ammonia, or one of the volatile oils.

(2) The bleaching is not inconsistent with the action of sulphurous acid. This vapour, I apprehend, attacks the tissues direct. Instances often occur in which the drippings from the condensed moisture on the glass fall on to the flowers, bleaching the corolla locally. This is frequent in pink varieties of *Bouvardia*. Identical with this is Prof. A. H. Church's observation* of *Convolvulus major*, growing in the Portland Road, with flowers bleached by rain-drops. That a corrosive action of sulphuric acid, similar to that described in Section I., A, occurs in the case of flowers, I have been unable to determine. It is with something more rapid that we have to deal here. Still, such action may be one co-operating cause in the injuries.

(3) The characteristic yellowing which sometimes occurs is difficult to trace. Sulphurous acid alone cannot account for its appearance. Of the many vapours which I have applied,

* *Journ. Roy. Hort. Soc.* vol. xi. p. lviii.

pyridine seems to me, judged in the light of experimental results, to be the one which most nearly reproduces the conditions in question. Upon white flowers pyridine, very generally, exerts a yellowing influence. Sulphurous acid does not.

(4) The brown precipitate is another of these complex phenomena. In some cases the presence of tannin in the cells may account for it. *Bouvardia* buds (and flowers), especially white varieties, are prone to become blotched here and there upon the corolla and calyx with deep brown. Sulphurous acid (whether weak or strong) calls forth nothing comparable to this. A drop of pyridine (and several other bodies of the pyridine series), volatilising under a bell-glass beside a shoot of *Bouvardia*, is sufficient to produce identical blotches on the buds. Histological examination shows a dark precipitate which begins in the outside epidermis, which, if the action be continued long enough, gradually extends to the subjacent layers, finally involving the whole bud. These characters absolutely agree with those of the blotches produced in the same positions in fog. Micro-chemical examination of uninjured buds show that the tissues in question are copiously provided with tannin. I do not make any definite inference here, as the whole subject is being further inquired into in my laboratory.

Very striking and remarkable is the action of phenol, applied as a vapour, upon white flowers. One may divide white flowers into those which turn brown with phenol and those which are simply killed, without change of colour. *Cælogyne cristata*, Lilac, and *Camellia* may be mentioned as flowers which speedily turn to a rich chocolate-brown; the Chinese Primrose, *Allium*, *Narcissus*, and *Cyclamen* as exhibiting no such coloration. Aniline, nitro-benzene, and certain other coal-tar products behave, in general, similarly. A short discussion upon the action of phenol upon foliage has been introduced already, so I will add nothing here. The matter is still under observation. The only point to which I desire to draw attention is this. In phenol we have one of a number of organic compounds which produce colour-changes in some flowers and not in others.* Amongst

* It is no question of mechanical resistance of cell-membranes. I have no doubt on that point. Nor is the production of a marked brown coloration in any way coincident with the presence or absence of tannin. White flowers which are rich in tannin show all degrees of colour-change, and so do those destitute of this substance.

white flowers I have already remarked that some are affected by whilst others resist fog. We have, then, indication that the organic impurities of fog are not unconnected with the injuries produced; an indication which is strengthened when we consider the action of the bodies cited. These not only produce a similar reaction, where a reaction occurs, but also fail to call forth the characteristic colour-change in one conspicuous group—the bulbous Monocotyledons—which likewise resist fog. I am far from asserting that the reagents I have employed are the particular impurities which we have to deal with in fog, though I suspect these impurities to be substances of the same character and general constitution. Nor must it be thought that I am too prone to neglect the toxic action of sulphurous acid. This no doubt, in all cases, takes a chief part in the destruction (*i.e.* killing) of the protoplasm, whilst the action of the accompanying bodies comes out in the secondary changes—the yellowing and browning to which allusion has been made.

But until our knowledge of the volatile tarry and other organic substances in [the air is much extended; until fog ceases to be a mixture of a limited number of known with an almost unlimited number of unknown compounds, we must be content to leave the problems discussed in the report in large degree unsolved.

IV. THE CHANGES WHICH THE CHLOROPHYLL UNDERGOES IN LEAVES INJURED BY FOG.

In view of the sensitiveness of chlorophyll to the action of acids, it might be supposed that this pigment would serve as a ready indicator of the presence of acid fumes in the atmosphere. But although sulphurous acid attains to a recognisable percentage in fog, spectroscopic examination of the alcoholic extracts of injured foliage gives altogether conflicting results. Without going into details, it may be stated that the samples which were from time to time submitted to Dr. Schunck, and upon which he has kindly reported, fall into two categories:—(1) Those in which the chlorophyll was unaltered; (2) those in which there were indications of the presence of an acid which had caused sometimes a slight alteration of the chlorophyll, in others a more complete destruction of the chlorophyll, leading

to the formation of granules of "chlorophyllan," which were microscopically recognisable in the corpuscles.*

But the development of these decomposition-products of chlorophyll in leaves injured by fog cannot be regarded as a sure indication of the action of an acid present in the air; for whenever a leaf which contains a relatively acid cell-sap is killed, as by steaming or boiling, these products are formed. The leaf itself possesses the essentials for the destruction of its own chlorophyll; and, as I have tried to show, there is good reason to believe that the amount of acid in the leaf increases in dull weather. But I will quote his own words from Dr. Schunck's letter—written after he had examined certain batches of injured leaves which I had transmitted to him. The first extract refers to injured leaves in which the chlorophyll did not appear to be altered†: ". . . your specimens have puzzled me a good deal, and though I have examined them chemically as well as I could, I am still at a loss to understand what is the cause of the peculiar discoloration which they show. If spectroscopic examination in this field may be trusted—and I think it may—then I should say that the discoloration of these leaves was *not* caused by *acid* of any kind, but by some other agent the nature of which remains to be determined. I took the leaves of *Aristolochia*, *Beaumontia*, and *Clerodendron*, neglecting the others, in which the effect would be essentially the same, only differing in degree, and I extracted portions of each with boiling alcohol. To my surprise, I obtained solutions of chlorophyll as pure as any I have ever seen, the band iv., which shows the presence of products of decomposition with acids, being hardly visible; the solutions too retained their bright green colour in the dark for a long time. The leaves after treatment with alcohol appeared more or less brown, the *Aristolochia* leaves being the darkest. I quite expected that by further treatment of the brown leaves with alcohol or other solvents I should obtain extracts showing bands due to products of decomposition of chlorophyll, but not a trace of any such bands was to be seen; hence I infer the absence of any such products. I then made some experiments

* Under Type 3, p. 16, the chlorophyll is undoubtedly broken up, and its products may be spectroscopically recognised. These cases of slow killing, which are on the whole exceptional, are excluded from discussion in the present section.

† *I.e.*, as judged by spectroscopic examination of the extract.

to determine the nature of the substance to which the brown colour of the leaves after treatment with alcohol is due, but I had not much success. The substance, whatever it is, is nearly insoluble in the usual menstrua—alcohol, ether, chloroform, acetic acid, &c. ; it dissolves partly in caustic lye, but entirely and easily in conc. sulphuric acid, forming a dark brown solution from which it is precipitated by water in brown flocks. What it is I cannot say, but its formation under the circumstances confirms me in the suspicion I have long entertained, that the effect produced by fog on green leaves is not always and entirely due to acids, as has been supposed.”

The next quotation, from the same source, refers to samples of leaves in which I had microscopically detected what I had assumed to be “chlorophyllan.” Concerning these Dr. Schunck says : “ I have examined the leaves as well as I could, and I find that they are very similar *inter se* so far as regards the cause of their discoloration, but differ in this respect from the leaves previously sent, inasmuch as the colouring matter contained in them must have been altered by the action of acid in some form or other. The big leaves of *Rheedia* do indeed contain, as you suppose, what may for convenience sake be called chlorophyllan (though this is, in my opinion, a mixture of substances), *i.e.* a product of the action of acids on chlorophyll, and the brown granules, of which you make mention, may indeed be this product.

“ It would, however (so I think), be a mistake to suppose that the formation of this product was entirely due to the action of some deleterious matter outside the plant. All green leaves, or nearly all, turn more or less olive-coloured on standing or lying, and their alcoholic or other extracts do the same in consequence of the action of the acid pre-existing in the leaves, or which is formed on exposure of the extracts to air, on the chlorophyll ; but, of course, this action may be hastened by anything that destroys the vitality of the leaf and allows the chlorophyll to come into contact with other cell-contents.

“ The alcoholic extracts of the leaf of *Schlegelia* and of the *Begonia* do not differ from that of *Rheedia* ; but in the case of *Schlegelia* I think I see evidence of the action of something besides acid, insomuch as the leaf after extraction with boiling alcohol retained a distinct brown coloration.”

These quotations clearly show that we must look in many cases to some other source of injury than sulphurous acid for an explanation of the observed effects. Elsewhere in this report I have dealt with pyridine, phenol, and other coal-tar products. When these are applied, although the leaves exhibit often an extreme discoloration, the chlorophyll itself can frequently be extracted in a very pure condition. One case which was very striking may be taken as typical. Fronds of *Phegopteris trichoides* commenced to turn brown at once when the vapour of phenol was introduced, and in a short space of time they were of a uniform deep brown hue. The alcoholic extract of the browned fronds, after it had been filtered, gave a very pure chlorophyll spectrum, and retained its bright green colour for a long time. So that it is quite possible for a marked change in colour to be produced without any direct co-operation on the part of the chlorophyll. Indeed sometimes with phenol and other tarry products the chlorophyll-corpuseles are found to contain brown granules which almost completely mask the green pigment. Nevertheless an alcoholic extract often shows (as in the case just mentioned) that the chlorophyll itself has been little altered. In these cases something is present in the chlorophyll-corpuseles—in addition to chlorophyll—and this substance it is which gives the deeply coloured body with phenol, &c. In other cases the chlorophyll appears to be slightly altered, a result perhaps due to the action of the acids of the cell-sap. As Dr. Schunck puts it—“When poisonous substances, such as you have employed, are allowed to act on leaves, two processes, in my opinion, go on side by side; one is what may be called the spontaneous decomposition of the chlorophyll; the other, the action on pyridine, phenol, or whatever it be of something contained in the cells, the nature of which is unknown. In using pyridine or any other weak base the former process is arrested in consequence of the neutralisation of the acid present, and the colouring matter therefore remains intact, whereas phenol, being practically neutral, has no such effect.” In this view I entirely concur.

V. GENERAL DISCUSSION.

The Effects of Reduced Illumination.

I have described the chief features exhibited by plants injured by fog, and to that description I have added some notes on the action of certain impurities of fog. But I have designedly omitted all reference to the effect which the loss of light entailed by fog has upon vegetation. One is frequently asked by cultivators of plants whether the injuries, such as are above narrated, are due to poisonous substances in the air or to reduced illumination. I will try to answer that question.

It must be borne in mind that within the London area cultivated plants are liable to long periods of deficient illumination during the season when fogs are most prevalent. For weeks together during the months of November, December, and January we are familiar with the dull, leaden sky, though actual fog may only prevail at intervals. This state of affairs, though not always by any means in an apparent manner, undoubtedly has a great effect on the general health or tone of plants, particularly upon those which are greedy of sunlight.

In the first place the assimilation of carbonic acid is interfered with. In dull weather the rate of starch-production in the chlorophyll-corpuscles is very small, whilst during actual fogs practically none at all is formed. Then transpiration, or the giving off from the leaves of aqueous vapour, is greatly diminished, falling almost to a standstill. The roots, however, continue their absorption, with the result that the cells of the plant become distended with water. This continued action of the roots is, of course, pronounced in the case of stove plants in pots; the warmth easily penetrates the soil and keeps the roots in a state of activity. Thus, in dull light, a plant comes to be in a condition of being over-watered. Finally, respiration is interfered with. Access of oxygen from without is a matter of increased difficulty, owing to faulty circulation in the intercellular passages, whilst one source of oxygen is almost entirely cut off, viz. the oxygen which is liberated during carbon-assimilation.

Respiration being deficient, many substances which are formed in the cells are incompletely oxidised, and consequently tend to accumulate. This is especially the case with the organic

acids. The few experiments I have made towards satisfying myself that this was the case do not add anything previously unknown. The presence of increased quantities of organic acids in the cells tends to make them increasingly turgid, whilst the presence of so much water renders an abnormal wateriness of the leaves inevitable. Under these circumstances, the whole mechanism of the leaf is out of gear. The normal balance is upset, and it is difficult to suppose that the protoplasm can offer effectual resistance (as it might under normal conditions) to the action of poisonous impurities in the air.

Symptoms of Disease.

That plants are in a pathological condition when grown in dull light or semi-darkness is evidenced in some cases by events which are quite apparent even to the passer-by.

One of these manifestations is the appearance to which Sorauer* has given the name of yellow-spottiness ("Gelbfleckigkeit"). Many stove-plants are liable to this during dull weather. Its occurrence is an expression of an enhanced wateriness of the plants exhibiting it. It is caused by the stretching—generally at right angles to the surface of the leaf—of groups of mesophyll cells scattered over the leaf area. This gives rise to little pustules or wartlike excrescences ("intumescences") upon the surface. The chlorophyll in the cells concerned turns yellow, giving an appearance of yellow-spottiness. During my work I have met with this symptom of disease, though I have not made any extended investigation, except into one case. This is the curious cupping of the leaves of *Bouvardia*, which is very prevalent sometimes in dull weather, or when the conditions of cultivation leave something to be desired. The surface of the leaf shows irregular depressions, varying in size and form, with wrinkles between the pits. These irregularities are due to the stretching of the epidermis of the lower surface without there being any equivalent extension of the other tissues. The epidermal cells in question, as a result, cover a considerably greater area than in sound plants. This throws the leaf into a

* Sorauer, in Wollny's *Forschungen auf dem Gebiete der Agriculturphysik*, Bd. xiii. p. 90.

An instance of this phenomenon came under the notice of the Scientific Committee some time ago (*cf. Journ. Roy. Hort. Soc.* vol. xi. p. lvi. under heading "Warts on Vine Leaves").

number of folds and depressions, the appearance being especially marked in the lower epidermis, which tends to split away from the subjacent tissues locally. I have little doubt this is only a special case of "gelbfleckigkeit," though, there being no chlorophyll in the epidermis, there is consequently no yellow coloration. At any rate it is of interest as indicating an undue wateriness and turgidity of the tissues.

Another symptom exhibited by plants which are insufficiently illuminated is a tendency to drop some of their leaves. This is very widespread, and is for the horticulturist a question of the first magnitude. In ordinary dull weather the actual falling of leaves is not as a rule very marked; but if any additional factor, inimical to the plant, be introduced the result may be a profound one. When a healthy plant is covered with an opaque shade, so that it is in darkness, we find that leaf-dropping begins in due time. I have experimented with selected examples of "hard-wooded" and of soft herbaceous plants. On the average a leaf will drop about the fifth day, then another a few days later, and so on. The oldest leaves drop first, and the others follow in the sequence in which they were developed. In this way more than a month elapses before the plant is stripped. When a plant is grown under a translucent screen, so that the light is reduced* but not extinguished, as in foggy weather, the rate at which the leaves fall is slow compared with what obtains in total darkness. The first leaf will not fall till perhaps the eighth or ninth day, and the succeeding ones at proportionately remote intervals. The whole process of leaf-dropping is prolonged to double the time occupied in darkness. It will be noticed that the rate at which leaves drop in actual fog is out of all proportion to the length of exposure to reduced light, or even darkness, which the plants have incurred. The thing was illustrated on a grand scale this winter for the first time since I have been occupied with the question. For the five days ending December 23, the west of London (including Kew) was covered more or less continuously by a dense mantle of fog. This was so opaque that artificial

* I took some pains in making these experiments to obtain, as nearly as possible, an average reduction of light similar to that experienced in foggy weather. I was able to do this by employing the method of photometry elaborated by Dr. G. H. Bailey, of Manchester, for the registration of sunlight intensity. In reviving and developing an idea of the late Angus Smith's, Dr. Bailey has provided the plant physiologist with a much-needed implement of research.

light was generally required. The fog was, however, emphatically an overhead one, and was rarely on the ground. A fog of such opacity and persistence would, had it rested on the ground, have produced an enormous destruction of hothouse vegetation. But, as it happened, neither at Kew nor at Chelsea was anything but the most insignificant damage to be noted. When I reflect on this, and on the results of my own experiments, I feel that I can confidently assert that the reduction of light incident to foggy weather cannot *by itself* be held as occasioning the wholesale dropping of foliage which occurs in severe fogs. I shall revert to this matter again directly.

The third symptom which plants exhibit in dull weather is the relative immobility of the starch in their chlorophyll-corpuscles. Correlated with the much diminished or suspended activity of carbon-assimilation is a marked sluggishness on the part of the plant to withdraw residues of starch from the corpuscles. In many cases (it is not a universal phenomenon) these residues remain *in situ* through long spells of foggy weather. But, as I have stated on p. 17, if the leaf actually falls, it first yields up its starch. When the death of the leaf is inevitable, an effort is made to save something of nutritive value. Thus the starch is converted into sugar, and travels down into the stem. Nor is this surprising, seeing how readily diffusible is sugar. Other constituents, especially proteids, travel more slowly, and they cannot be saved in the sudden destruction which is meted out by the poison-bearing fog; or, to state it more accurately, the slow contraction or plasmolysis of the cells establishes a barrier, as it were, around each cell, detaining all but the most diffusible substances, which escaped prior to the contraction.

That plants may suffer in the way described was recognised by Sachs* nearly ten years ago. After remarking the rapid formation and disappearance of starch, he continues: "But, on the other hand, there exists a condition in which plants, though apparently healthy, are in a state of rigidity or foliar inactivity. In this condition little or no growth takes place, and the starch in the leaves exhibits no variation sometimes for weeks." He took a Tobacco-plant which exhibited these symptoms, "and placed it in a dark room, where it remained for a week at a

* Sachs, "Ein Beitrag zur Kenntniss der Ernährungsthätigkeit der Blätter," *Arb. des botan. Instituts in Würzburg*, Bd. iii. 1884.

temperature varying from 16° to 20° C. During this period it did not make any perceptible growth, and at the end of the experiment the leaves were quite as rich in starch as at the beginning."

The Double Action of Fog.

I have devoted the last few paragraphs to showing that plants undergo a lowering of tone when insufficiently illuminated. This is evident (1) by the occasional development of intumescences and cupping; (2) by the tendency to drop leaves; and (3) by the persistency with which residues of starch remain in the chlorophyll-corpuseles. I could have gone further and instanced the frequency with which more or less etiolated growths are produced. All these things indicate that the plant is in a diseased condition. It is true we know too little of the maladies of plants which are due to environmental fluctuations—light and shade, heat and cold, dryness and humidity. The labours of many who would be plant physicians have too frequently been devoted to unravelling the life-histories of the fungi which prey upon plants, whilst the constitution of the plant and the predisposing causes of disease have perhaps hardly received the attention they deserve.

If, then, when a period of darkness overtakes a plant, and from this cause its constitution is liable to be undermined, how vastly is the danger aggravated if poisonous vapours are present in the air! With urban fog these two conditions are fulfilled. In addition to the prevailing darkness, the air is charged with sulphurous acid, hydrocarbons, and other impurities toxic in property.

Whilst investigating the action upon plants of the known or probable impurities of fog, I was impressed with the difficulty of successfully imitating the main features of fog-injuries. It is sufficient for our purpose to cite what happens with sulphurous acid. If a healthy plant be placed in an atmosphere in which sulphurous acid is present in much greater amount than it is in a severe fog—*e.g.* if there be ten times as much—we observe the development of certain injuries. The leaves are discoloured, the cells killed; but the leaves do not readily disarticulate. If the amount of sulphurous acid present be diminished so that the percentage in the air is approximately the same as in a typical fog, then the killing of the leaf is much prolonged. The change in

colour is slow, and the action may be continued over many days, but the result more nearly approximates to a fog-injury. But it differs from this in at least two important respects. Firstly, the time taken is too long; and, secondly, the leaves by no means always disarticulate. One characteristic fog-injury is never met with when healthy plants are exposed to the action of dilute sulphurous acid—that is the disarticulation of green and apparently uninjured leaves. This effect I could not produce until I more rigidly imposed the conditions prevailing in fog. It was only when I employed plants which had been kept in feeble light for a few days that I was able to cause anything like a rapid defoliation with sulphurous acid; or the same result was attained by conducting the experiments in darkness or under light-absorbing screens. The best imitations of normal fog-effects can only be obtained in this way. The reduction of light alone is insufficient to account for the observed result. Nor will sulphurous acid in full daylight bring about this result. To the acid must be superadded diminished illumination. The latter produces a loss of tone in the plant, to which I have already alluded. The power of the protoplasm to resist any toxic substance present in the air is lowered. The death of the leaves is hastened, and they disarticulate. As to the reason for their disarticulation under these conditions, and their non-disarticulation with the acid alone, I shall venture no explanation.

The Behaviour of Different Classes of Plants.

And now we are in a position to consider why the leaves of Ferns, Monocotyledons, and Dicotyledons differ in their behaviour towards fog. The facts are these. Ferns, with their tender and delicate foliage, hardly suffer perceptibly. At Kew I have examined the various Fern-houses after spells of severe fog, when the collections of stove plants in adjacent houses were completely disfigured from this cause, without remarking any damage to speak of. At Chelsea, though the Ferns do not enjoy such an absolute immunity from fog, the injuries are slight compared with those obtaining amongst other groups of plants.

The foliage of Monocotyledons at Kew does not suffer. Mr. Watson, who has given this matter his earnest consideration, tells me that he can recall no instance of damage to the vegetative organs of any Monocotyledon at Kew. At Chelsea

circumstances are less favourable, and with severe fogs the foliage of some Orchids and of certain other families of Monocotyledons are affected. But even here the number of species which show signs of severe suffering is small as compared with Dicotyledons. It is amongst hothouse Dicotyledons that the bulk of the damage to foliage is met with.

On a preceding page I pointed out that the effect of reduced light is to lower the tone of plants and to undermine their constitution, so that they are less able to resist actual poison in the air. It is these two circumstances of the environment, playing as it were into each other's hands, that lead, in my opinion, to the results observed. But Ferns—speaking generally—are exceptional in this respect. Ferns, as a class, may be termed shade plants, and as such are not seriously affected by periods of partial darkness. Other things being equal, the more greedy a plant is of sunlight, the more will it suffer when its illumination is reduced. If, then, the constitution of the Fern is not seriously undermined in dull and foggy weather, may it not perhaps on this account be the better able to resist the poisonous gases? May not the apparently extreme delicacy of the Fern's organisation be more than compensated for by its immunity from any serious lowering of tone in partial darkness? I put this solution of the question forward with some reserve as I know I have not sufficient evidence to prove it. It may reasonably be urged that, amongst Dicotyledons, such as are shade plants should likewise resist injury. Many undoubtedly do, but I am not as yet in a position to say that this is anything like general.

Monocotyledons are not so easily dealt with as Ferns, though, taken all in all, cultivated Monocotyledons are shade-loving when compared with Dicotyledons. One thing seems pretty certain, and that is that Monocotyledons do not suffer in the same degree that Dicotyledons do from diminished illumination. And there is good reason for believing some fundamental physiological difference between the properties of the leaves of these two classes of plants exists, though a satisfactory explanation of this difference is not as yet forthcoming. The following extract from Vines's "Physiology"* supports this assertion: "One of the most striking features presented by plants which have been grown in darkness is the smallness of the leaves. This is not a

* S. H. Vines, *Lectures on the Physiology of Plants*, p. 380.

universal rule by any means, though it applies in the vast majority of cases when the leaves are dorsiventral. The radial or bilateral leaves characteristic of many Monocotyledons become excessively elongated in darkness, just as shoots do, but their breadth is diminished. And even among dorsiventral leaves exceptions occur. The leaves of the Beet, for example, attain a considerable size in darkness. From Sachs' observations it appears that leaves which, when they unfold under normal conditions, become fully exposed to light at a comparatively early stage in their development, are those which are most affected in their growth by continuous darkness; whereas those, such as sheathing leaves, which are naturally protected more or less from exposure to light by others investing them, attain a relatively more perfect expansion." I shall not attempt to discuss this difference in behaviour amongst leaves, but what is of interest for us to note here is the fact that those plants which present a contrast in regard to their reaction towards diminished light should also exhibit very different capacity in resisting fog.

Action of the several Impurities.

It is hardly possible to sharply distinguish between the lesions caused by the various toxic ingredients of fog. Wherever "tannin" is present in tissues a dark coloration may be assumed, sooner or later, after the death of the protoplasm.

With *sulphurous acid* this change is certainly slow in its development. Frequently no such change is observed.

With the *pyridines* there is often a browning with tannin. But where tannin cannot be shown to exist, or where its presence is doubtful, the colour-change does not proceed usually beyond a slight yellowing (as in many corollas). Still, I should not like to make any definite generalisation as yet.

With *phenol*, *nitro-benzene*, and several other coal-tar products a very general browning results; and this in green and colourless tissues alike. But the degree in which this colour is formed varies in different plants. We find every stage between no change in colour to the production of a deep chocolate-brown. The distribution of tannin in the organs affords no clue here.

But we must remember that our knowledge of *post-mortem* colour-changes in plant-tissues is limited and uncertain. We

are operating in an unknown field, and for many years it will be impossible to speak with confidence. This is but another instance of pathology outstripping the limits of ascertained normal physiology.

At present we must be content with the knowledge that organic matters take a marked share in these fog-injuries. I have taken pyridine, phenol, &c., as *samples*. But the onus of demonstrating the presence of these and similar bodies in the air, and the determination of their amount, rests with the chemists.

VI. POSSIBLE REMEDIAL MEASURES.

In conclusion, there is very little of what I can say likely to be consoling to the horticulturist. We must recollect that in the employment of measures directed towards mitigating the injuries incident to fog, two factors—the presence of poisons in the atmosphere and the reduction of light—have to be considered. To counteract these the urban cultivator is asked to construct airtight houses, with definite openings where the admitted air can be filtered; whilst to compensate for the loss of light due to the absorption which the rays undergo in traversing a stratum of dense fog, he must provide a generous installation of electric light. Without doubt, the entire preservation of vegetation in foggy weather is only a matter of *£ s. d.* But it is for the cultivator to sit down and count the cost. Representative growers agree in advising me that although horticulture, under these conditions, would be very interesting from a scientific point of view, it would hardly be commercially desirable. The necessity for the reconstruction of glass-houses upon valuable urban land must of necessity suggest to the horticulturist the alternative of decamping into the country, where the cultural conditions are more favourable. The enhanced value of urban sites has, apart from other inducements, no doubt been a factor in determining an increasing number of growers to settle well outside the suburbs. If, then, any idea of reconstruction is raised, it would in all probability prove to be the last straw. Considerations of this sort lead me, in making a few remarks upon cultural precautions, to limit my suggestions to such as are possible of realisation—things being as they are.

If we could eliminate atmospheric contamination, I do not think the reduction of light alone would be a very serious cause of complaint. Now and then it might be so to some extent, though it would hardly be a grievance of the first magnitude. It is when we have superadded aërial contamination that the mischief is done. Many very common injuries to flowers—injuries which impress the cultivator and catch his attention—have no causal relation with diminished illumination. The inflorescences of Rhododendrons, which become so characteristically glued up in their bud-scales and fail to open, will expand perfectly in total darkness. So also will the flower-buds of most Orchids. Since, however, the application of artificial light, in a manner likely to be effective, would be an unduly heavy burden on the grower, we will dismiss this aspect of the question, and proceed to discuss whether atmospheric contamination can be cheaply remedied.

And, first of all, can fog be neutralised or absorbed after it has entered a plant-house? I have experimented with several things, but my results do not justify me in basing any recommendations upon them. The sluicing or syringing of liquid chemicals about a house has little to recommend it, even when attended with some success. To solids the objection is not so great. But I have not found that carbonate of ammonia, for instance, exerts any noticeably beneficial action as a neutraliser of the acid vapour of fog. But fog is a complex product, and anything which might neutralise one constituent would probably leave the others free to do their damage. I have never felt that anything could be done inside the house towards mitigating fog except the taking of certain precautions as regards watering and heating. And I am of this opinion still.

The scope of this report does not extend to a discussion of the big question of the abolition of fog. Even the most sanguine of the present generation can hardly hope to enjoy any abatement of the fog-*nuisance*. So that I shall be more practically discharging my mission in discussing how fogs may be excluded from plant-houses than in attacking the greater problem. Stoves, within certain limits, can be covered in with sheets of canvas, and this has been tried with encouraging results. I first heard of this method being systematically and successfully applied from Mr. C. Davies, of the Mote Park Gardens, Maidstone. Even the fogs of limited duration which are experienced there are sufficient

to destroy the blossoms of a whole houseful of Orchids. But they have been successfully combated by covering in the house with canvas sheets. Elsewhere I have seen this done, sometimes at my suggestion, with beneficial results. Still, at the best, it is but an expedient. Immunity obtained in this way is only partial. Severe fogs of short duration, or longer ones of only moderate density, may be filtered through canvas, so that the damage caused is lessened; but a persistent dense fog generally prevails in the end.

If plant-houses were constructed rather less leaky than is the case at present, something definite could no doubt be done towards filtering the air. I confess to holding serious doubts as to whether the admission of air to plant-houses, as in vogue just now, is based on sound physiological principles—and this quite apart from the fog- nuisance. During the course of my inquiries into fog, a device for ventilating conservatories—the “patent fog-annihilator” of Mr. Charles Toope—came prominently under my notice; and as I have been frequently asked what I think of it, I will take this opportunity of stating what I know. The system is as follows: A number of boxes, situated on the floor under the staging, communicate directly with the exterior by means of apertures which can be readily closed if desirable. These boxes contain several open-work trays, upon which sticks of charcoal are loosely placed. The air entering a box from outside is led through these trays, coming into close contact with the charcoal. As the air leaves the box it impinges upon the hot-water pipes, and is thus warmed before it reaches the plants in cultivation. The entrance of air is promoted by simple contrivances known as “exhaust-caps” placed on or near the ridge of the house. These caps are so constructed that practically, under all conditions, an out-draught of air obtains. Should the draught be too great, it can be regulated by means of valves. By this system a constant circulation of air throughout the house is brought about. The air enters the charcoal-box at once from outside. It passes through this and is warmed by the hot-water system of the house, and ultimately escapes by means of the “exhaust-caps.” Excepting for the apertures mentioned the house is air-tight. It is by means of the charcoal that Mr. Toope claims that the air admitted is purified. As the air circulates between the sticks of charcoal it gives up the products

of coal-combustion with which it may be contaminated, as in foggy weather.

Charcoal undoubtedly possesses remarkable properties as an absorbent, and Mr. Toope is by no means the first to call attention to its properties in this respect. Forty years ago the chemist Stenhouse* made observations on these properties, and it may not be without interest to call attention to what he said about it. In the paper referred to, Stenhouse describes and illustrates the remarkable property of charcoal as an absorbent and oxidiser of the products of decomposition of organic matter. He describes how the carcasses of dogs were kept covered with a thin layer of powdered charcoal—but otherwise exposed—without any nuisance arising therefrom. He adds that he has devised a respirator on this principle, to be used in districts smitten with cholera or yellow fever. He found, further, that with such a respirator he could breathe with impunity air containing large amounts of ammonia, sulphuretted hydrogen, and other hurtful gases. Finally, he suggested the application of charcoal for purifying the air of houses located in infected districts—all air admitted to be passed through thin canvas bags containing crushed charcoal. Were such precautions taken, many regions at that time fatal to Europeans could be, he was sanguine, dwelt in with impunity.

In a later paper† Stenhouse describes his experiments, showing how the absorbent property of charcoal could be greatly increased. From this paper I venture to make the following extract, as charcoal seems to have fallen into desuetude as an absorbent:—

“The lighter kinds of wood charcoal, owing to the nine volumes of oxygen gas contained in their pores, possess a considerable power of oxidising the greater number of easily alterable gases and vapours. The absorbent power of charcoal is comparatively much greater than its capacity for inducing chemical combination. In this respect charcoal presents a remarkable contrast to spongy platinum, which, though inferior as an absorbent for some gaseous substances—such, for instance, as

* J. Stenhouse, “Ueb. die entfärbenden und desinficirenden Eigenschaften der Holzkohle, nebst Beschreibung eines Kohlen-Respirators zur Reinigung der Luft durch Filtration,” *Annalen der Chemie und Pharmacie*, Bd. xc. 1854, p. 186.

† J. Stenhouse, “On Platinised Charcoal,” *Journ. Chem. Soc.* viii. 1856, p. 105.

ammonia, of which spongy platinum absorbs only thirty volumes, while charcoal absorbs ninety—is, nevertheless, immensely more effective both as an oxidiser and as a promoter of chemical combination generally. As it is desirable for some purposes, while retaining the absorbent power of charcoal unimpaired, to increase its oxidating influences, it struck me that this important object might be easily effected by combining the charcoal with minutely divided platinum. In this way a combination is produced to which I have given the name of platinised charcoal, which possesses the good properties of both of its constituents. In order to platinise charcoal, nothing more is necessary than to boil the charcoal, either in coarse powder or in large pieces, in a solution of bichloride of platinum, and when the charcoal has become thoroughly impregnated with the platinum, which seldom requires more than ten minutes or a quarter of an hour, to heat it to redness in a close vessel—a capacious platinum crucible being very well adapted for this purpose. When 150 grains of charcoal were impregnated with 9 grains of platinum, by the process just described, the charcoal was found to have undergone no change in its external appearance, though its properties had been very essentially altered. . . . I find that 2 per cent. of platinum is sufficient to platinise charcoal for most purposes. Charcoal containing this small amount of platinum causes a mixture of oxygen and hydrogen to combine perfectly in about a quarter of an hour, and this is the strength of platinised charcoal that seems best adapted for charcoal disinfectant respirators. . . . Platinised charcoal seems likely to admit of various useful applications; one of the most obvious of these is its excellent adaptability to air-filters and respirators for disinfectant purposes.” So much for the properties of charcoal. My colleague, Professor Corfield, of University College, assures me that “charcoal is now very little used for the purification of foul air. It was formerly employed in sewer ventilation, but it was found that it soon became damp and was then useless.”

I was anxious to test Mr. Toope’s application, and to see how far the sulphurous acid of fog might be absorbed as the foggy air passed through the charcoal trays. Mr. Toope therefore, at my request, furnished me with a sample box, so arranged that I could aspirate air through it. I was frequently in the habit of aspirating fog through 25 c.c. of potassium permanganate of such

strength that the aspiration of $2\frac{1}{2}$ to 3 cubic feet of an ordinary fog would decolorise the solution, whilst $1\frac{1}{2}$ to 2 cubic feet sufficed in the case of very severe fogs. I have repeatedly aspirated air, in all sorts of foggy weather, through the charcoal-box. But even in the most severe instances I have never noticed anything more than a slight discoloration of the permanganate after the passage of as much as 25 cubic feet. I have also placed the box in a chamber into which an atmosphere of strong sulphurous acid was introduced—an atmosphere of which $\frac{1}{10}$ cubic foot sufficed to entirely decolorise the permanganate. When drawn through the charcoal, however, 3 cubic feet could be drawn without perceptibly affecting the colour of the fluid. When kept in an atmosphere of strong sulphurous acid the charcoal becomes in time charged, and, for the time being, incapable of further absorption. In this charged condition I left the box for some eight or ten weeks, and found that by the expiration of that time it was as good an absorber as ever. With ordinary fogs there seems little fear of anything of this kind happening; nor have I observed any tendency in the charcoal to get choked in this way in long spells of foggy weather. That other impurities are also absorbed I have no proof, though I consider it most probable.

In order to demonstrate the advantages of his system to horticulturists, Mr. Toope has constructed a small conservatory at his offices in Stepney. Here he cultivates, in an unfavourable atmospheric environment, a collection of Orchids and other stove plants. The results I regard as distinctly favourable to his system, though they were not by any means convincing. This arose, not necessarily from any defect in the filtering apparatus, but rather from faulty cultural methods. Mr. Toope is a busy man, and the charge of his plants falls to the lot of others. Many plants very sensitive to atmospheric impurities, which he obtained at my suggestion, received a severe check in transit before they reached him. Others, again, which he raised from seed for observation were liable to neglect from time to time. So that a casual visitor unacquainted with the facts might easily have carried away an unfavourable impression of the utility of the system. But, taking everything into consideration, I incline to take a distinctly favourable view of charcoal as a filter for contaminated air—so much so that I believe it might be adopted with advantage by our urban cultivators. The charcoal un-

doubtedly absorbs a very large percentage of the sulphurous acid, and this can only have a beneficial result. The adaptation of the system to old plant-houses does not involve any very serious reconstruction. The charcoal-boxes and the exhaust-caps are easily fixed; whilst it is only very old and leaky houses that cannot be rendered reasonably airtight. In this way the toxic action of fog will be mitigated to an appreciable extent.

As regards cultural precautions to be observed in foggy weather, experience indicates that a low temperature and a moist atmosphere are conducive to the well-being of the plants, though they, of course, afford no absolute protection. This aspect of the question has been clearly put in a note to the *Gardeners' Chronicle* by Mr. Thiselton-Dyer, which I quote *in extenso* :—

“The Kew practice of keeping the winter temperature of the houses as low as we dare is based on the result of practical experience. I do not dogmatise for other people who want to solve their own problems, and find out what is best for their particular requirements for themselves. But as Mr. Henslow has pointed out, the theory of the subject has been stated clearly by Lindley; and it may not be amiss to quote a few words from his classical ‘Theory and Practice of Horticulture’ on the subject.

“The point of the whole matter is that in winter, with a low external temperature and nocturnal radiation, it is practically impossible, in a large glasshouse, to keep the internal atmosphere humid with a high temperature. I quote from Lindley, p. 207 :—

“‘Another source of dryness is the coldness of the glass roof, especially in cold weather, when its temperature is lowered by the external air, in consequence of which the moisture of the artificial atmosphere is precipitated upon the inside of the glass, whence it runs down in the form of “drip.”’

“Again, ‘It is evident that the mode of preventing this drying of the air by the cold surface of a glass roof will be either by raising the temperature of the glass, which can only be effected by drawing a covering of some kind over our houses at night, so as to intercept radiation, or by double glass sashes; or else by keeping the temperature of the air as low as possible, consistently with the safety of the plants, and so diminishing the difference between the temperature of the external and internal air.’

“In large glasshouses it is obviously impracticable to adopt

the expedients which Lindley suggests. The only alternative is to do what we do at Kew—lower the temperature as much as possible, and so secure the highest possible relative humidity, with the double result of keeping the plants at rest and of checking their desiccation.”

I hope soon to prepare an illustrated and detailed monograph in which I shall be able to justify many of the statements which occur in the body of this report.

ON SOME EFFECTS OF GROWING PLANTS UNDER GLASSES OF VARIOUS COLOURS.

By the Rev. G. HENSLOW, M.A., F.L.S., &c.

[Read March 14, 1893.]

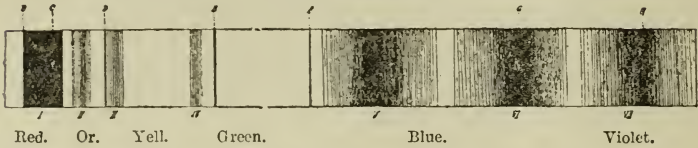
INTRODUCTION.

OF the three important functions executed by living protoplasm under the influences of solar radiations—namely, *respiration*, or the inspiration of oxygen and the expiration of carbon-dioxide; *transpiration*, or the exhalation of watery vapour; and *assimilation*, or the inspiration of carbon-dioxide and the expiration of oxygen—it has been clearly established that the heat-rays are the prime stimulators of the first, or respiration, which may, therefore, be independent of the luminous rays. Under ordinary circumstances there is an optimum temperature for each kind of plant; and if it be continually raised artificially, respiration also continues to increase, indicated by the ever-increasing quantity of carbon-dioxide expired, until death ensues; the curves representing the increments of carbon-dioxide disengaged corresponding to the increments of temperature being in all cases parabolas.

Experiments are wanting to ascertain under which colour or colours respiration attains maxima; but as the curve of obscure heat in the solar spectrum has one maximum between the lines B and C, *i.e.* corresponding pretty accurately with the chlorophyll absorption-band No. I., we may assume with some

degree of probability that it would attain the highest, if not the only maximum, under red glass.

SPECTRUM OF THE ABSORPTION-BANDS OF CHLOROPHYLL.



A, B, C. &c. the principal Fraunhofer's lines. I, II, III, &c., the absorption-bands of Chlorophyll. Red, orange, yellow, &c., indicate the approximate places of the different coloured bands of the solar spectrum.

With regard to transpiration, M. Wiesner and others have come to the conclusion that it is just those rays which are absorbed by chlorophyll which are most energetic in exciting this function. According to my own experiments, however, this general statement would seem to require some qualification; for, taking the means of numerous examples, I find that two chief maxima occur in a very pronounced manner under red and violet glasses, a minor one often occurring under green glass; while yellow, blue, and clear glasses as a rule give minima.

With regard to assimilation, with which the experiments discussed in this paper are concerned, M. Dehérain* came to the conclusion that it was the same chlorophyll absorption-bands which were instrumental in exciting it, as with transpiration; so that when the one function is stimulated to excess the other is more or less deficient. My own experiments confirm this latter statement, but do not seem to quite tally with the former; for I find that assimilation has maxima under yellow, blue, and clear glasses. In other words, in a more or less degree of correspondence with the position of absorption-bands *alternating with those required for transpiration*, so that if the upper letters, indicating the colours of the glasses, represent the positions of maxima, and the lower ones those of minima, the two functions may be illustrated as follows:—

Transpiration	{	R.	G.	V.	
	{		Y.	B.	Cl.
Assimilation	{		Y.	B.	Cl.
	{	R.	G.	V. (?)	

* *Ann. des Sci. Nat.* 5^{me} Sér. (1839), 12, p. 5.

I put a (?) after V., as through an accident my violet glass was broken; but M. Dehérain found that with violet he obtained a less amount of carbon-dioxide than with blue.

The above result is somewhat unexpected, so that I propose repeating my experiments this summer, to thoroughly test the accuracy of this conclusion.

Before giving the results of my experiments on the germination and growth of plants under different coloured glasses, it will not be out of place to make a few remarks upon the general effect of light on seeds.

The question whether light is favourable to germination or not was raised more than a century ago, and has never yet been altogether satisfactorily answered. Numerous experiments have been tried to solve the problem, first by Senebier in 1772, latterly by Cieslar in 1884, and lastly at the Cornell Agricultural College in 1889. Of the more important papers of late years, those of MM. Pauchon, Adrianowski, and Cieslar may be mentioned; yet these authors do not agree in every respect.

In the first place it must be noted that the word "germination" covers two stages of growth, which are not always distinctly kept apart in descriptions, and what may be true for one may not be equally true for the other. The first stage consists of the protrusion of the radicle or the "sprouting," with the consumption of reserve food materials—that is, until any chlorophyll is required. Secondly, as soon as the time arrives for the plantlet to have green colouring matter, then it is obvious that light is necessary.

With regard to the first period, M. Adrianowski's* experiments appear to be important. He found that of 200 Hempseeds placed in diffused light and of 200 in total darkness, other conditions being equal, the average number of seeds which had germinated (*i.e.* presumably protruded their radicles) at the end of one day was as 9 to 12 respectively. Similarly of *Agrostis stolonifera*, the proportion was 5 to 54; of Colza, 17 to 62; of *Camelina sativa*, 13 to 50.

Using coloured glasses, he found that an average of twenty series of experiments gave the proportional number of seeds which had germinated at the end of a day as follows: Under

* *Archives de l'Académie Forestière et d'Agriculture*, Moscou, 6^e ann. ii. p. 171.

red, 47; orange, 48; green, 29; blue, 49; violet, 56; and in darkness, 58.

These results would appear to show that light is less favourable for the first stage of germination, or sprouting, than darkness, and that, excepting green, which we shall see is always most injurious to plant growth, violet being the nearest approximation to darkness, is better than all the other rays.

M. Cieslar,* by a series of experiments, came to the conclusion that the influence of light varies according to the species. Thus some, like Mistletoe, do not germinate in the absence of light. Perhaps this may be correlated with the fact that the seeds of the Mistletoe contain chlorophyll in their endosperm. Other seeds, as those of Pistachio, Tangerine Oranges, Peas, &c., contain chlorophyll in their cotyledons. These perhaps might be also found on experiment to require or to be benefited by light.

Again, some seeds, as of Barley, Maize, &c., appeared to M. Cieslar to be indifferent to it; while, lastly, the germination of other seeds was hastened by light. Thus generally small seeds, poor in reserve food, germinated better in light than in darkness, while seeds rich in food-materials either germinate better in light than in darkness, or are indifferent to either. He adds: "One cannot find a single seed which germinated better in darkness than in light"—a result quite different from M. Adrianowski's; as also is the observation that while yellow rays favour germination, violet rays retard it, and can even render it impossible at low temperatures.

It will be thus seen that these two authors are not altogether in accordance.

Again, M. Pauchon† found differences to occur with differently constituted seeds. Thus oily seeds appeared to derive an advantage from light. This may be due to the fact that they require a relatively larger amount of oxygen than farinaceous seeds in order to convert the oil into an assimilable substance, and the absorption of oxygen is favoured by light.‡ M. Pauchon found that this was especially the case with seeds having dark-coloured skins. At the same time the amount of carbon-dioxide given off

* *De l'Influence de la Lumière sur la Germination des Graines*, Ann. Agronomiques, 1884, tom. 10, p. 87.

† *Ann. des Sci. Nat. Bot.* x. p. 81.

‡ Thus the proportion of O. absorbed under light and in darkness was for Castor Oil as 122 to 94, and for Scarlet Runner as 53 to 37.

was reduced. This means that while vital activities are, so to say, set in motion and enhanced by oxygen, the loss by destructive metabolism is lessened in consequence of a reduced respiration.

Lastly, experiments conducted at the agricultural experimental station at the College of Agriculture, Cornell University, gave the following results* :—

1. "Very great differences in results may sometimes be expected between samples exposed to light during the process of sprouting and those kept in darkness.

2. "When such differences occur, they indicate that light retards, or even wholly prevents, germination.

3. "In some species this influence of light is greatly marked, while in others it is not apparent."

The few preceding observations will illustrate the difficulties in ascertaining the exact effects of light in germination. They appear to be due to the fact that the several influences of heat† and of each of the rays of the solar spectrum cannot be isolated and studied apart and so ascertained independently of the others, while each species requires a different combination of heat, light, &c. The first broad distinction lies between obscure heat and light, for we all know that heat without light will excite germination, and that it is the most important factor in the process. Now when it is said that certain special colours stimulate

* *Second Annual Report for the Year 1889*, p. 56. The four following examples are given of the percentages of "sproutings" in light and in darkness respectively: Field Poppy, 56 and 74; Larkspur, 0 and 20 to 30; *Adonis æstivalis*, 4 and 68; Radishes (1) 91 and 71; (2) 82 and 92.

† The following are results of the influence of heat obtained at the agricultural experimental station, Cornell University (*op. cit.* p. 40):—

1. "Different results are obtained from the same sample of seeds under different variations of temperature, of which the daily mean is essentially the same.

2. "Sprouting takes place more quickly under an essentially constant temperature of about 74° than under a temperature ordinarily variable, which gives about the same mean.

3. "Rapidly of sprouting is particularly marked in Beans and Peas.

4. "As the mean temperature becomes lower, rapidly of sprouting becomes slower.

5. "Greater rapidly of sprouting does not appear to be correlated with greater percentage of total sprouting.

6. "Constant temperature, of the degree here mentioned, does not appear to give greater percentages of sprouting; at least, the variation in this respect between the constant and variable temperatures is no greater than that which is usually obtained from tests conducted under identical conditions. In the seven tests with Beans, however, there is an average gain of 5 per cent. in favour of those under constant temperature."

germination more than others, the question to ask is, Are there more heat rays associated with those coloured ones or not?

Such is the case with the least refrangible, or red and yellow rays; so that we seem to trace a clue to at least the higher rates of germination under these colours.

Green glass absorbs heat rays as well as many others, while chlorophyll does not absorb green light to any important extent. Consequently, we think we can see why this glass alone may not only be merely inefficient but injurious.

The curve of heat is now regarded as having one maximum in the red, falling steadily towards the most refractive, or violet, end of the spectrum; and although the temperature is consequently considerably lower under blue than red and orange, yet we shall see that the assimilative powers under the blue are approximately equal to those under yellow.*

If the heat is reduced under blue glass, we may ask the question, Why are the effects so nearly equal to what takes place under yellow?

Perhaps the following facts may lead us towards an answer. We know that the chlorophyll absorption-bands are broader under the most refractive end of the spectrum, and therefore more of the rays are absorbed at that end, so that it would seem that there is a compensating power here; while fewer and "more powerful" rays, if we may so imagine them to be, are absorbed under red and yellow, *i.e.* by the bands known as Nos. I and II. Hence the light absorbed represents the capability of the same amount of "work" at both ends of the spectrum.

That light can supply the place of heat is well known, as in the case of plants growing in arctic regions and high altitudes, which germinate when the heat is very deficient.

Again, it is now known that the light absorbed by chlorophyll is the chief agent in producing transpiration, by its being converted into heat within the plant; so that it would seem reasonable to infer that the rays absorbed in the blue and violet end may compensate for the absence of obscure heat-rays.

* Many experiments have been made by surrounding plants with coloured solutions, as of the yellow-orange bichromate of potash, and the blue one of sulphate of copper; but in these cases the water absorbs a great quantity of heat, and so must necessarily complicate the problem. In fact, unless the experiments are carried out in the light of the pure spectrum itself, *without* the aid of solutions or coloured glasses, the results can never be more than approximately accurate.

M. Pauchon also found that in several cases in which light appeared favourable for the first stages of germination the temperature happened to be lower. Other observers have also come to the conclusion that light is favourable under similar conditions of temperature. This, therefore, may be one, if not the chief, use of light in germination with low temperatures. If the preceding considerations are of weight, they will perhaps account for the general results of a more or less equal vegetative activity occurring under the yellow and blue sections of the solar spectrum.

I will now give some account of my own experiments. They were made in square wooden frames with four sides only, of one cubic foot capacity, painted white, within and without. A row of small holes bored obliquely upwards and inwards near the bottom of the front, and similar ones near the top of the back, insured ventilation. The frames were placed on a border of an ordinary kitchen garden, the glasses being laid on the top and facing the south-west.

The following is a description of the glasses used in the experiments, and the quality of the light transmitted, as tested by the spectroscope :—

As the glasses were all exactly one square foot in area, the same amount of sunlight fell upon each of them, and, with the exception of the yellow glass, which was one-eighth of an inch, or between three and four millimetres, all the rest were three-fortieths of an inch, or nearly two millimetres in thickness.

RED*.—Transmitted light appears as an almost purely monochromatic crimson-red terminating abruptly at D, with a nearly opaque band of very dingy green extending from D to F. The red embraces the position of the very strong chlorophyllian absorption-band No. I, and also the somewhat weaker one, No. II.

YELLOW.—This glass transmits nearly half of the spectrum, from the extreme red up to a point a little beyond F, allowing a trace of blue to appear. It, therefore, stops the most refrangible half, including the positions of the absorption-bands Nos. VI and VII, if not somewhat of No. V as well.

GREEN.—This excludes the red and all the rays of the most refrangible half of the spectrum; hence it transmits light

* See figure, page 60, for the position of the lines A, B, &c. and of the chlorophyll absorption-bands I, II, &c.

covering the positions of the three absorption-bands Nos. II, III, and IV only.

BLUE.—This has the red greatly subdued in consequence of a broad absorption-band exactly corresponding in position with the chlorophyllian band No. I. Another occurs to the right of it, but *not* in the position of No. II. The whole of the more refrangible half is transmitted, so that all the chlorophyllian bands excepting No. I will be included.

When the light is examined with the spectroscope, after passing through each of the coloured glasses as well as a dark green solution of chlorophyll, one quarter of an inch in depth, the following are the results :—

With red glass, there is a band of red sharply separated from a band of green by the dark absorption-band No. I.

With yellow glass, a yellow band is intercalated between the absorption-bands No. I and No. II.

With green glass, there is only a green band of light over-spreading the positions of the feeblest absorption-bands, Nos. III and IV.

With blue glass, there is a narrow red band, then a very broad dark absorption-band. This is followed by a second to the left of the D line. All the most refrangible end is absorbed, including the bands V, VI, and VII.

EXPERIMENT No. I.

Germinating Mustard.

Three grammes weight of Mustard-seed was sown under each glass on May 4, 1889. Three other grammes were perfectly dried, and they then weighed only 1·78 grammes. The dry weight of the embryos separated from the testas was 1·24 grammes ; that of the testas being, of course, 0·54 gramme. On May 29 the seedlings were taken up and weighed at once. They were then perfectly dried, and the dry substance left, after the evaporation of all water had taken place, was ascertained. The following table gives the results :—

	Mean temp.	Total weight (grs.)	Dry sub.	Gain (do.) (on embryos)	Dry sub. (p.c.)	Water (p.c.)
R.....	62°F.	41·52	2·14	·90	5·15	94·85
Y.....	63°	48·67	4·29	3·05	8·81	91·19
G.....	54°	37·80	2·86	1·62	7·56	92·44
B.....	56°	33·56	2·70	1·46	8·04	91·96
Cl.....	60°	85·47	7·27	6·03	8·46	91·54
Open ..	56°	92·82	8·45	7·21	9·10	90·90

The first fact noticeable is that plants become perfectly green under light of all colours, showing that no glass used was of so deep a tint or intensity as to cause the least etiolation or prevent assimilation.

Next, with regard to the results given in the table, it will be observed that the differences in the total weights acquired do not necessarily at all correspond with the respective total weights of dry substance; which latter, of course, is the best measure of the assimilating powers of the plants under each kind of light. Thus the total weight under yellow glass is 48.67 grammes, under green 37.80, and under red 41.52 grammes. Yet the amount of dry substance under yellow is double that under red, and one and a half times that under green.*

Turning next to the column of gains in dry substance over the amount in the embryos (the testas, of course, taking no part in germination), it appears that yellow is the only coloured glass which permitted of a sufficient amount of assimilative power to overrule the waste due to respiration, so as to leave a relatively considerable gain. As under red, green, and blue, there was a minimum gain in the weights of dry substance. The gain under clear glass, it will be observed, is far in excess, or about double that under yellow, and approximates that under normal conditions, or in the open.

Reducing the amounts of dry substance and the corresponding amounts of water to percentages, interesting results are obtained. Thus red glass brings about the storage of the largest amount of water, which necessitates the least amount of dry substance.† The next result observable is that the marked differences between the gains of dry substance under yellow, blue, and clear glasses disappear, so that the percentages of dry substance produced by yellow (8.8), blue (8.0), and clear glass

* This implies a different *distribution* of dry substance over the plants respectively, in correlation with different amounts of water.

† Percentages may be regarded as affording the "net results" of assimilation; for they represent the actual amount of dry substance in the plant, *i.e.* the "balance" or difference left between what is assimilated and what is lost by respiration. Similarly the percentage of water represents the residuum between absorption and transpiration.

The fact that these four processes are all going on together at different rates at different times and periods of growth, varying with different luminous and thermic vibrations, shows how extremely complicated are the collective phenomena, and the corresponding difficulties in any attempt to attribute the due effect to each process respectively.

(8.5) are not markedly divergent. This fact shows that in this respect these three conditions approximate most nearly the normal state, *i.e.* in the open, in which the proportion of water to dry substance is about 10 to 1; whereas under red glass it is nearly 19 to 1, and under green glass a trifle over 12 to 1.

Looking now to the causes of these results, and noticing the mean temperature under each glass, it is clear that red glass accumulates too much heat. This induces a greater amount of respiration with a corresponding decrease of assimilative power, which would seem to account for the diminished percentage of dry substance.* On the other hand, while transpiration is aided by the presence of the strong absorption-band No. I, yet this process cannot keep pace with the absorption of water, the amount of water being greatly in excess (94.8 per cent.) over the amount in plants grown in the open (90.9 per cent.).

Yellow and blue glass show more nearly equal effects than in the case of adult Lettuces described below (pp. 73, 76). Now, the temperatures under coloured glasses show one maximum under red and yellow, and another under blue, because a minimum occurs under green glass. Blue glass, therefore, induces activities relatively similar to those under yellow glass; but they are inferior in absolute effects, as seen by the column of total weights and the total amounts of dry substance. This conclusion might be anticipated, as large chlorophyllian absorption-bands (Nos. V, VI, and VII) occur in the blue, thus supplying the energy necessary for the decomposition of carbon-dioxide and water.†

The fact that blue glass shows assimilative powers apparently proportioned to respiration and transpiration, just as they are under yellow and clear glasses, affords an interesting corroboration of the experiment for illustrating the evolution of oxygen;

* Bonnier, Mangin, and others have shown that respiration and assimilation are phenomena directly inverse of each other. *Ann. des Sci. Nat.* 1879, p. 47.

† The above-named savants have also shown that annuals have two periods of maxima of respiration, *viz.* at germination and when flowering. The Mustard may be taken as illustrating the former, especially under red glass, while Virginian Stock represents the latter, in which the percentage of dry substance is *lower* in the open than under clear glass, all the plants being in full blossom in the former condition. See table, p. 70.

† See *Vines' Physiology of Plants*, p. 156.

for Engelmann has shown that individuals of *Bacterium termo* only exhibit movements in the presence of free oxygen, and consequently congregate round a *Conferva* at two places, one being between the lines B and c, the other to the right as well as in the line F in the blue, that is, about the situations of the two chlorophyllian absorption-bands No. I and No. V. It may be also observed that the illustration shows the amount of bacteria between B and c to be much in excess of that of the organisms at F.* Similarly, MM. Bonnier and Mangin have proved by a different method, viz. by comparing the respective values of the ratio $\frac{CO_2}{O}$, that assimilation is discoverable both in the violet and obscure ultra-violet rays, in addition to the position in the red-orange part of the spectrum.†

Under green glass vital activities of all kinds seem to be greatly checked. Though the temperature is lowest of all, and therefore the injurious effect of heat, so conspicuous under red glass, is not so apparent, yet the percentage of water is the next highest to that under red glass. This is probably due to an opposite cause, namely, the feeble absorption-bands III and IV being only present; and, therefore, the loss of water by transpiration is much reduced. Moreover, the loss by respiration not being increased by heat as under red, the percentage of dry substance is nevertheless low, through the feeble assimilative powers.

Clear glass shows a slightly less percentage of dry substance than yellow. This is doubtless due to the increase of temperature; though, by transmitting all rays, the assimilation and transpiring powers are very active.

Plants growing in the open air are in the best condition of all. The temperature being nearly as low as under green glass, the assimilative powers now rise to a maximum, and the percentage of dry substance is the greatest, that of water being, of course, the least.

* See the description and figure by Vines, *op. cit.* p. 256.

† *Bull. de la Soc. Bot. de Fr.* 1885, tom. xxxii. 2. sér. 7, p. 368.

EXPERIMENT NO. II.

Virginian Stock, from Germination to the Flowering Stage.

One gramme weight of seed, containing 0·86 gr. of dry substance* and ·14 gr. of water, was sown in each frame on July 8, 1889, and the produce collected on September 16, when the plants grown in the frame without any covering glass were in full blossom. Two plants only blossomed under the clear glass, and none at all under any of the others, which remained in a remarkably arrested condition.

The following table gives the results obtained :—

	Mean temp.†	Total weight (grs.)	Dry sub.	Gain or loss of dry sub.	Dry sub. (p.c.)	Water (p.c.)
R.....	64°	20·80	1·43	+ ·57	6·87	93·13
Y.....	71°	30·65	2·11	+ 1·25	6·88	93·12
G.....	62°	12·90	·79	— ·07	6·12	93·88
B.....	63°	29·35	2·05	+ 1·19	6·98	93·02
Cl.....	65°	117·50	11·13	+ 10·27	9·43	90·57
Open ..	61°	279·00	19·05	+ 18·19	6·82	93·18

From the columns of total weights and of the gains, it will be seen that, for plants grown under coloured glasses, yellow and blue are decidedly the best; while green is conspicuously the most injurious, an actual loss of dry substance having taken place in the ten weeks during which the experiment lasted.

The percentages of dry substance, however, reveal other results. The proportion of water to dry substance is practically the same under red, yellow, blue, and in the open; while under clear glass it falls considerably, presumably from the fact that transpiration is more active, less water being retained in the plants in consequence of the higher temperature.

The great advantage accruing to the plants grown under no glass at all is seen in the large amount of gain in dry substance, viz. 18·19 grs., while under clear glass it falls to 10·27 grs.

Here, then, as occurred with germinating Mustard, and as will be seen with the Lettuces also, we discover two maxima of assimilation as well as two minima. The former occurs under yellow and blue, the latter under red and green. Hence these experiments mutually corroborate each other in showing that

* The seeds are too minute to enable one to separate the weight of dry substance in the testa from that of the cotyledons.

† These temperatures were taken on several occasions at mid-day in September and in full sun, as well as at 9 A.M.

it is not only the (optically) brightest rays of the spectrum which are concerned in the process of assimilation, but that there is a second series of rays in the more refrangible half of the spectrum, as is proved by the experiment with bacteria. It was remarked above that no plant bore flowers under any coloured glass, and but a very few blossomed under clear glass. Sachs has given reasons for inferring that the ultra-refrangible rays may be concerned in producing flowers. If this be so, and if these rays were cut off by the coloured glasses, it would account for their absence. In the case of clear glass, however, the same reason could not be held, for the only difference must be a higher temperature. Flowers, however, are, of course, produced through the agency of foliage. So that we may justly conclude that the failure to produce them was due to the abnormal conditions which engendered a weaker vegetative growth. Plants being naturally attuned to full sunlight, whenever any rays are withheld, or are in excess, as of obscure heat, they instantly exhibit the ill effects due to these causes.

Moreover, the percentage of dry substance in the case of plants grown in the open is lower than that of plants under clear glass, and equals that under blue. This is an unexpected result, when compared with Mustard and Lettuce. But the fact that the plants were in full bloom in the open will probably account for it, as one maximum of respiration is always coincident with the flowering process.

Virginian Stock also illustrates specific individualities, so to say, in that under all the coloured glasses the plants were peculiarly incapable of development, never exceeding to any marked degree the germinating stages of growth.

EXPERIMENT No. III.

*Lettuces grown from the Seedling to the Adult Stage
(during thirty-two days).*

Eighteen seedling Lettuces were weighed, and their average weight calculated as 10 grammes. Three were planted in each frame on May 29, 1889. The actual weight of each individual, being known, was calculated as 10 grammes.

In order to draw comparisons between the amount of dry substance in the plants used for the experiments, both in their

seedling or initial stage as well as in the adult condition, twelve young plants were selected, as nearly the same size and stage of growth as possible as those used in the experiments. They were weighed fresh, and again when perfectly dried. The average amount of dry substance thus obtained (*viz.* 2·6 grammes in a total weight of 27·15 grammes) was reduced to a standard of 10 grammes, of which the water constituted 9, and the dry substance 1 gramme.* This afforded a basis for calculating the dry substance in the experimental plants, first in their initial stage (*i.e.* 10 grammes), and secondly in their adult or final stage, when taken up on June 30.

On the other hand, the dry substance in the three plants grown in the frame without any glass, but freely exposed, supplied another basis for the final comparison.

Assuming the dry substance of these latter plants to be the normal amount acquired by assimilation, the differences in the amounts of dry substance of those grown under coloured or clear glass would, therefore, indicate the degrees of disadvantage in growing the Lettuces under them respectively.

TABLE I. (TOTAL WEIGHTS).

Col. 1 gives the mean, final or total weights calculated from an assumed initial weight of 10 grammes for each plant.†

Col. 2. This represents the total increase or gain above the original 10 grammes.

Col. 3 represents the increase per cent.

	Mean temp.	(1)	(2)	(3)
R.....	70°	26·3	16·3	263
Y.....	73°	43·5	33·5	435
G.....	62°	15·7	5·7	157
B.....	64°	24·9	14·9	249
Cl.....	65°	44·7	34·7	447
Open	63°	67·3	57·3	673

TABLE II. (DRY SUBSTANCE).

Col. 1. The calculated total amounts of dry substance obtained by assimilation. The amount in the assumed original weight of 10 grammes was 1 gramme, or 10 per cent.

* More accurately ·957 gr., but 1 gr. is quite accurate enough to show comparative results.

† Thus, *e.g.*, the mean weight of the three seedlings under red glass was originally 7·03 grs.; that of their total weights was finally 18·59 grs.; hence, $18·59 \times 10 \div 7·06 = 26·3$, or the final mean, or total weight by calculation.

Col. 2. The amount of dry substance obtainable *if the percentage had remained at 10* (Table I. col. 1 \div 10).

Col. 3. The differences between the amounts of dry substance actually obtained and calculated above (col. 1), and what it would have been supposing it had remained at 10 per cent. (col. 2 \mp col. 1).

Col. 4. The percentage of dry substance actually obtained and calculated as above in col. 1.

Col. 5. The loss or gain per cent. between the initial 10 per cent. and the final percentage of dry substance (10 less by col. 4, or *vice versa*).

Col. 6. The differences between the amounts of dry substance (col. 1) and the maximum obtained by plants grown in the open (*viz.* 8.63 grs., col. 1).

	(1) grs.	(2) grs.	(3) grs.	(4) p.c.	(5) p.c.	(6) grs.
R.....	1.85	2.63	-0.78	7.1	-2.9	-6.78
Y.....	3.18	4.35	-1.17	7.3	-2.7	-5.45
G.....	0.83	1.57	-0.74	5.3	-4.7	-7.80
B.....	2.64	2.49	+0.15	10.6	+0.6	-5.99
Cl.....	5.19	4.47	+0.72	11.6	+1.6	-3.44
Open....	8.63	6.73	+1.90	12.5	+2.5	

TABLE III. (WATER).

Col. 1. The calculated amount of water in the final stage in grammes.

Col. 2. The amount of water calculated on the basis of 90 per cent., *i.e.* in the initial stage.*

Col. 3. Gains or losses between the preceding (col. 1, less by col. 2, or *vice versa*).

Col. 4. The percentage of water from the calculated amount in col. 1.

	(1) grs.	(2) grs.	(3) grs.	(4) p.c.
R.....	24.45	23.67	+ .78	92.9
Y.....	40.32	39.15	+ 1.17	92.7
G.....	14.87	14.13	+ .74	94.7
B.....	22.26	22.41	- .15	89.4
Cl.....	39.51	40.23	- .72	88.4
Open	58.67	60.57	-1.90	87.5

I will now make some observations on these results.

The first to be considered is red glass, which shows, after green, the least amount of dry substance in plants grown under it; this being the test of assimilative powers.

* Thus, *e.g.* (Tab. 1, col. 1, R.) $26.3 + 9 \div 10 = 23.67$ grs.

Comparing the final total weights, we see how that under red (26·3 grs., Table I. col. 1) it is considerably more than under green (15·7 grs.), and *exceeds* that under blue (24·9 grs.). Now, looking at the first column of Table II., we find that the dry substance under red *falls short* of that under blue. Reducing the dry substances to percentages, a still more important difference is seen, in that under red it is only 7·1 (Table II. col. 4), but under blue it rises to 10·6. Hence it appears that, while red glass favours total weight, blue glass is really more favourable for healthy assimilation, as there is a greater accumulation of water in the tissues under red glass.

The marked difference in the percentage, as shown in col. 4, is, of course, due to the larger amount of water in plants grown under red glass than in those under blue. This is seen in col. 4 of Table III., where the percentage is nearly 93 for the former and about 89 for the latter.

With regard to the absorption of water by plants grown under red glass, although it gives, as I have elsewhere shown,* one maximum of transpiration, there must be some powerful cause to account for the large percentage of water present, notwithstanding the great loss due to this function. A presumable cause is heat, as temperature is not directly concerned in transpiration. Organic acids, however, have been proved by H. de Vries to be an essential feature in turgescence. The question then arises whether heat alone stimulates the absorptive powers to an excessive degree, or whether it is indirectly a cause of turgescence by bringing about the production of organic acids which cannot be further decomposed in the absence of other rays.†

Considering next the effects of green glass which exhibits the least amount of vital activity in plants growing under it, we find first that the total increase of weight is the least of all, or 5·7 grs. (Table I. col. 2). The weight of dry substance actually *decreased* as compared with the original amount by calculation from the initial stage, viz. from 1 gr. to 0·83 gr. (Table II. col. 1), while the amount of water in the tissues increased from 9 grs.

* "A Contribution to the Study of the Relative Effects of Different Parts of the Solar Spectrum on the Transpiration of Plants," *Journ. Linn. Soc. Bot.* xxii. p. 81.

† See a paper by M. H. Jumelle, "Recherches Physiologiques sur le développement des Plantes Annuelles," *Rev. Gén. de Bot.* tom. i. p. 389.

to 14·87 grs. (Table III. col. 1). In other words, the percentages (Table III. col. 4) show an increase of water and a decrease of dry substance. The interpretation of this appears to be that transpiration and assimilation were much too feeble and respiration too active.

The total calculated weight of dry substance by assimilation under green glass (0·83 gr.) falls short of the calculated amount of plants grown in the open by 7·80 grs. (Table II. col. 6), the percentage being only 5·3, as compared with 12·5. In every way, therefore, green glass is proved to be most prejudicial in arresting vital functions.*

After green, red glass incites the least amount of assimilative activity. Comparing the effects of these glasses with those of yellow, the different influences of the heat and luminous rays are well seen. Thus while the mean temperatures under red and yellow are nearly the same, the total increase of weight is far greater under yellow than under red, the gain being at the rate of 263 per cent. for the latter and 435 per cent. for the former.

The effect of heat is perhaps best seen in the amount of water, for the percentage is practically the same under both red and yellow glasses (Table III. col. 4).

When, however, we compare the results of assimilation, as shown by the relative amounts of dry substance, then the superiority of yellow light becomes very apparent. Thus, comparing the columns (1) and (6) in Table II., we see that the total amount of dry substance acquired under yellow glass (3·18 grs.) is much greater than that under red (1·85 grs.); while the *deficiency* from that obtained by plants grown in the open (5·45 grs.) is less than that for red glass (6·78 grs.).

* An account (together with Dr. Lindley's criticisms) of the preparation of the pale emerald-green tinted glass of the Palm-house in Kew Gardens will be found in the *Gardeners' Chronicle*, 1847, p. 524, and 1848, pp. 138, 155. The main object was to reduce the scorching heat of the sun. The depth of the colour is too feeble to be injurious; but, as Dr. Lindley observed in his *Theory of Horticulture*, p. 300, "No advantage seems to have resulted from glazing the great Palm-house with green glass of a tint selected by Mr. Hunt." On the other hand, the Fern-houses at Kew were glazed with a much deeper tinted green glass. This, however, has now been removed, as it was found to be injurious. (See art. in *Gardeners' Chronicle*, Nov. 26, 1892.) The fact is, as more recent experiments show, that it is not only a certain amount of heat which is cut off by green glass, but the more important rays which are required for assimilative purposes.

It may be noted that a tendency to elongate the axis prevails in plants grown under yellow as under red glass, and to a less extent under green. They thus resemble plants grown in total darkness and with a sufficient temperature. This clearly indicates the necessity of the presence of the more refractive rays of the spectrum to ensure normal growth. On the other hand, a most important difference exists, in that while plants grown in the dark are etiolated, those grown under coloured glasses are all pretty equally green, and therefore capable of assimilating carbon-dioxide, though it may be in very different degrees. This elongation of the stems, which decreases from the red to the blue glass, is possibly due in part to the confined air becoming more saturated with moisture under red, yellow, and green, as the heat-rays are of course greater and tend to saturate the air; so that in this respect the elongation of the stems, as takes place in etiolation, would confirm Vesqué's and Viet's researches, who found that a too moist atmosphere produced much the same effects on the growth of plants as obscurity.*

With regard to the comparative effects of yellow and blue glasses, we find that of the total weights given in Table I. (1), the plants under yellow glass gained weight at a higher ratio, or as 435 per cent. to 249 per cent. for blue, the total weights being as 43·5 grs. under yellow and only 24·9 grs. under blue glass. Similarly the total amount of dry substance is greater under yellow than under blue glass (Table II. col. 1).

When, however, the amounts of dry substance are reduced to percentages (Table II. col. 4), that under blue (10·6) is greater than that under yellow (7·3), and comparing the second and third columns with the sixth of Table II. we see that while under yellow the total amount showed a deficiency whether compared with the initial or final stages of growth, there was a gain under blue in the first case, but a slightly larger deficiency in the second.

These results show that while yellow light favours the assimilative process so far as *quantity* represented by the total weight (*i.e.* of dry substance and water together) is concerned, as well as by the calculated *total* weight of dry substance alone (Table II. col. 1), blue light favours assimilation strongly as well, in causing even a larger "storage" (as shown by the *percentage* of dry substance)

* *Ann. de l'Inst. Nat. Agro.* 3^e ann., et *Ann. Sc. Nat.* 6^e sér. t. xiii. p. 167.

to be acquired, because the accumulation of water is so much less ; while respiration is probably also reduced.

Moreover, under red, yellow, and green coloured light there is, as stated, a tendency to elongate the axis,* but this does not occur under blue light, which in this respect resembles white or clear light as well as plants when grown in the open without any glass at all.

The arrest of the axis under blue glass is also correlated with the smaller amount of water in the tissues, for excepting plants grown under clear glass and in the open the percentage is the least—89.4 (Table IV. col. 4).

Lastly, of the results obtained from plants grown in the open, by comparing them with the preceding we get marked differences, which can presumably be only attributed to a lower temperature than that under clear glass, coupled perhaps with a diminished circulation of air.

The total increase of weight of the plants grown in the open has risen by 673 per cent., as compared with 447 per cent. for those under clear glass.

By comparing the numbers corresponding with plants grown in the open with the rest, it will at once be seen that the latter are greatly at a disadvantage—that nothing is gained by growing them in any way except freely exposed.

If it be thought it would be advisable to make Lettuces more succulent by growing them, say, under green glass, then the table of total weights reveals the fact that they fail to produce *quantity*, and at the same time the axes are encouraged to elongate and not the foliage to expand.

There is one more general result to be noticed, which is revealed by the columns 3 and 4 of Table II. In the young stage, when the seedlings were first planted, the assimilative powers were only capable of producing 10 per cent. of dry substance. Under red, yellow, and green glasses this assimilative capacity subsequently *decreased* ; while under blue and clear glasses, and above all in the open, the assimilative powers greatly *increased* with age.

An important question appears to arise from the preceding observations, namely, in what way do the different rays assist

* Under red, the stem was 19 inches ; under yellow, 16 inches ; under green, $6\frac{1}{2}$ inches ; under blue and clear glass, as well as in the open, it was about 3 inches.

each other? The results of these experiments show that no ray, or indeed any limited group of rays, are sufficient *per se*, inasmuch as growth under each of the coloured glasses falls far short of that of plants when growing normally in open ground.

Again, on ascertaining the amounts per cent. of water, as well as of dry substance, in each case, the results are very different. Thus, *e.g.*, the effects of red and yellow are alike (Table IV. col. 4), while that of blue approximates that of clear glass.

Hence the results show that any single curve drawn to indicate the assimilative powers of chlorophyll corresponding with the several rays of the solar spectrum will be insufficient; for it is quite as important to observe the *relative* amounts of dry substance formed as it is to note the *absolute* amount of growth, as indicated by the total weights.

The general result arrived at by a study of the different effects of each colour is that *every ray requires the aid of all the others* for effective growth.

The fact appears to be that green plants are naturally attuned to receive the vibrations of *all* kinds of rays, of course within prescribed limits of intensity, including those of a proper temperature; so that every phase of their energies becomes at once impeded if the luminous environment be deficient in any one or more particulars, though all the rays of the spectrum are required for perfect functions. We see that certain rays when in excess will stimulate the effect due to that particular part of the spectrum. Thus under red and yellow we find the stimulus of heat to be in excess, and so its effects become injurious. Under blue, however, several observers think that they have discovered a stimulus to activities, engendering a precocity of growth especially perhaps in germination. Thus Mr. Hunt, in a paper read before the British Association in 1845, described a process which consisted in covering germinating seeds with glass coloured blue by cobalt. That author also read a letter from the Messrs. Lawson, in which they stated that by allowing seeds to germinate under blue glass they had succeeded in raising a larger number of seeds in a given time as well as producing germination in a shorter period.* This has been corroborated by M. Bert; and a London florist has described to me his method of hastening the flowering of the Lily-of-the-Valley by subjecting

* *Gardeners' Chronicle*, 1853, p. 691.

three-year-old crowns to violet light associated with dry heat. By these means they flower fourteen days earlier than when treated in the ordinary way. The foliage is somewhat paler when thus forced than is normally the case.

Although blue light appears from the foregoing observations to have some *stimulating* effect, the interpretation may be that respiration is somewhat arrested under the more refractive rays of the spectrum, so that assimilative powers are not checked by it. Consequently germinating seedlings and etiolated crowns of the Lily-of-the-Valley may thus grow more quickly than they otherwise would if respiration were more active, which, of course, involves a greater waste of substance.

With regard to temperature, it is now established that transpiration and assimilation are functions of light, and seem to be almost, if not quite, unaffected by heat; whereas respiration is powerfully affected by it. Hence, if the temperature is relatively high, we can account for the assimilative powers being defective. More than one observer has noticed that temperature has apparently little or nothing to do directly with the function of assimilation. Thus Famintzin showed that with temperatures ranging from 29° to 39° C. in July 1880, 10·59 cc. of CO₂ were decomposed, while at 20° there were 19·84 cc. Again on August 2, at 13°, 11·62 cc., and at 20° there were 19·84 cc. decomposed. Similarly Boussingault found that, when he placed his apparatus at the north side of a great wall exposed to a sky without clouds, the volume of oxygen exhaled did not differ notably from that obtained in direct sunlight.

These results agree with those obtained from my own experiments; for it will be seen that the largest gain, viz. of plants grown in the open, is accompanied by the lowest mean temperature.

CONCLUSION AND PRACTICAL RESULTS.

The net practical results from all the preceding observations appear to be that, first, as far as the preliminary stage of germination, or sprouting of seeds, is concerned, it is for the most part a matter of indifference whether seeds be subjected to light or not; as in a shorter or longer space of time, to be represented in hours, all that are sound will germinate.

However, the case of the "Dwarf Rocket" Larkspur opens the question whether there may not be other instances of seeds

of garden plants to which light seems positively injurious. Further experiments are desirable.

Secondly, no specially coloured light, or combination of lights, which do not collectively constitute pure colourless daylight are ever so good or effective as natural sunlight itself; as each ray seems to require the assistance of all the others for the full exercise of plant functions.

Thirdly, that when a comparison is made between plants growing under ordinary window-glass and in the open, the injurious effect of the glass becomes very apparent for ordinary plants of a temperate climate. The deleterious effect is presumably due to an excess of heat, by which respiration is stimulated and assimilation reduced. If, therefore, "scorching" is to be subdued, it must be done by some means which reduces the heat-rays without lessening the whole amount of white light, or at least without diminishing the amount of any one or more individual ray of the spectrum, as by the passage of the light through water.

Lastly, the experiments, especially those of Lettuces, show clearly that growth under ordinary conditions in open ground is much the most preferable in every way.

FLOWERS OF THE FRENCH RIVIERA.

By MONS. HENRY DE VILMORIN, F.R.H.S.

[Read March 28, 1893.]

WINTERING on the Riviera has become such a common feature of modern life—so many invalids or pleasure-seekers resort annually to the sun-warmed shores of Hyères, Cannes, Nice, and Mentone—that most educated Englishmen of our days are perfectly familiar with the climate, sights, and produce of Maritime Provence.

And not only to actual visitors is the floral wealth of the Riviera displayed on the spot, but, thanks to the ever-increasing rapidity and cheapness of the means of transport, immense quantities of cut flowers are despatched daily to the central and

northern parts of Europe in mid-winter, to spread and maintain the reputation of the Riviera as the very place to grow flowers out of doors at the time when they become terribly scarce anywhere else.

I will not venture on a ground already well beaten in attempting to describe the beauties of the Var and of the Maritime Alps, or in contrasting the vigorous and blooming vegetation of the gardens on the Riviera during the colder months of the year with the desolate aspect of our pleasure-grounds when covered with snow or beaten by the winter gales.

I will therefore approach the subject from a purely horticultural point of view, and will limit my remarks to a short account of the climatic conditions of the French Riviera, and to a review of the principal kinds of flowers grown there for profit, with brief remarks on the most approved varieties and on the most noteworthy features of cultivation and disposal.

My endeavour will be to give a faithful account of what is being done in the present year (1893), as it must be borne in mind that the production of, and the trade in, cut flowers are undergoing frequent and material changes from one season to the next.

The mere difference in latitude cannot account sufficiently for so large a discrepancy as exists between the coast of Kent or Sussex and that of Provence. The climatic conditions peculiar to the Riviera must be traced in a large proportion to the effect of the sheltering hills and mountains which keep off the north winds, turn away the currents of cold air, and radiate the heat they receive from the sun on warm clear days.

Sunshine, in fact, is the great boon of the district. It may be very well said that the main difference between the climate of Southern England and that of the Riviera is not so much in a higher temperature as in a greater amount of sunlight. In fact, the proportion of sunny to overcast days is nearly three times greater in Cannes than it is in London, and although the total rainfall is nearly the same at both places, the number of wet days is about three times greater in England.

The sea acts also as a moderator. Its deep waters never sink, even in the middle of winter, to a lower temperature than 48° Fahrenheit. All the coast, and more especially the head-

lands which are nearly surrounded by the sea, derive a very mild climate from the vast extent of almost tepid water round them. The pretty island of St. Honorat, opposite Cannes, which is only a hundred acres in extent, and scarcely rises twenty feet above the level of the sea, is almost free from frost on that account.

Sharp and protracted frosts are seldom experienced on the Riviera except on low-lying grounds, where cold air collects and lingers for some length of time. On ridges, or indeed on all higher grounds or on hillsides, frost is due only to intense radiation during clear nights, and is easily obviated by the use of light screens of canvas, heather, or reeds. Glass frames are also used very extensively, and each successive season adds several acres to the extent of land covered with glass on the Riviera.

Not that glass houses proper are very frequent on the grounds of the florists. Some score of them are devoted to forcing the climbing Roses and perpetual-flowering Pinks; but by far the commonest structures are low rows of glass frames, supported by a single central rail, and sloping almost to the ground, while the lower part of the sides is made tight with straw, heather, or seaweed. Bush Roses, Pinks, Mignonette, bulbous flowers, bloom freely under such shelter, and the same is found sufficient, heated or unheated, to produce French Beans, Tomatos, and Strawberries in January and February.

The use of artificial heat is by no means despised or neglected by the gardeners and florists on the Riviera, but it is only occasionally resorted to. Nearly all the large glass structures there are provided with hot-water pipes, simply laid flat on the ground, to insure the possibility of heating on an emergency; but the sun alone generally gives more heat than is required, so that the main work consists in airing and ventilating the houses.

Many are the plants cultivated on the Riviera which would *not* be benefited by the use of artificial heat. To Anemones, Polyanthus Narcissi, and Mignonette some shelter is at times acceptable and helpful, but the principal requirements of such plants are plenty of light, bright sunshine, and fresh air.

Flowering trees and shrubs, of course, have to rough it out in the open air. We will take them first.

TREES : ACACIAS, EUCALYPTUS, ETC.

All the Australian or New Zealand Acacias, known in the bark trade as the "Wattle trees," and in the flower trade as "Mimosa," have found a new home on the Riviera. Several dozen species grow there luxuriantly, and become large trees or shrubs in a wonderfully short time.

Five species are largely used for floral decorations, but one of them is pre-eminently "the Mimosa" proper, as *Eucalyptus Globulus* is essentially "the Eucalypt."



FIG. 1.—ACACIA DEALBATA.

Acacia dealbata (fig. 1) is the sweetest and most graceful, the most feathery, and the finest foliaged of all the winter Acacias. It grows to be a large tree, and develops its yellow flowers, which look like stringed beads of the finest silk, as soon as it is three or four years old. A large tree of this species all ablaze with the sunshine on its golden fleece is indeed a beautiful sight.

The blooming season of *Acacia dealbata* lasts from the middle of January to the end of February. Immense quantities of it are then distributed all over Europe, and the price is maintained at a pretty high figure (about £2 per cwt. on the spot), owing to the limited area over which the tree will thrive. Only in the Esterels and on the gneiss hills around Cannes is the



FIG. 2.—*ACACIA RETINODES* VAR. *FLORIBUNDA*.

proper soil for *Acacia dealbata* to be found in combination with a suitable climate. On all clayey or calcareous soils the tree sickens, turns yellow, and dies off rapidly.

An artificial process has been in use for a few years in order to anticipate the blooming season of Mimosa. Flowering branches are cut a week or so before they would bloom in the open air, and are submitted, with their butt end steeped in water, to the

action of moderately heated steam. The flowers expand in ten to twenty hours, and last as long afterwards as if cut direct from the tree. Large tin vats are prepared for the purpose, and the process is a very profitable one, as the first consignments of "Mimosa" fetch a high price at the opening of the season.

Four additional species of *Acacia* are current articles of commerce, although they stand far behind *A. dealbata* in every respect.

A. retinodes, commonly called *A. floribunda* (fig. 2), is a dense tree with numerous narrow phyllodes not unlike Willow leaves. The yellow globular blooms are borne in small groups at the end of very slender branchlets. Their great merit consists in being produced all the year round. No other *Acacia* can be had from the Riviera through the autumn months. Choice sprigs of *A. floribunda* are very pretty and graceful.

A. pycnantha var. *petiolaris*.—The leaves in this species are reduced to an expanded petiole or phyllode, dull green, broad, more or less sickle-shaped. The glomerules of flowers are larger, more dense, and of a deeper colour than those of *A. dealbata*, and they come into bloom some weeks later. The golden yellow branches of *A. petiolaris* are very effective, especially in large masses, but they lack the delicacy and refinement of *A. dealbata*.

A. cultriformis (fig. 3) is extremely distinct in appearance. The long, slender shoots are thickly covered with foliage inserted edgewise, of a glaucous or silvery colour, more like scales than leaves. The axillary spikes of flowers stand out near the end of the branch in large numbers, and form a thyrses-like bunch of an intense yellow colour almost verging into orange. *A. cultriformis* is in bloom in March and April.

A. longifolia bears oblong phyllodes, and blooms also in March. The axillary flowers are not compressed into a globular mass as they are in all the foregoing species, but make a sort of cylindrical catkin, one inch or more in length, and of exquisite beauty. The plant is very hardy and a strong grower. Only the smell is not nice, and is even by some pronounced offensive.

The so-called St. Helena *Acacia*, which is a drooping form not far removed otherwise from *A. cultriformis*; *A. binervata*, *A. obliqua*, *A. cyanophylla*, *A. ulicina*, are also very pretty and

useful on the spot, but they are not recognised articles of exportation.

Eucalypts are profusely planted on the Riviera as ornamental trees. Some species are occasionally relieved of part of their flowering branches for commercial purposes.



FIG. 3.—ACACIA CULTRIFORMIS.

E. cosmophylla, with medium-sized flowers in threes, white glossy buds of wax-like appearance, and stiff greyish foliage, is the greatest favourite in the Paris market; it blooms in autumn and early winter.

E. melliodora gives extremely slender drooping branches, in which graceful leaves accompany small white flowers grouped in trusses of seven ; they have a faint smell of honey.

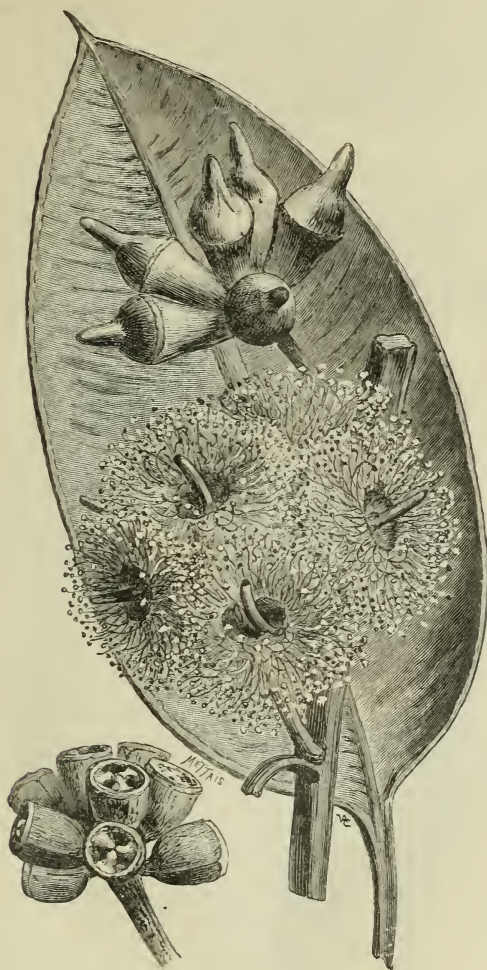


FIG. 4.—EUCALYPTUS ROBUSTA.

Flowering twigs of *E. robusta* (fig. 4) are very effective. They are erect, with bold bay-like foliage, and pointed buds in terminal bunches, white or tinged with crimson.

E. Andreana, Ndn. (fig. 5) is also sometimes sent to the Paris Halles Centrales. The flowers are very small, but



FIG. 5.—EUCALYPTUS ANDREANA.

intensely white, the slender stamens suggesting a little flake of cotton wool. They are disposed in the axils of leaves, in com-

pact masses of twenty to forty. The tree was introduced to the Riviera by the great traveller and landscape gardener M. Edouard André.

Even *Eucalyptus Globulus* (fig. 6) may be considered as



FIG. 6.—EUCALYPTUS GLOBULUS.

very ornamental when its large discs of long white stamens are well expanded.

The white and pink varieties of *E. leucoxyton* are also very

elegant, but, like the Acacias mentioned lately, they are mere fancy flowers, not in regular demand on the markets.

I cannot dismiss the subject of tree flowers without mentioning *Hakea laurina*, alias *H. eucalyptoides*, one of the strangest looking plants when in bloom of the aptly named order Proteaceæ. The half globular trusses of flowers, with their long curved filaments crimson at the base and white at the top, look as much like a sea anemone as anything.

The best collections of flowering trees and large shrubs are to be seen at the Villa Thuret, near Antibes, and at La Mortola, the residence of Mr. Thomas Hanbury. Both places are filled with collections of the highest botanical value. Villa Thuret is officially connected with the scientific universities of France, and La Mortola might aptly be described as a South European extension of Kew Gardens.

SHRUB FLOWERS: ROSES, MARGUERITES, ETC.

Roses are everywhere on the Riviera; they grow in hedges, hang from trees, cover the front and sides of houses, overtop fences, and line railway tracks. Many kinds, such as the *Indica major* and the Banksian Roses, bloom only in spring, when they are of surprising beauty. Some others flower nearly all the year round, and it is on these latter that the winter supply has to depend.

The highest authority on Roses in England, the Dean of Rochester, remarked more than ten years ago that out of every hundred Rose-bushes planted on the Riviera, ninety belong to the Safrano variety. The remark holds good to this day, but only where the production of Roses in the open air and without shelter of any description is contemplated. On the other hand, Safrano is very seldom if ever grown under glass.

This shows plainly that the one capital merit of Safrano is to continue blooming and developing buds at a temperature which would be too low for any other Tea Rose. How often, for instance, do we find, even in the North of France or in England, well-formed buds of Safrano in November or December, when every other hybrid or Tea Rose is crippled by cold. It seems that the limit of temperature at which Safrano would cease blooming is just equal to the lowest temperature experienced at well-

sheltered spots on the Riviera, so that in such places the blooming tendency of the plant is sometimes reduced in winter, but never entirely conquered.

Riviera Safranos are very variable in size and beauty, according to the age of the bushes and to the amount of care exercised in pruning, manuring, &c. The long conical buds, unfolding so much freshness and beauty as they begin to expand, are known everywhere as the "Nice Roses." The exterior petals often show a deep crimson colour on the outside; this is generally the effect of cold weather experienced in the bud state.

Young leaves and shoots of the Safrano Rose often exhibit a beautiful brown colour, and they are then turned to good account by the local florists as a contrast to pale blush Roses.

The China Roses (common, blood-red, and Ducher), are also perpetual bloomers on the Riviera; they are planted extensively in hedges. But they are of limited commercial importance, especially as the stems are too slender to carry well the large egg-shaped buds, and so make wiring a necessity.

Only the beautiful, nearly single Rose, Gloire des Rosomanes, is still hardier and more perpetually in bloom than Safrano. It makes a charming and a striking feature of the country in winter, but, although of great artistic beauty, it is too perishable and too short-lived to be sought after as a flower for exportation.

We may refer to open-air Roses, the climbing kinds which, trained along walls on a southern aspect, bloom all through the winter, as Général Lamarque, Gloire de Dijon, Reine Olga de Wurtemberg, and even Reine Marie Henriette and Maréchal Niel, but the two last named succeed better under glass. Even the hardier kinds are much benefited by the use of a canvas screen in front and on top of the wall. Général Lamarque treated in that way gives lots of buds of the purest white. Gloire de Dijon is not a great success on the Riviera; it is too full, does not open well, and is often damaged on the outside.

Very handsome Roses are produced on the Riviera from several hybrid or Tea sorts by the help of glass with or without artificial heat. Souvenir de la Malmaison, Marie Van Houtte, and La France come first under that head, as also Perle de Lyon, Souvenir d'un Ami, and especially several varieties originated on the spot, and mostly raised by Nabonnand, such as Paul

Nabonnand, Papa Gontier, Isabelle Nabonnand, and Général Schablikine.

The first named is one of the finest Roses in existence when grown under glass. It has become one of the greatest favourites on the Riviera. Isabelle Nabonnand is a very large flesh-coloured flower with a darker centre. It grows to a very large size, as does Papa Gontier. Général Schablikine has a very pretty bud, elongated, and of a very bright carmine with a coppery tinge on the exterior ; the shoots bear most formidable thorns.

Marie Van Houtte need not be praised here ; it gives splendid buds, even in winter, with the help of some artificial heat. In very warm and sheltered corners it blooms well in the open, even



FIG. 7.—*CHRYSANTHEMUM FRUTESCENS* VAR. *ÉTOILE D'OR*.

in mid-winter ; this is the case chiefly if it be trained against a wall.

Maréchal Niel requires more artificial heat than any other Rose. Next to Safrano it gives the largest money return on the coast, but it cannot be considered as a characteristic sort of the Riviera, as the way in which it is grown there does not materially differ from the English fashion of dealing with it.

White and yellow Marguerites (*Chrysanthemum frutescens*) (fig. 7) are grown in large quantities on the Mediterranean coast. The former are used extensively for house and church

decoration; the latter are amongst the most valuable export flowers. Yellow Marguerites bloom all the year round, but the bright golden flowers are especially sought after from December to May. Pruning tends to concentrate the blooming period to winter and early spring.

The habit and foliage of the yellow variety are just the same as those of the vigorous white Marguerite, Comtesse de Chambord, but the pale gold colour of its rays gives quite a peculiar charm to it. It is generally called "Anthemis" on the Riviera; it is known also as the "Étoile d'Or" Marguerite.

It is said to have originated at the Golfe Jouan from a chance seedling, but nothing absolutely certain is known on the subject. The plant is mostly multiplied by cuttings, which strike easily. It grows into large bushes of three feet in height, and as much in diameter, which are generally shortlived, the flowering power of plants more than three years old being in most cases apparently exhausted.

The flowers, when borne on young vigorous plants, sometimes exceed three inches in diameter; they are scentless, and with proper care can be kept fresh in water for ten days or more.

HERBACEOUS PLANTS: PINKS, BULBS, MIGNONETTE, VIOLETS, ETC.

From time immemorial perpetual-flowering Pinks have been grown on the Riviera, as they are in Italy, and especially in Spain; but until the last twenty years they were only considered as household favourites, kept in pots on window-sills or in small gardens. A few gardeners used to raise some plants for sale.

Since the fast trains have been established, which carry the Riviera flowers to Paris in twenty hours and to London in less than two days, the cultivation of Pinks, both in the open air and under glass, has made a wonderful progress. Acres and acres are now devoted to the growth of Pinks about Toulon, Hyères, Cannes, Antibes, Nice, and Beaulieu. Hundreds of glass houses, or temporary structures simply made of two rows of glass frames supported by wooden rails, give to the best class of winter-flowering Pinks the help of some additional heat and of some useful shelter.

But acres upon acres are grown without any glass at all, straw mats or canvas screens only being used to protect the plants from

the effects of radiation, and to afford them the necessary protection against the bad effect of rain or cold dew.

Large tracts of land are met with, especially on the Cape of Antibes, all partitioned into long beds, every one of which is lined with wooden bars supported by rows of posts three feet high. Or, simpler still, tightened wires are run from post to post lengthways, and mats or screens of some cheap material are spread at night over the beds on top of the bars or wires, and they are removed by day in clear weather (that is to say, nearly every day and all day) in order to admit the heat and light of the sun. Canvas strips are sometimes hung down from the bars as an additional protection.

Cuttings are generally made from November to March in a shady place in the open air, or in such houses as are used to force Roses with little or no heat; young plants begin to bear flowers in October, and continue through the winter.

Any well-drained soil is fit to grow Pinks, but the plants are found to succeed especially well on the dark red clayey soil which lies on top of some of the calcareous formations on the coast. Such soil is found, for instance, on the southern part of the Cape of Antibes near the world-famed residence of Eileuroc, and in the Ste. Hélène quarter at Nice.

The following are the favourite varieties:—

WHITE.

Petit Génois.—Flower small, deeply cut, pure white, hardy, and a most profuse bearer.

Enfant de Nice.—A strong plant, very prolific, white with flesh-coloured centre, at times nearly pure white.

Miss Moore.—Large, very fine, of good substance, edge nearly smooth.

ROSE-COLOURED.

Rose Rivoire.—Large flat flower, not very full, edge quite smooth, soft colour.

Rose Chair d'Antibes.—Very large and very full, edge deeply toothed, a fine flower.

SCARLET.

Alégatière.—Flowers large, almost round, of a very bright rich scarlet colour, and a free bearer.

Rouge Niçois.—Large and full, a vigorous grower; colour deep scarlet or blood-red, edge toothed.

YELLOW.

Comtesse de Paris.—Large, pale sulphur, very full and finely fringed, occasionally marked with small pink streaks.

This variety was introduced from Seville by, and consequently named after, H.R.H. Mme. la Comtesse de Paris.

VARIEGATED.

Panaché de Nice.—A pretty flower, streaked with deep scarlet on rosy ground, edge of the petals lacinated; a great favourite on the markets.

Jean Sisley.—Mottled scarlet and salmon colour, edge bluntly toothed, a very pretty and effective variety.



FIG. 8.—DIANTHUS CARYOPHYLLUS FLORE PLENO VAR. MARGUERITE.

A new race of perpetual Pinks, known as *Œillet Marguerite* (fig. 8), and apparently of Italian origin, is well adapted for open-air cultivation, and promises to succeed well on the Riviera. It is easily told from other races by its erect habit, yellowish-green foliage, and finely toothed thin petals. It grows fast, and, if sown

early in the year, will bloom in the autumn and through the whole winter. Colours and combinations of colours are not yet as varied as in the old perpetual-flowering Pinks.

Seedling Pinks are grown very largely at Cannes, Antibes, and Nice. Very fine novelties are raised every year, and it is quite probable that a new local strain will find its way into the horticultural trade before long. Flowers of large size and petals deeply and sharply toothed seem to be the characteristic features of the Riviera Pink.

BULBOUS PLANTS.

Roman Hyacinths are grown on the Riviera for bulbs and for

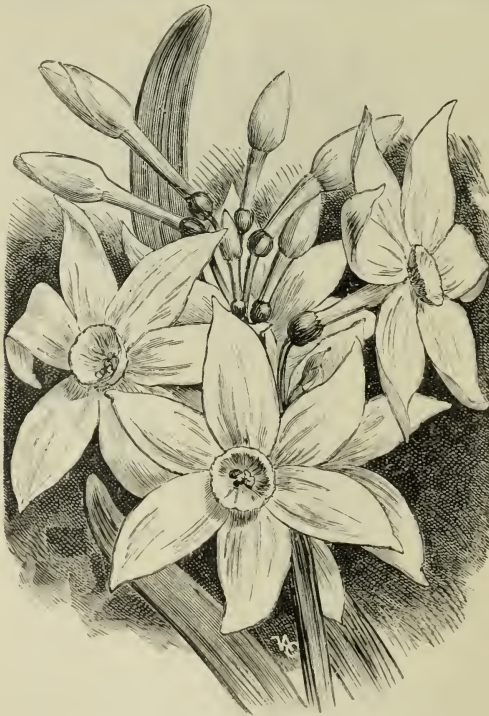


FIG. 9.—NARCISSUS TAZETTA VAR. TOTUS ALBUS GRANDIFLORUS.

blooms. From Marseilles to Nice they are seen everywhere. The headquarters for their production is, however, at Toulon and Ollioules. No protection whatever is required, and the blooming season extends, according to situation, from December to March.

The delicate white spikes are sent by hundredweights, at times by tons, and fetch but a poor price on the markets. They certainly cannot compete in northern parts with the same forced in heat on the spot.

A curious industry, which seems to be developing fast, consists in dyeing white flowers by making them suck up various colouring substances mostly derived from coal-tar. White Hyacinths are peculiarly apt to take dye in this way, and they are now frequently offered for sale in Paris either of a rosy lilac, of a salmon colour, or of a glaucous green quite unknown to nature. The same process was tried last year with white Pinks, but it fell flat after a very short run. Its revival as applied to Roman Hyacinths and to forced Lilac appears to give better promise of permanent success.

Polyanthus *Narcissi* are natives of the Riviera. The wild *N. Tazetta* is found in large numbers on the low-lying meadows all along the coast. Paper-white *Narcissus* (fig. 9), with its new large-flowered variety, *Étoile d'Or*, *Soleil d'Or*, and *Grand Monarque*, are the most prominent kinds, and they flower in the order named, from November to March.

Daffodils proper, the trumpet and Nonsuch *Narcissi*, are not yet of common occurrence on the Riviera, although some choice varieties are being introduced by amateurs, and although *Narcissus minor* is found wild on the hills bordering the coast. The fine garden varieties of Daffodils bloom about three weeks earlier there than they do in England, and they will surely gain ground every year.

The Poet's *Narciss* is also a native of Provence, and dots the hillside meadows and pastures with its dazzling white stars. On peaty grassland above Grasse it is so plentiful that it blooms in white patches, rods in extent, which are discerned miles away on the dark green grass. Bulbs might be lifted there by cart-loads; only it is the common late-flowering kind, which is of limited commercial value.

In gardens only the large early-blooming form, *Narcissus poeticus ornatus*, is met with. It is a most valuable form of Parisian origin, but now distributed all over the world (fig. 10).

Narcissus odoratus and the single and double Jonquils are plentiful, and spread their fragrance all over the country in March and April.

Hybrid Gladioli are quite hardy on the Riviera, and can be left in the ground from year to year. Dry bulbs started only in summer will bloom in spring, when handsome spikes will fetch high prices. Very few gardeners as yet go in for forced Gladioli.

Gladiolus segetum is very plentiful in a wild state, and it blooms through the cornfields in April.



FIG. 10.—NARCISSUS POETICUS ORNATUS.

G. Colvillei, and especially its charming white variety "The Bride," are seldom obtained before April. They are grown in large masses such as sometimes to glut the market entirely.

Gladiolus tristis, a dull white elegant flower with purplish-black marks on the outside of the divisions, blooms as early as February. It finds favour on the market, chiefly on account of its earliness.

Allium neapolitanum (fig. 11) and *Allium triquetrum* are still found wild on the Riviera, although much hunted up by florists. They are also grown in gardens, and give very pretty elegant milk-white umbels of good duration. They should, however, be handled with care, as the stalks if bruised will give forth a powerful smell of garlic.

Tulips of several species are wild on the coast. *T. oculus-solis* and the exquisite pink and white *T. Clusiana* are plucked in the fields. Some early Dutch or Parisian varieties are grown by



FIG. 11.—*ALLIUM NEAPOLITANUM*.

florists, but the strange-looking Parrot Tulips are the most profitable of all.

Freesias become every year more common on the Riviera. They are perfectly at home there, as well as the *Ixias* and *Sparaxis*.

Lachenalia pendula Aureliana is a remarkably distinct form, although evidently belonging to the *pendula* type. It is more compact than the common *L. pendula*, and stronger. It has broader leaves and more numerous flowers of a dull red colour scarcely tipped with green. It flowers in the open air through the winter months. It is said, and the fact is supported by high

authorities, that the plant was found wild in the Esterel Mountains, close by the track of the old Roman road, Via Aurelia. Still it seems scarcely credible that a species belonging to a South African genus should be found isolated so far and in a place so entirely disconnected with the station of all other *Lachenalias*.

Anemones, like *Narcissi*, are indigenous on the Mediterranean



FIG. 12.—ANEMONE CORONARIA VAR. CHAPEAU DE CARDINAL.

coast. From fields and meadows they were early introduced into gardens. The Provençal varieties of Anemone belong mainly to *A. coronaria* (fig. 12). *A. hortensis* is found also in a wild state, but it is scarcely, if at all, subject to cultivation. In deep, rich, moist soil it is found as *A. pavonina*, a large scarlet flower with a golden disc in the centre. On pastures and hillsides it is

common as *A. variabilis*, much smaller, and with flowers changing from pink to lilac, sometimes pure white.

A good many wild forms of *A. coronaria* are natives of Provence, some of which have become extinct in a wild state during the last twenty years.

Two single varieties are very abundant to this day, viz. the common purple and the single scarlet form. The former is very common, and is gathered from field and vineyard nearly all through the winter. It is brought to market in bunches, which look strangely like bouquets of big Violets. The scarlet variety is not either so frequent or so early as the purple, but it is of a very bright colour. The roots are eagerly sought after for commercial purposes. It is a favourite on the Paris market.

Two very distinct double forms were introduced long ago into gardens, and lately into florists' lists. One of them, known to botanists as *Anemone Rissoana*, is called in trade "Anémone Rose de Nice" (fig. 13). It is a double flower with narrow-pointed divisions of a salmon colour, more or less greenish in the centre. It commences to bloom very early, and lasts from January to April. It is one of the most exquisite flowers from the Riviera.

Anemone grassensis, locally termed "Capeou de Capelan," presents two distinct varieties, one of a rich crimson colour, the other white mixed with carmine in a greater or less proportion. Both are quite distinct from any other *Anemone coronaria* by the angular appearance of their exterior divisions, which rather suggest a flower of *Nigella* than a cup-shaped *Anemone*. The centre of the flower is filled with short, thickly pressed scales, red, rosy, or flesh-coloured. The "Capelan" *Anemones* flower only from February to April. They are very fine and effective when well grown, especially the white variety.

The large improved strains of *Anemone coronaria*, both single and double, succeed admirably on the Riviera, and are sold on the local markets, and sent to florists in the North in large quantities. All *Anemones* carry well, revive easily in water, and last for many days.

Although by no means peculiar to the Riviera, some varieties of Stocks ought to be mentioned here, as they contribute very large quantities of cheap winter flowers to the local and export trade.

All the varieties of the large-flowered German Stocks, and

also of the "Empereur" Stocks, are well adapted to the local conditions; but, in fact, the pure white and the crimson varieties are preferred.

A very fine biennial white Stock, known as the "Nice White," as well as a dwarf, very large-flowered whitish lilac form, found their way into general horticulture from being at first purely



FIG. 13.—ANEMONE ROSE DE NICE.

local strains. A branching blood-red annual Stock is also grown with profit.

Mignonette is in great demand in the South, as well as everywhere else. It is grown under screens, just in the same way as the hardier class of Pinks. It is sometimes pinched by frost. The large "Pyramidal" and "Machet" varieties are the only kinds in use.

Many more herbaceous plants are occasionally grown for their flowers on the Riviera; but very few besides those enumerated above constitute a real article of trade. I must, however, make an exception for Violets, which will be mentioned by-and-by, and for *Iberis gibraltarica*, *I. semperflorens*, and *Arctotis aspera*, and also for the common Cornflower and the closely allied *Centaurea depressa*.

Iberis gibraltarica thrives remarkably well, chiefly on rocks or loose walls, in a shady situation. Its large umbels of white and lilac are really wonderful.

Arctotis aspera gives through the whole winter a succession of large cream-white flowers, with a deep yellow ring round a black disc in the centre. They are very effective, and stand well in water.

Violets, though last, are certainly not least amongst the Riviera flowers. Large quantities of the common sweet Violet are exported daily, and supply the Paris market to the nearly complete exclusion of North-grown flowers. The rich grass and orchard land round Solliès-Pont in the Var is now the home of sweet Violets. It supplies all the principal markets with ready-made bunches of flowers, collared with fresh green leaves. The large dark Violet "Le Czar" is in great demand, but the pale, white-centred, long-stalked "Wilson" variety holds its own all the same. A new large kind, known as "Luxonne," is well spoken of. It is not yet widely distributed.

Neapolitan Violets are grown by the acre all round Grasse, Magagnosc, Vence, and Cannes for the perfume factories. A good proportion of the crop, however, finds its way to the market or to the florist's shop. They are universal favourites, and in constant request for corsage and button-hole. They are met with every day in apartments, where they combine admirably with bright Anemones or golden Mimosa, and tons of them are used at the "battles of flowers."

Although some other flowers not unworthy of attention might still be mentioned, I feel that the line must be drawn somewhere, and I will not, therefore, extend these remarks any further. Suffice it to say, that to a lover of flowers the Riviera is never destitute of some objects of interest and of attraction. At this time of year the contrast between Northern skies and the "Côte d'Azur" is at its highest. Should any of those

present here feel inclined, and at liberty, to take tickets to the Riviera for the Easter holidays, they may rest assured that they will find there plenty of material for horticultural observation, and many sights of beauty to gladden their eyes, besides the bright sun and the dark blue sea.

“RAMBLES WITH A TROWEL.”

BY MR. H. SELFF-LEONARD, F.R.H.S.

THE Secretary asked me some time back to give you a short paper on my plant-hunting rambles in the Dolomite Alps. I complied with a light heart, and have ever since been wondering at my temerity.

For I have none of the imaginative power which can paint the glories, floral or otherwise, of the Alps; nor even that far commoner gift of making many words about what can be said in few.

My first resource in my difficulty has been to enlarge the scope of my paper to cover my general Alpine wanderings, Dolomitic or otherwise, and my second to determine that, relying on your good nature, and on the freemasonry of plant-lovers, I might write, just as I would talk to you, for twenty minutes or so, rough notes on Alpine plants and plant-hunting, and on how I personally “do it”—on the high places, or some of them, which I have visited, on some of the things which I have found there, and on what I do with what I find.

Enthusiast though I am in the culture at home of Alpine plants, the desire to possess them in some quantity could never by itself impel me, or anybody else, to be at the expense of time and money incurred by seeking them in their habitats. And this although, somewhat strangely, there is no professional foreign collector known to me who does his work well enough as regards lifting, packing, and transmission of the plants to be an efficient substitute for collecting personally.

For, allowing for the difference in quality and vitality between fresh and home-reared plants on the one hand, and travel-worn specimens on the other, we can, even already, buy them at home more cheaply in the long run than we can supply ourselves from abroad *even in quantity*. At least, speaking *broadly* and *generally*, that is so; it is only not true of the few plants which on one ground or another we often cannot buy in quantity, or perhaps at all, and so must collect if we want them.

We collect not to save money, but first because we enjoy the hunt, and next because “our collected” plants have for us an “extra value” by reason of some pleasurable association connected with their acquisition.

That plant of *Eritrichium nanum*—reminder of the place where, at last, first in your life, you suddenly came upon it in the mountain fastness and solitude nine thousand feet up; that plant of the lovely *Saxifraga squarrosa*, to get which lured you on to a vast torrent of loose stones, ready to travel at express speed with you and your plant to the bottom, a thousand feet down; that other plant which Schmidt, the great German cragsman, brought you in his pocket from some mountain fastness which thus you are glad to visit by so famous a deputy—how shall the value of such be appraised in pounds, shillings and pence?

You are made happy by finding the bright pink variety of *Aster alpinus*, though the “find” is no fortune to you; and when you light upon a *Saponaria ocymoides*, as you easily may, brighter than Backhouse’s *splendens* variety—brighter even than his latest *splendidissima*—your happiness is that of the hunter, and not of the nurseryman, amateur or professional.

And now a word or two upon the subject of the protection of Alpine plants from extinction, and on the sins, or alleged sins, of Alpine plant-hunters. I have quite got over that sense of guilt in collecting Alpine plants which divers people, good, bad and indifferent, endeavoured to instil into me, more or less successfully, in my green horticultural youth. I have done so by taking a course which may be recommended in other matters than those of plant-collecting, namely, make up your mind by all methods open to you what it is wrong to do, and don’t do it; but also make up your mind what you may rightfully do, and do

it until you are stopped by some other and better authority than, perhaps amiable but certainly ignorant persons who imagine a plant (produced it may be at the evening *table d'hôte*) to be nearing extinction if they have never found it near the roadside in their "lowland" wanderings; or, I may add, than those very selfish persons, happily few, and for whom I feel even less respect, who would ban all plant-collecting whatever, with the vast pleasure which it brings to hundreds of us, if so they themselves may casually see a few plants the more from their carriage windows. There are, so far as I know (I speak of true Alpine plants wanted or taken for their beauty), few which are really at all scarce. Any which are so, take only sparingly—collect their seed, and raise from it when you can. I may say in a parenthesis that the much-prized Edelweiss, of whose threatened extinction we hear perhaps most, is thus so easily raised in a year that there is no purpose at all, except for the sake of association or similar reason, in collecting the plant.

Be slow to collect any plant whatever from near a public pathway. There can rarely be any purpose in so doing, for it is sure to be found in greater plenty not far off, and out of sight of Mrs. Grundy, as well as of more agreeable people. If you will, scatter discriminatingly any seed you find and don't want. Easily may you thus help Nature far more than you rob her. All reckless or purposeless collecting (and there is a good deal of it) is to be deprecated, and the few really rare plants should be sparingly taken. An excellent society exists for these objects, and should have our support. But for the rest, I am not aware of many Alpine plants which we want for our gardens, or for those of others, which cannot be had in any reasonable quantity (by looking for them in the right places) without, so to speak, their being missed. It may, I own, some day be otherwise, if, as is likely, or at least possible, the demand for Alpines should much develop and grow. In that case precautions may become proper which under present circumstances are needless; but I take it to be also probable that in that event the demand will be supplied largely from seed rather than by importation. Indeed the main commercial demand ought to be on more grounds than one, and probably is, thus supplied. Of newly ripened seed, promptly sown, in the majority of cases germination is as safe and easy as with any other classes of plants, although results, of

course, have to be awaited for years in the case of such genera as the Primulas, Saxifrages, and others.

But to return to plants and plant-hunting. A word or two on the subject of a plant-collector's outfit and paraphernalia may not be unacceptable to any who may contemplate rambles like mine. Of course it is very simple. As regards dress there is nothing to be said; it may well be that of the ordinary Alpine climber, minus the ice-axe and blue spectacles; or that of the more everyday Rambler. For your search, remember, will never carry you above nine thousand feet above sea-level or thereabouts, for as you reach the line of perpetual snow plants become scanty, and I know of none found above the level which I have named which are not found probably in greater plenty below it. You gain little or nothing by going higher. But it is only at from eight thousand to nine thousand feet, I think, that you reach the mountain homes of such gems as *Eritrichium nanum*, *Androsace glacialis*, *Ranunculus glacialis*, and a few others.

I carry and advise a belt, with scabbard, to hold the trowel. The form for this latter which I find best is that of a long steel scoop. I got it originally I know not where; I think at Berne. It is not, I believe, generally to be had in English shops, but without difficulty you can get it made for you. The steel should be good, and neither break nor bend, for accident to it fifty or a hundred miles from “supplies” is serious. For this reason, I carry a reserve trowel—indeed two. This plan has the additional advantage that you can either pay a local rustic or, better, lure an unsuspecting friend to accompany you, and make him dig roots for you. The trowel is practically the only tool I use; but it is not equal to lifting a few deep-rooting things like *Anemone alpina* and *sulphurea*; and even the local spades—which on occasion you “beg, borrow, or steal” from the hotel gardener, and carry to heights strange to them—are not equal to the task.

I once in my green youth devised an elaborate spade for the purpose now in hand, and had it made to order “regardless of cost.” It consisted of a strong steel blade made to screw to the end of a specially constructed alpenstock, and to take off and on. It was a beautiful instrument—“on paper”; but, like so many rubbishy plants “off it,” it was a distinct failure. It went to pieces at its first or second encounter with, I think, the Schilt-

horn, and was never more heard of. But, in fact, what we do well to take from the Alps can be got with the trowel. The deep-rooters which want the spade you can rarely establish in your garden or nursery when you have got them, and they are better let alone. What kind of case to use for your spoil when collecting is a fairly moot point. It is certain that it should be something stiff, to minimise the crush and jam of the plants.

The usual tin botany-case, slung to the back, is well enough on occasion, but it is generally inadequate for one's serious and concentrated annual effort. It almost goes without saying, that what is wanted must be as handy and portable as possible; strong enough, yet light, and must open and close conveniently. I run the danger of amusing you—a danger from which I recoil—when I say that *I* have found the desiderated qualities *best* concentrated in—shall I say it—a small portmanteau! or, rather say, in a valise. But not in a British one, for the typical British one is, like the Britisher, heavy, solid, and tough. But in most towns on the Continent can be bought, in all sizes, small and large, cheap valises (from two francs and upwards), rather “thin”—canvas and cardboard predominating in their structure—and which admirably unite the desiderated qualities before tabulated. You prod holes in them freely for ventilating purposes. Such I use as well on my collecting rambles as on the return journey. And on it they have a final merit which crowns all (although I believe I selected them irrespective of this quality)—I mean that they enable you yourself to *carry* your plants home as “passenger's luggage.” Only thus are you sure of them, and not always then. The perils of their journey home are many. For instance, I recall many years since arriving at my Paris hotel with my precious freight, which, as usual, I had cared for like a mother all the way from the Alps, by day and by night. At Paris I thought it wise to direct that my charge should be “made to descend,” as the French say, to the ice-cellar. I “gave command” accordingly, in what I have still no reason to doubt to have been quite unimpeachable French. A lucky mistrust seized me five minutes later as to whether my instructions might have been to the letter obeyed; and, penetrating promptly to the recesses of the lower regions, I found my parcel of plants placed before a cheerful fire in the middle of the kitchen, while “Monsieur le Chef” received me equally cheerfully, and needed to have it

explained to him with some particularity why the arrangement was not completely to my satisfaction.

Probably there is no one present here to-day who does not know as well as myself how to pack Alpine plants, namely, in *dry* moss, the plants themselves as dry and “unexcited” as possible, consistently with their not drying up, and with such admission of air as is consistent with the same thing. It is far better to bring a limited number in good order than a great number in bad, and small or medium-sized plants are generally better than large ones. The elastic moss packing should therefore be abundant; the whole of the root, when possible, should be brought away, and when it is unavoidably injured, the head of foliage should be proportionately reduced. Indeed, it is generally well to diminish this in any case, and to remove all flowers.

But I am packing up and starting home prematurely. Let me get back from Paris to the Alps for a bit. No harm has been done if I have said a few things by anticipation, and out of their place.

Yes, my outfit may be thought a singular one, and you need not imitate it unless you like. My trowel in its scabbard and belt have been mistaken scores of times for a dagger or stiletto, and have in turn evoked the mistrust, curiosity, and, more rarely perhaps, the respect of gendarmes, douaniers, tourist and mountain shepherd, and, I have fancied, of mountain dog. The curiosity at least is not allayed by the association of my very third-rate valise, which is, it must be allowed, an article not often seen on its way towards the clouds, and say seven or eight thousand feet above the sea. I have not been surprised to learn that to tourists I have commonly, as I mounted, presented the appearance of an economical person who, dissatisfied with the too luxurious appearance of the hotel below, is under the impression that he may find a more modest and suitable hostelry if he only climbs high enough, and is thus carrying his luggage thither “on spec.”

For botanical and collecting purposes, the Alps may be conveniently divided into calcareous or chalky formation, and the non-calcareous, generally granitic, formation. This division answers naturally to a leading distinction in the culture of the Alpine plants at home. There is a considerable number of plants which are found on both formations. But there is also a con-

siderable number found in nature only on chalk, and perhaps a smaller number only found off it. The flora of the chalk is exceptionally rich.

Of Alpine culture generally I am not treating to-day; but I think it well to make a remark or two on this subject. The great difference between the two typical soils which I have named seems to be a mechanical one. The chalk is of a sticky nature, and holds water for the plant winter and summer. Those plants which by nature or habit exact such constant moisture, and do not resent a clinging embrace from the soil, are the chalk-lovers. I could instance a host of plants. *Gentiana acaulis* and *verna*, *Primula Auricula*, *Clusiana*, and many other Primulas are rarely found off the chalk in nature. So *Dryas octopetala*, *Saxifraga cæsia* and *squarrosa*, and a host of others which I could name. It is singular to note how in the Dolomite range of mountains—which is generally calcareous, but in which are strangely intermingled mountains of syenite (a non-calcareous formation)—you pass from one flora to another rapidly and often, and can tell the soil you are traversing by the plants you see. Again, in the Engadine, where the range is nearly wholly granitic, but where there is a patch or two of chalk upcropping (chiefly on the Albula Pass), it is only on these few patches that we can find in the whole district such chalk-lovers as *Dryas*, the great Bell Gentian, and *Androsace chamæjasme*. The place of *Gentiana acaulis* is taken off the chalk by the similar and equally fine Bell Gentian, *Gentiana excisa*—a hint, by the way, for those who find they cannot grow the first-named species. I may here observe that while in nature many plants are only found on chalk, it does not follow that in cultivation they cannot be grown without it; and this for the very simple reason that art, assisted by our humid climate, can readily supply otherwise the function of chalk in maintaining a constant supply of moisture. In fact, I know of no single chalk-loving plant which may not be grown, and well grown, without it. On the other hand it seems, according to my experience, to be the fact, and a fact easy to understand if what I have just been writing be correct, that many plants found in nature only off chalk cannot be successfully grown on it. I incline to think that some of these “lime-haters,” as they are called, may find something impossible and poisonous to them in its chemical constituents, so immediate are the effects. But, for

the rest, their failure in it is adequately accounted for by the mechanical properties to which I have already referred. Art can otherwise supply the qualities of chalk for those plants which like it; but art can only, very partially at most, correct its positive faults for those plants to whose habits or constitutions it is inimical. *Androsace carnea* and *glacialis*, *Eritrichium nanum*, *Primula glutinosa*, and many other Primulas, with *Lithospermum prostratum*, *Azalea procumbens*, and *Ranunculus glacialis*, are among the plants—and there are many—which so exact a non-calcareous soil as to refuse wholly to grow in a calcareous one.

The range of my plant-hunting Alpine expeditions has not been a very wide one. I have made two excursions to the "Dolomite" range in South Tyrol (Austria and Italy), a country with a flora at once numerous, rich, and beautiful. Each of these adjectives has a separate meaning, for a flora is often rich, as well as beautiful, without being numerous. I mean the number of distinct species may not be large.

The Dolomites are almost equally well reached through Northern Italy by Milan, or *viâ* the Arlberg Railway from Zurich by Innsprück, the Brenner, and Botzen. In the neighbourhood of Botzen (the capital of South Tyrol) and just outside the Dolomites proper, are several fine "botanical mountains," notably the Schlern and the Mendl, with fair accommodation for tourists on their top or sides. Those whose time is limited may be content to go no further.

The inn accommodation in the Dolomites is still reported to be generally inferior, though in the way, probably, to rapid improvement. There are two marked exceptions (I mean to the badness), viz. at Cortene, their chief town, and at San Martino di Castrozza, where is a capital inn and a floral centre at once rich and rare. It has been my chief centre of operations on my two visits. The fact that it is on a fine military road, which mounts to the summit of the Rolle Pass behind it (over 6,000 feet), reminds me to adventure a piece of general advice for the benefit of any, if there are any here, who, so to speak, are like myself, not "as young as they were." It is this. For your day's work get as high as you can on wheels; when wheels can go no further, go as high as you can on horse or mule, and only begin to use your Shanks's ponies, *i.e.* your own legs, when all other

means of locomotion fail you. At a pinch, I have not refused the aid of the patient ass, and I should think twice ere I refused a sedan chair were it offered me. I have a dark suspicion that I may be oftener laughed at than I wot; but "let those laugh who win," and I can aver that my day's enjoyment and plant-winnings in the heights are, ordinarily, in direct proportion to the care with which I have husbanded my strength for those long hours of excited scramble, and, better still, of delightful "potter" among the stones, which succeed arrival upon the hunting-ground.

For the same reason, start early, that you may be in the cool heights ere the sun is hot. So much for my Dolomite excursions.

Scarcely second to it for interest, and for wealth of plants, we must place the Engadine. It is a fit "pendant," so to speak, of the Dolomites, for the latter are generally calcareous, while the Engadine is almost wholly granitic, and the flora varies accordingly. The comparison between the two floras is interesting and instructive. Take, for instance, the different Alpine Primulas found in each district. To the best of my recollection, only two species of Primula did I find common to both localities, viz. *farinosa* and *longiflora*. For the rest the Engadine is rich in *Primula viscosa*, *integriolia*, *graveolens*, and a host of their beautiful hybrids; but there is not found in it either of the following, which in the Dolomites (not probably 100 miles off) are plentiful: *Primula minima*, *Balbisi*, *Floerkeana*, *glutinosa*, and their many hybrids.

Famous plant habitats in the Engadine are the Bernina Pass and the range generally, and particularly the famous Heuthal (the Val de Fain as it is also known) included in that range. The Fex Thal and Bever Thal, which radiate (in another direction) out of the Engadine Valley, are nearly as famous botanical resorts. But it is quite likely that many adjoining and less frequented valleys are as rich or more so.

The Engadine, as most of you know, is the strangely large and high-placed valley of the Upper Inn, in the extreme east of Switzerland. Pontresina still remains, perhaps, the best headquarters there for the plant-hunter and botanist, if he can tolerate the transformation from the once simplicity and picturesqueness of the village as it lately was to the town almost as it now is.

Half-a-dozen large hotels, and as many smaller, now dominate the place, and in the season you may, if you please, secure a dance at one of them two nights out of three. It is a place overcrowded from the end of July until the middle of September, and much more to be recommended at other seasons. In the season itself smaller places like Sils Maria (at the entrance to the Fex Thal) or Silvaplana may be recommended to the plant-hunter, as combining very passable accommodation with proximity to his, shall I say—work?

The best route to the Engadine happens to traverse one of the very best plant-hunting grounds—as owner of a calcareous garden, to me the very best, because there (practically alone) is a chalk soil found side by side with the granitic; I refer to the beautiful Albula Pass, by which you best pass into the Engadine from Coire. At Coire, some six or seven hours only from Basle, your railway journey from England ends. The summit of the Albula Pass I have seen (even by the roadside) carpeted with *Ranunculus*, *Saxifragas*, *Primulas*, and *Gentians*, although in the season the road is traversed by scores of vehicles daily.

At a spot just on the west side of this pass, and a little below the summit, is a small inn said to be habitable even at night; and if so, it would be an admirable base from which to work. We have never yet, however, been able to get free from the idea, judging from the exterior of the building, that the entomology of this place might prove almost as rich as its botany, and, though I speak not from knowledge, I should suggest, therefore, that our example be imitated, and that the district (although otherwise at a great comparative disadvantage) be worked either from the Engadine or from Bergün lower down on the home side of the pass.

I have botanised in other parts of Switzerland proper only casually and unsystematically, and my impression is very strong that, although such well-known places as the Mürren (above Lauterbrunnen in the Oberland), as the Bel Alp and Æggischhorn, Zermatt and the Riffel Alp, the Evolena and Zinal Valleys, Val d'Anniviers and Val de Saas (all approached from the Rhone Valley), are rich and good hunting-grounds—and they are all probably twelve hours nearer to London than is the Engadine, and two days nearer to London than is the higher ground of the Dolomites—yet, so far as I can judge, they

are not nearly so rich as the two typical districts, the Engadine and the Dolomites, of which I have spoken, nor is anything, at least of marked beauty, found in them which is not also found, and generally in more profusion, in those two more easterly districts. Here, however, I am speaking my impression and opinion only, and am not talking from wide or exact knowledge.

For my first visit to the Pyrenees I start next month. From what I have heard, I fancy its flora is rather distinct than either generally very rich or numerous as regards species. But distinct it certainly is; and, owing to similarity of soils probably, I have had marked success with Pyrenean plants. This encourages me to extend my experiments to others with which (arriving in bad order) I have hitherto failed, but which seemingly are well worth fetching and introducing to commerce. Among the beauties peculiar, I think, to the Pyrenees are *Saxifraga longifolia*, *Ramondia pyrenaica*, *Aquilegia pyrenaica* (a glorious Alpine species of Columbine, easily grown—with me at least—but all too rarely seen), *Senecio leucophyllus*, *Lithospermum Gastoni* and *graminifolium*, and *Saxifraga calyciflora*, *arctioides*, and others.

I trust that I may on another occasion have something to say as to my rambles in those parts, and in others which I have not yet visited.

The Auvergne Mountains in France seem to be worth visiting, judging by the number of species or varieties dubbed “Arvernensis.” Mont Cenis must be visited, for it holds the beautiful *Campanula Allioni*, and other gems which I always think of as I pass beneath them in the great tunnel—very properly with my hat off, for it is night when I thus pass through to Italy, and I cannot well break my journey to reach them. Of the mountains of the Tessin, or Italian Switzerland, and of North Italy, I have visited practically little but Monte Generosa. This mountain has its peak in Italy, its hotel two miles off, in Switzerland. The mountain has been spoiled for ever and for everybody, plant-hunters included, by a villainous staring mountain railway, unredeemed by any serious effort to mask its ugliness. It is easily reached from Lake Lugano on the Gothard Railway. But there remain such mountains in North Italy as Monte Baldo, and Grigare, and Bobbio, and

Tombea, and a dozen others, which must be made to relinquish to me, some day, samples of their wealth and loveliness.

And I have forgotten, as ere leaving France I should not have done, to remind you that the Alps of Dauphiné, with Monte Viso, and the Alpes-Maritimes, are far less explored than are others. Though it is improbable that they can ever yield anything (unless, perhaps, a few new varieties) wholly new, it is certain that they, like the Eastern Alps, hold very many of the most distinct and beautiful Alpine plants of gardens, nowhere else found. *Dianthus neglectus*, the easily grown *Primula marginata*, and the difficult and beautiful *Primula Allioni*, with *Saxifraga cochlearis* and *lantoscana*, are among the plants which these “Sea Alps” send us.

Happy it is, for a “land-lubber” like myself, whose enthusiasm would yield before a sea voyage as before scarcely anything else, that, according to the better opinion, the flora of the European Alps is the richest Alpine flora in the world, and can be reached with but an hour’s view (and “feel”) of the hateful sea. And so one is half comforted to learn from Mr. Whymper that the Alpine flora of the high Andes apparently amounts to little, and one is content to take from the mountains of Asia Minor whatever Mr. Whittall and others may contrive to find and send us, now or presently.

It remains, I hope, ere I die, to visit not only Styria and Carinthia and Carniola, and perhaps Transylvania, all rich and comparatively little explored, but the mountains of Bulgaria, the home of *Primula deorum* (the “Primula of the gods”). Should I ever return from that quest, whether minus my ears (left behind with the brigands) or minus one of them, I trust that, as kindly and patiently as you have done to-day, you will receive me and hear from me the tale of how I found *Primula deorum*, and how (if so it must be) I lost my ears in the process.

ALPINE PLANTS AND THEIR TREATMENT.

By Monsieur HENRI CORREVON, Jardin d'Acclimatation, Geneva,
Corresponding Member R.H.S.)

[Read April 25, 1893.]

THE vegetation which grows upon the flanks of the Swiss Alps, or of the other high mountains of the world, is of a most distinct character—quite *sui generis*; so much so that the most casual tourist is at once struck with its peculiarity. At these high altitudes the plants are of a very dwarf habit, almost stunted, and the higher we ascend the dwarfer they seem to become, so that at 6,000 feet in the Swiss Alps we find nothing but dwarf or stunted perennial plants, presenting often the appearance of little carpets. Even the genera which in the lowlands appear as trees or shrubs, are represented here only by dwarf or creeping varieties. *Salix*, *Azalea*, *Betula*, *Arbutus*, for instance, instead of growing to their more usual height, spread themselves out upon the ground. They seem to shrink from the coldness of the air, and cling to the ground on account of the sun-heat which it retains.

Alpine plants are generally perennials, and only a few *Gentians* (*G. tenella*, *obtusifolia*, *nivalis*, *utriculosa*, *campestris*), *Lomatogonium carinthiacum*, and some *Rhinanthaceæ* are annual. They are for the most part stoloniferous, cæspitose, and send shoots in all directions. The flowers are very numerous, and relatively large; the colours bright, brilliant, and pure; the stems, if not altogether absent, are short; and the flowers, owing to the suddenness of the change from winter to summer, appear all together at the same time.

There are no Fungi in the Swiss Alps; the bright and intense light which reigns there does not permit their development.

Take a plant of *Dianthus alpinus*, and compare it with the Pinks of the plains. You will be surprised at the brightness of the colouring, the large size of the flowers, and the shortness of the stems; the whole life of the plant seems to be concentrated in the flower (which is, of course, its most important part). And these flowery carpets are the most enchanting amongst all the

sights of the vegetable kingdom; no language can describe them, no pencil reproduce them; they are the jewels of the Creator and His favoured ones in the world of plants, and both they and their marvellous surroundings alike enchant and astonish us.

But not only are their flowers peculiar, but the leaves also of plants on high elevations are differently constructed to those of the plains. The powerful action of the sun impresses a distinctive character not only on the exterior form, but even on the very organisation of Alpine plants. The leaves are thick and of compact texture, and, thanks to the density of their skin, they are capable of resisting the drying influence to which they are exposed from the intensity of the sun's heat. Often, too, they are further protected from this drying influence by a thick pubescence, almost always composed of starry hairs which protect the skin—the grey down which, like thick felt, covers other Alpine plants, especially the *Compositæ* (*Edelweiss*, *Senecio*, *Artemisia*, *Achillea nana*), serves the same end. And it has been repeatedly noticed that in positions exposed to the sun on open heights and slopes almost all plants have coriaceous leaves or a close pubescence, whilst in shaded and sheltered ravines, and in the gorges and hollows which serve as beds for the torrents, they possess greener and more delicate leaves.

The anatomy of Alpine plants proves that the cells of their leaves are smaller, and that they have thicker walls and more concentrated contents than plants of the plains, so that in alternate freezing and thawing the tissues are not torn even at temperatures at which the plants of the plains, whose cells are provided with thinner walls and contain a greater proportion of water, would infallibly succumb. The more tufted habit, and the imbricated leaves of the mountain plants also contribute to protect them from the cold air currents which pass over the surface of the ground.

And it is precisely these frosts, renewed as they are every night, that explain the cause of the dwarfness of all these plants. The most recent physiological researches have proved that it is during the night that plants grow the most rapidly. By day they grow so much the less the more they are exposed to the sun. For plants of the high Alps there is very little opportunity of nocturnal growth, which is prevented by the frosts. It is only during those hours of the day when the sun is strong enough to

warm the soil considerably that they can possibly grow, and this explains the shortness of the internodes. It is for the same reason that the plants which carpet the high Alps so frequently, or even generally, change their appearance when transplanted to the lowlands; the nights being warmer, they continue to grow, and exhaust themselves; all their parts are soon lengthened, and they rapidly become paler in colour. For the same reason again, many Alpine plants form large tufts, beautifully leaved, in England, which in our gardens at Geneva, where the sun is more powerful and the moisture in the atmosphere less, appear undeniably weaker and smaller. In our Alpine Garden at Geneva we cannot produce such tall, large, and vigorous plants as you do here in England. And it has been noticed that just those very plants which we have such difficulty in raising under our unfavourable conditions in Geneva, succeed well under the more suitable conditions they meet with in England, and increase very rapidly. I was very much astonished some years ago at seeing in Mr. G. F. Wilson's garden at Weybridge quite a bed of *Saxifraga oppositifolia*, a plant that never grows with us more than 8 centimetres ($3\frac{1}{4}$ inches) in diameter, even under the most favourable conditions. The Ramondias on the rockery at Kew caused me a very great surprise, and, I must add, discouragement. I often think of the marvellous growth of Alpines in your English climate, and sometimes, I confess, with somewhat of jealousy.

But if you in England are favoured in some ways, you are not so in all, and you might well sometimes envy us the vivid colours of the flowers in our modest rockeries, and the profusion of the stemless blossoms covering our tufts of *Saxifraga oppositifolia*, *Androsace glacialis*, *Laggeri*, *helvetica*, &c. And I believe that our plants grown in unfavourable conditions, but under the more powerful action of the sun, have better preserved their original character than the very healthy and strong specimens which call forth my exclamations of delight in the beautiful rockery at Kew. But, alas! we cannot alter the existing condition of affairs. You cannot get more sun, and it is impossible for us in Geneva to get more moisture in the air. The best thing is for us each to endeavour to obtain the best results under our several conditions.

It is important for those who wish to devote themselves to the cultivation of Alpines to know the conditions under which

they grow in a natural state. These conditions are not, of course, to be found in a lowland climate; but it is possible in many respects to supply them by artificial means. And in the search for and application of these means lie all the secrets of successful cultivation.

The first condition of growth for Alpines, as for all other plants, is a certain degree of heat. If the thermometer never rise above the freezing point, the sun may flood the landscape with its light without producing any movement of vegetable life, even supposing that the soil were free from snow and ice. But whilst a considerable increase of warmth is necessary to bring the plants of the plains into growth and flower, it is quite otherwise with the plants of the Alps, as the smallest degree of heat above the freezing point wakes them at once into active life. The vegetation of the upper zones is subjected to a much more severe treatment, and enjoys a summer so short and so cool that it might almost be said to represent winter for the plants of the plains. These Alpine species, however, accomplish during this short space of time the complete cycle of their annual existence. They flower and ripen their seeds as well as do the lowland plants; and their stunted habit, the shortness of their stems, and the smallness of their foliage evidently contribute to quicken and awaken life, by sending to the flower and to the reproductive organs all the sap conveyed to the plant by its numerous roots.

It is necessary, however, to remember that under the conditions to which the Alpine flora is subjected it enjoys an ardent and intense warmth, from the fact that the solar rays shine longer and more continuously upon it, and that the thickness of the atmosphere is less than in the lowlands. But if during the day, and when the sun exercises its influence, the vegetation enjoys a greater degree of warmth, it has, on the other hand, to endure cold and rigorous nights, during which the thermometer sometimes descends to 18 or 20 degrees Fahr. below freezing.

Another essential condition to rapid growth is light; and it is, after warmth, the chief element in which the Alpine flora revels. At a great altitude nature is far more prodigal of light than in the plains. At the very commencement of its growth the Alpine flora is immediately benefited by the same amount of light that the plants of the plains receive in the summer.

Spring in the upper zones is retarded three or four months later than in the lowlands ; or rather it may be said that spring does not exist there at all. Immediately after the melting of the snow Alpine vegetation enjoys all the advantages of summer without having to pass through an intermediate season. The time of the disappearance of the snow in high regions is generally put at that of the longest days of the year—May and June—and in a few days, almost hours, you may see the snow-fields transformed into verdant pastures jewelled with flowers. After seven or eight months of sleep the plants find themselves suddenly surrounded with the most favourable conditions for growth and development. Light, warmth, and moisture contribute all together and at the same time to accomplish this work, which is only interrupted by cold and short nights. A very large amount of light is necessary for Alpines if you wish to obtain a profusion of flowers. As a general rule, all the plants of the Alps, far from fearing the sun's rays, absolutely require full exposure to the light, and it is only since I have kept them fully exposed to the sun that I have been successful with such as *Eritrichium nanum*, *Androsace pubescens*, *A. helvetica*, *A. imbricata*, *A. glacialis*, *Edraianthus*, &c.

But if warmth and light are necessary, there is also a third condition which is indispensable, and ought never to be allowed to be lacking in cultivation. The rays of the sun would soon destroy these delicate organs and slender flowers if there were not a protecting agent to prevent the damage. This agent is water diffused in the air in the form of vapour, which surrounds the plants as with light gauze, thus preventing the rays of the sun from scorching them. When summer comes the Alpine pastures are watered by the melting snow, and the spongy soil holds the moisture for a long time and gives it up to the atmosphere as soon as it begins to get dry ; and in districts overtopped by more elevated summits the snow which melts throughout the summer on the heights supplies the Alpine and sub-Alpine regions below with the necessary water. And besides, when it does not rain, the nights in summer always yield heavy dews, of which the effect is evident, filling the air with moisture. Later on, in the months of August and September, the air is drier and the morning dews less heavy. It is then that the ripening of the seed takes place, for which a too great moisture would be injurious.

The plants then enter upon a period of comparative rest ; they have set aside their brilliant attractions and seem inactive. They do not, however, pursue a less incessant work very interesting to observe. During this period of its life-history the exterior parts of the plant have less need of moisture, because the seeds, in order to ripen, require to be under the direct influence of the dry warmth of the sun. Then when the sap is no longer required by the seed (which when ripe falls, and is scattered around its mother plant), it returns to the subterranean organs, where a different work is carried on. Roots swell and are filled with nutritive juices, and bulbs store up the food which is required for the following spring—in a word, the plant provides for its future needs. Winter is at hand. Before, however, entering upon this season of rest, Alpine vegetation seems to make a last and supreme effort of life and development. Then are formed the flower-buds of the spring-blooming kinds, which must be already formed in order that the first sun of spring may expand the flowers. Plants of this sort often bring some of their buds into blossom in the autumn, so that if you make an excursion in October, just before the Alps begin to be covered with snow, you will find in the sub-Alpine regions (1,000 to 1,500 metres) that *Gentiana verna*, *Potentilla verna*, *P. aurea*, &c., are in flower, and often abundantly.

The rocks and the stony *débris* which is so plentiful in the high regions must be considered as gigantic water reservoirs, and their presence or absence plays a most important part in plant life. The rocks hold the water and, like colossal sponges, store it up in rainy weather and retain it till the dryness of the air absorbs it.

Moisture is then one of the three conditions essential to the life of Alpine vegetation, and it is the reason why in England Alpines generally do much better than in our dry climate of Geneva. For years I have tried several plans for supplying this want of moisture. Rockeries and stone walls are very good, as the stones, as I have already said, are excellent for retaining moisture. *Eritrichium nanum*, *Androsace glacialis*, and others do very well when grown in a stone wall in the full sun if the wall is often watered. But the best plan for all countries where the sun is too powerful and the air too dry is cultivation in Sphagnum. In the *Gardeners' Chronicle* I spoke of cultivation in

Sphagnum only, and with it I have been remarkably successful. But by this method the roots grow so freely that it is necessary to use very large pans for the plants, and this is often inconvenient. I now find the same results can be obtained with smaller pots, using a mixture of Sphagnum and fibrous peat or turf. The one important condition—*sine quâ non*—is to expose the plants to the full sun and to water the soil abundantly. I always thought that in the damp climate of England this method of cultivation would not succeed, but I am glad to hear that in the southern counties experiments have been made with good results. In Geneva I never could persuade Soldanellas, *Arnica montana*, *Gentiana bavarica*, *G. purpurea*, *Saxifraga carpathica*, *S. iberidifolia*, &c., to flower until I planted them in Sphagnum; and a great many other plants are now beginning to succeed very well with me by means of this system.

But what you want in England is not at all the same thing. Would that we could give you some of our sun-rays and a little of our dry atmosphere! One of the most difficult things for you is the cultivation of the true rock-plants like *Campanula Zoysii*, *excisa*, *Elatine*, *Rainerii*, *Edraianthi*; *Senecio incanus*, *leucophyllus*, and *uniflorus*; *Phyteuma comosum*, *humile*; *Androsace ciliata*, *cylindrica*, *helvetica*, *Pacheri*, *Wulfeniana*, *pubescens*, *imbricata*, *Haussmannii*, *Heeri*, *Charpentieri*; *Draba tomentosa*, *Saxifraga diapensioides*, *Eritrichium nanum*, &c., which succeed more easily in Geneva. Our English friends write to us very often that these plants make them despair; that they rot even under the best conditions, &c., &c. I always give them the same advice: Place your plants in an old stone wall or between the crevices of your rockery in the full sunlight, and in a perpendicular position, so that the tuft of the plant is parallel to and flat upon the wall, the central axis being horizontal to it. Under this system I have always obtained the best results. But of far greater value than my own opinion is that of Edmond Boissier, who covered his walls with the rarest and most delicate of Alpine and rock plants, and my contention is that this is the only method for keeping such delicate plants in good health in England. It is not at all necessary to put any soil in the crevices and holes made in the stone wall; they should be very narrow, so that the roots of the plants are pressed by the stones as in their natural state. They find in the moisture of the stones

all they want for their development. I never found any trace of soil in the natural crevices into which the rock-plants thrust their long thin roots. They find in the moisture and decomposition of the stone all they need, and, bearing in mind that generally these plants are of dwarf and small habit, it is evidently a mistake to suppose that they want nourishing soil between the stones. You would be astonished to see in the most interesting garden of the late M. Edmond Boissier at Valeyres, Canton Vaud, the very numerous varieties of plants which grow in the walls, between the stones only, without a particle of soil. The garden is situated at an elevation of 1,900 feet above sea-level, and in a very sunny position just at the foot of the Jura Mountains. I may be asked how some plants from high glacial regions can thrive where the heat of summer is so intense, and how they can bloom so profusely there. I do not hesitate to answer that it is owing to the mass of calcareous stones which were employed by M. Boissier that the success of his garden is due. There is there a wall which excites the admiration of all visitors. It is a retaining wall, supporting a terrace along its whole length. This wall is constantly damp, as it has earth on one side of it. It is about 15 feet high and nearly 40 feet in length, and faces the north-west. Here are the greatest treasures, the choicest gems of the collection: *Haberlea rhodopensis* (who would believe it?) attaining in such a position, and without nourishing soil, gigantic proportions. *Alyssum pyrenaicum* is plentiful along this wall, and even comes up on the gravel path. *Matthiola Valeriana*, *Campanula garganica*, *C. Vanneri*, and *C. Portenschlagiana* grow so freely that they have to be hoed up. *Saxifraga diapensioides*, *S. media*, *S. squarrosa*, *S. marginata*, and the extremely rare *S. cuneata* grow together and mingle their tufts as if emulating each other in vigour. *Saxifraga florulenta* is here perfectly acclimatised; it abounds and wanders about freely in the chinks of the wall. It was planted here more than twenty-five years ago. Why then, if such results can be obtained at Valeyres, could they not also be had here in England?

Increasing Alpine Plants.—The most infallible and practical means, which always gives the best results, is by seed. It is the natural way and the most simple. It is generally thought that this method is slow and difficult. I must confess that this is true for some kind of Alpines, but only for a few of them, and

with just a little care you can raise by far the greater part of Alpine plants from seed. I have myself raised, either in the Botanic Garden of Geneva or in our Jardin d'Acclimatation, more than two-thirds of the Alpine flora, and the plants obtained in this way are always more robust and healthy than wild plants transplanted into the gardens.

The easiest to raise from seed are the Caryophyllaceæ (*Dianthus*, *Arenaria*, *Silene*, *Lychnis*, &c.), the Cruciferæ (*Erysimum*, *Lepidium*, *Iberis*, *Arabis*, *Draba*, &c.), the different kinds of *Helianthemum*, many of the *Compositæ*, the *Papavers*, *Globularias*, *Potentillas*, *Geums*, *Aquilegias*, *Astrantias*, *Eryngiums*, the *Campanulaceæ* (*Edraianthus*, *Campanula*, *Phyteuma*), *Dracoccephalums*, *Lithospermums*, the *Geraniaceæ*, *Hypericineæ*, *Loniceræ*, *Leguminosæ*, *Paronychieæ*, *Polemonium*, *Rubus*, *Scabiosa*, *Sedum*, *Sempervivum*, *Thalictrum*, *Veronicas*, *Saxifragas*. All these plants grow with the greatest ease and facility in good and light soil; they germinate in a few weeks after having been sown, and have no special wants.

The *Primulaceæ*, *Gentianaceæ*, *Berberideæ*, many of the *Ranunculaceæ*, *Scrophularineæ*, *Umbelliferæ*, *Liliaceæ*, *Amaryllideæ*, *Rutaceæ*, *Irideæ*, and *Daphne* are slower to come up, but come without difficulty. The raiser must wait often two years (*Pæonies* and *Dictamnus* for instance), but they never fail. Give them a porous light soil with a little *Sphagnum*, and you will succeed in all cases. All the Alpine plants must be sown in a cool frame, and in the early spring or in late autumn (November).

The most difficult kinds are the following:—*Pedicularis*, *Bartsia Pæderota*, *Parnassia*, the *Rhinanthaceæ*, *Pinguicula*, *Heaths* (*Ericas*), *Lycopods*, *Pyrolaceæ*, *Ramondia*, *Haberlea*, *Jankæa*, *Rhododendron*, *Orchids*, &c.

On these very difficult kinds Mr. Moë, of the Botanic Gardens, Christiania, made some very interesting experiments. For the *Heaths*, *Lycopods*, and *Ferns* he takes pieces of turf cut into cubes of two or three inches, and rubs the seeds or spores against the sides and on the upper surface of the cubes, which he then places in water to the depth of an inch. All the upper part is thus kept in a state of constant and regular moisture, which allows the slow and difficult germination to take place in a regular manner. During the winter those turf-cubes sown with *Yaccinieæ* and *Ericaceæ* are placed in a cool frame sheltered from

the sun, whilst those sown with Lycopods and Ferns are placed in a warm house, where they must be put in a dark position.

For the Pyrolaceæ, Orchids, Parnassia, and Rhinanthaceæ Mr. Moë recommends another system. The pots which are to contain the seeds are filled with a compost of one part peat, one of forest soil, and one of the remains of pinewood or rotten fir, to which is added a little chopped moss and dry fir needles. This compost is firmly pressed into the pots, and small Mosses (*Dicranum*, *Bryum argenteum*, *Mnium*, &c.) are then planted in it, and in this moss the seeds in question are sown. The pots are then placed in a case containing water, so that the soil may be continually and regularly moist. The case containing the pots is then placed for fifteen days in a frame heated and shaded in a uniform manner, and kept hermetically closed during the whole time. And in this way Mr. Moë has obtained excellent results.

Many of the berries like *Empetrum*, *Arctostaphylos*, and *Vaccinium* are very difficult to raise from seed. I noticed that it is only in those parts of the Alps where partridges and other berry-eating birds are common that these plants can be found as seedlings in any quantity, and so during the last eighteen months I have tried sowing in Geneva and at the Linnea (the Linnea is a botanic garden situated in the Alps of Canton Valais, near to the St. Bernard Hospice, at 5,000 feet elevation) seeds of *Arctostaphylos* and *Empetrum* eaten and digested by a blackbird, and some which were not so digested, but as yet I have arrived at no definite conclusion, because none of them have as yet come up, and I am still waiting for results.

When the seeds have germinated, and the plants begin to get strength, they must be pricked out in pans or planted singly in little pots. Some kinds, as *Rhododendrons*, *Daphne*, *Adonis*, *Ranunculus*, *Gentiana purpurea*, *G. lutea*, *G. punctata*, *G. pannonica*, *G. asclepiadea*, *Pæonias*, some of the *Androsaces*, *Silene acaulis*, &c., are very slow to grow, and take a very long time to bloom. Others, as *Papavers*, *Thlaspi*, *Linaria alpina*, *L. petræa*, *Arabis*, &c., frequently blossom in the first year.

The best season for the collection of seeds in the Alpine regions is the month of September, as at that time one can still recognise the species to which the seed belongs, and, as it is equally the best time for taking up the plants we desire to trans-

port to the plains, a journey in the Alps affords then a double advantage.

The month of September is also the proper season to undertake the propagation of Alpines by division of the tufts, though this may be done also in the spring. A large proportion of Alpine plants can be increased in this way, but they will not all bear the operation. The kinds which grow in carpet fashion, forming mossy tufts, are especially suited for division. The Saxifrages of the sections Isomeria (*S. aconitifolia*), Miscopetalum (*S. rotundifolia*, &c.), Hireculus, Diptera (*S. sarmantosa*, &c.), Dactyloides (*S. cæspitosa*, &c.), Trachyphyllum (*S. Aizoides*, &c.), Euaizoonia (*S. Aizoon*, &c.), and Robertsonia (*S. meifolia*, &c.), are particularly well suited for this method of propagation. The Saxifrages of the sections Nephrophyllum (*S. cernua*, &c.), Boraphylla (*stellaris*, &c.), Prophyron (*oppositifolia*, &c.), do not root well, and the section Kabschia (*S. cæsia*, *squarrosa*, &c.) will not bear division at all. All the Sedums, Sempervivums, many Silenes, Pinks, the Compositæ, some Campanulas, the dwarf and creeping Phloxes, and a certain number of Primroses seem rather to require division in cultivation than to object to it, and many other species, especially those which belong to the pastures and grassy slopes, are the same. But it is not so with the European Androsaces, the Dianthus of the group *sylvestris*, the Silenes of the group *acaulis*, the Gentians, and, generally speaking, the Ranunculaceæ, the Leguminosæ, *Papaver alpinum*, *pyrenaicum*, &c., the Phyteuma, and many other tufted and dwarf but not creeping plants.

Certain species, such as creeping Willows, Rosa, Clematis, Daphne, *Androsace lanuginosa* and *foliosa*, *Silene pumilio* and *Elisabethæ*, *Dianthus alpinus*, many Campanulaceæ, *Erodium petræum*, &c., can be increased by cuttings; it need hardly be said that they should have a cold treatment in a close frame. I was a long time endeavouring to find out a way of increasing kinds of Erodium which are sterile in our country, such as *E. Sibthorpiatum*, *chrysanthum*, and *olympicum*; but two years ago, seeing my gardener making his Geranium cuttings in August, it occurred to me that possibly the same plan might do with these Erodiums. And so it proved, and I now get all my Erodiums from cuttings made of the rhizome in August, and I never lose one.

Finally, any sorts like *Ramondias*, *Haberleas*, *Jankæa* can be increased from the leaves (as is often done in the case of *Gloxinias*), and others like *Daphne*, *Coronilla*, *Betula* can be grafted on commoner sorts.

The digging up of Alpine plants and transplanting them to gardens was for many years the only method employed for increasing them and furnishing rockeries ; but for many varieties this not only injured the specimens transplanted—for many will not bear the moving, and perish miserably without flowering—but it also does great injury to the flora of the Alps or other country whence the plants are taken, and the fears expressed by naturalists of seeing certain rare plants disappear from the localities where they exist is not at all exaggerated ; indeed, it is a fact that this has already happened in more than one instance in Switzerland and other countries. The disappearance, for example, of the very rare and interesting *Spiranthes Romanzoffiana* from Ireland, the only European station of the plant, is known to all of you. Far, then, from being chimerical, our fears are fully justified, and a movement has been started in Switzerland for the purpose of preserving the wild plants in their respective localities and for their protection generally. Notice the following fact, for instance, as proof of the need for such a movement. We have at only two or three miles distant from the boundary between Tessin and Italy one of the most beautiful, as well as the rarest, of all the *Androsaces*, *A. Charpentieri*. It grows nowhere in the world but on three or four of the peaks about the Lake of Como, and there are only a few specimens of it. The position of the plants is well known—so well, indeed, that some German horticulturists have already been there many times to collect this rare and distinct plant for sale ! Suppose, for a moment, that twenty people, each taking twenty plants, annually visit the spot, and in a very few years at most the species will be exterminated. I got seeds of it some years ago, and sowed it at Geneva, raising three plants of it, and planted them in the rockery of our Alpine botanic garden, “The Linnea” in Valais, where they are now very flourishing and give us a mass of seeds every year. I could tell the same story of more than fifty rare Swiss plants, so that I think you will agree with me in recommending everybody always to reproduce rare plants by seed, cuttings, or division, instead of rooting them up in a wild state.

We founded eleven years ago a society for the protection of wild plants, in order to prevent the danger of extermination which I have been speaking of, and the society now numbers more than 700 members, of whom fully 200 are in England. We also founded a garden at Geneva for the rearing of Alpine plants from seed, the "Jardin d'Acclimatation"; and we have since founded in the high Alps of Valais, two hours below the Hospice of the Great St. Bernard, and near the village of Bourg S. Pierre, and close by the mule-path which goes over the pass into Italy, another botanic garden for the protection and perpetuation of such plants as are threatened with extinction. This garden, "The Linnea," is well situated, and the plants which we cultivate there are most healthy, and will well repay a visit from anyone passing that way.

CHEMICAL DETERMINATIONS CONCERNING THE SOIL WITHOUT THE AID OF CHEMISTRY.

By Professor F. CHESHIRE, F.L.S., F.R.H.S.

[Read May 9, 1893.]

I PROPOSE to endeavour to popularise a matter which has been regarded as solely the concern of the chemist, and beyond the reach of the horticulturist, and I shall have to ask your forbearance in using the chemist's shorthand, as time will permit of no other.

Every gardener stands at a disadvantage when he takes a piece of new ground, previously unknown, and under these circumstances he will possibly for a long time labour with only a small measure of success. By degrees, however, he becomes acquainted with its special peculiarities, and higher fertility rewards his efforts. Yet, even to make this amount of painful progress, keenness and attention are required. To-day I desire to point out how to bridge over this time of difficulty, and secure by a few simple gardening experiments even more information than the analyst would commonly provide.

All plants may be regarded as requiring twelve different kinds of food, out of which they are able to form their various tissues. These foods are oxygen, hydrogen, nitrogen, carbon, sulphur, phosphorus, potash, iron, lime, soda, magnesia, and chlorine. The gardener need not consider some of these at all, as he has not to supply them. For instance, oxygen and hydrogen are provided for him in the form of water. Carbon is always furnished by the processes of combustion and decay, and by the breath of animals, including human beings, who give it off from their lungs, as an effete product in the form of carbon-dioxide, which is a combination of carbon and oxygen. This gas when taken in by the leaves of plants is divided into two parts; the carbon is retained by the plant, and the oxygen is given off into the air. This is a popular view of the process, and for the moment sufficient, though not strictly accurate.

Amongst the constituents needing careful attention from the cultivator, the most important—with the exception of nitrogen, to be considered in detail presently—are potash and phosphorus. These are met with in only small quantities in most soils, but their presence in sufficiency is essential to the plants, if a high standard of fertility is to be attained.

Lime in some form will also need to be considered. It is present in nearly all soils; but the amount is frequently below that which is desirable for fruit and leguminous crops; besides its chemical and mechanical action on many clays make its use as a manure often very beneficial. Tillage (cultivation) quickens a chemical change naturally produced in the soil, which is called nitrification, and the nitric acid thus formed dissolves lime as readily as hot tea dissolves sugar, and it is then washed out by the rain; and, therefore, unless re-supplied, a diseased condition is rapidly produced, and the plants are generally stunted and weak.

Chlorine needs far less attention, yet it must not be wholly disregarded. For instance, an acre of Mangel-wurzel will take up 56 lbs. of it, while Wheat will only absorb $\frac{1}{2}$ lb.

Iron is sometimes wanting in a soluble condition, and plants are frequently improved in colour of flower and fruit, and in weight of yield by its manurial use. The remaining chemical requirements for healthy plant food are, except in very rare cases, present in an amount exceeding the demand. We have then

only to deal with nitrogen, potash, phosphorus, occasionally, lime, and still more rarely iron.

All the materials of every soil occur in three conditions : first, directly soluble in water ; second, soluble in water through the action of roots, which yield weak acids ; and, third, the insoluble condition. The first two are the matters upon which the plants must depend, since they, like animals, can only absorb their food when in an absolutely dissolved state.

The gardener, realising to some extent these truths, ardently desires to know what his soil contains, in order that he may form a judgment as to its capabilities, the crops which it may bear, and the manures to apply. In his difficulty he turns to the chemist for information.

It is not my intention to scold the analytical chemist. Yet in former days, and, if truth be told, too often even now he is a great misleader. He uses strong acids, and dissolves parts of the soil not reachable by rain or roots, and returns these as being present. True, they are present, but locked up so securely that fifty years must probably elapse before they can be of service to the cultivator. The improved methods of analysis now used by the most advanced men are rectifying this, and it is only just that the cultivator should be informed what *his* plants *can secure*, rather than what the land will deliver up to posterity.

It is my wish to enable the gardener, without applying to the analyst, to determine for himself, at home, the nature of his soil. Water-cultures have long since shown that plants cannot grow in the absence of the essential foods already mentioned, and let me repeat that it is only the food which is soluble that can be absorbed by them ; thus the food which is not absolutely dissolved is of no use whatever, and, therefore, if any of the substances required are present in a totally insoluble form, growth will be impossible ; for example, if Turnips are grown by water-culture, the young plants use up the material stored in the seeds, and then become exhausted, unless replenished. In the absence of iron the puny leaves are nearly white, but if soluble iron be added, in the most minute quantity, the leaves begin to turn green, and develop until the iron is again exhausted. But the addition of any other food than the essential one missing is of no service whatever. Probably a plant is growing unsatisfactorily, and this or that manure is added, but without effect.

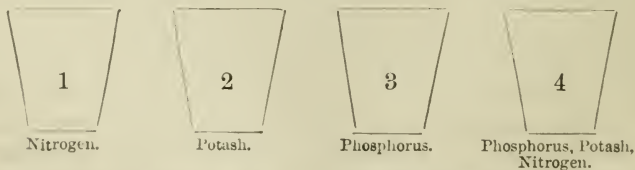
The reason is that the particular food needed by the plant has not been given to it. Owing to this fact farmyard and other vegetable and animal manures are justly valued, and this one thing more than any other has been in their favour. They contain *all* the necessary constituents required by the plant, so that in using them the want is inevitably supplied. You may, however, give large quantities of material in this way which are not at all helpful because not in demand, but which may sometimes be rather injurious. Farmyard manures possess a large number of valuable properties, but they are not in all cases the most desirable to use.

During the last few years a discovery has been made which was at first received with considerable doubt; it has now, however, become established, and gives a greater amount of hope to Agriculture (which is the twin sister of Horticulture) than any discovery made in recent years. It lies in the notable fact that leguminous plants have the power, by means of certain organisms, of obtaining abundant quantities of combined nitrogen, the nitrogen itself being derived without cost from the air. This combined nitrogen is the most valuable of manures, and gives, broadly speaking, the largest help to fertility. From this discovery the intelligent cultivator has the power of obtaining unlimited supplies of nitrogen absolutely free of cost. Recently I examined a Vetch, the roots of which were covered with small nodules; these nodules occur on the roots of leguminous plants generally in greater or less abundance. They are produced in response to certain forms of bacteria, which may be seen by means of a good microscope and proper preparations. Having a root with nodules, place it in water, and allow the particles of earth around it to become thoroughly saturated; then apply the nodules to a piece of glass; add a little red ink or methy-aniline violet dye, which will stain them, so as to render them easily visible. These nodules are enlargements of the root, presenting much surface to the surrounding soil, by which surface nitrogen, as ammonia or nitrates, can be absorbed.

It is necessary to remember a law of excretion which may be thus expressed. Every excreted product is injurious to the organism excreting it. For example, when a plant absorbs carbon-dioxide it must get rid of the oxygen, which stands in the relation of an excreted product, or it will soon begin to

suffer. Similarly, carbon-dioxide excreted by our lungs and skin is injurious to us, and so on without limit.

The organisms thrive and multiply around the absorbent nodules, because these remove from the organisms the combined nitrogen which is thrown off by their vital changes. Both are thus benefited. This may be exemplified by the fact, if Clover and Rye-grass be treated with manures rich in nitrogen, the Clover dies out, perishing with the disappearance of its microscopic food-provider, while the Rye-grass thrives abundantly, because it has not only manure congenial to it, but also plenty of room owing to the death of its companion. The importance of this discovery to agriculture is immense. A Mr. Mason, on the stiffest and most intractable Oxford clays, is growing Corn at a profit, because he is taking advantage of this advanced fact, now no secret, since it has been proclaimed in many scientific journals. Mr. Mason proceeds thus: He manures his unpromising soil with potash in the form of kainit and phosphorus in the form of basic slag, with which he raises a crop, say, of Beans. These, by means of the bacteria nodules on their roots, take their combined nitrogen from the air. Eventually the Beans go to market, while the remaining stems and roots are returned to the soil as a green manure, thus giving it an abundance of nitrogen, gained without cost, as well as the greater part of the purchased potash and phosphorus. To discover what necessary constituent is present in sufficient quantity, in any soil, we may proceed thus: Take four pots, filling them with similar quantities of the typical mould. Sow seeds in the pots, so as to secure absolutely uniform conditions, manuring each as indicated below:—



Using nitrate of soda in No. 1; basic slag, well mixed with the soil, in No. 3; and kainit in No. 2—No. 4 receiving all three. If we find No. 2 gives us the finest results in a marked degree, we learn that our soil demands potash; if No. 3 is best, then phosphorus is required; if No. 4 is best of all, then all are needed—the condition of Nos. 2 and 3 indicating the relative

intensity of the need of potash and phosphorus. A caution is required here ; all plants do not need the same relative proportions in their foods. Tomatos, for example, require potash and chlorine, and there are few soils which would not be improved for Tomato-culture by kainit, which contains large amounts of both these constituents ; but the continuous use of kainit on a Vine-border would be very undesirable, although some, in the absence or defiance of chemistry, are recommending it. The chlorine the Vine does not need, and suffers from its presence if pronounced ; here nitrate of potash would be infinitely better, as proved both by theory and experience.

Our tests may be simplified by using leguminous plants, as nitrogen, which other orders require with hardly an exception, is not helpful to them, as previously explained. If French Beans be taken as a test crop, we proceed as before, but three pots will be sufficient, and lime may be included in the inquiry, since leguminous plants commonly require this in large amounts. The pots will then be manured with potash, phosphorus, and lime, and the behaviour of the plants will determine the peculiarity of the soil under inquiry.

HARDY RHODODENDRONS AND AZALEAS.

By Sir JOHN T. D. LLEWELYN, Bart., F.R.H.S.

[Read June 6, 1893.]

Most people are struck with admiration at the brilliant and glowing colours of the genus *Rhododendron*, and those who care to give more than a passing glance at their beauties, who will also take interest in their specific distinctions, or judge the hardy hybrids by the tests of colour, shape of the truss, shape of the pip, and by the spotting of each pip, will doubtless be further interested to prolong the blooming season during which they may enjoy their treasures.

The two common species, common in gardens and shrubberies in the last century, and still abundant where this lovely genus thrives, are *Rhododendron ponticum* and *Rhododendron catawbiense*.

R. ponticum is a native of, and named after Pontus in Asia Minor; *catawbiense* from the river Catawba, in the Rockies of North America.

Both of these species, which greatly resemble one another in blossom, though not in foliage, bloom in May and June, and I know of none, excepting perhaps *cinnabarinum* and *ferrugineum*, which bloom later. If, therefore, we desire to prolong the period during which we can ride our hobby, we must begin earlier in the year.

And I am at once confronted with the test word imposed upon me by my friend Mr. Wilks, who asks me to read a paper on "Hardy Rhododendrons." The word "hardy" is a contentious and comparative word. I am not afraid of winter frosts when I describe to you the Rhododendrons and Azaleas on which I have to speak. If I were so afraid, I should not be justified in calling my favourites hardy. No, it is not the winter frosts—assuming the wood formed in the preceding year to be well ripened, they will stand very severe frosts—but it is the spring frosts which so often attack us in April, May, and even June, which we have to fear.

These spring frosts may catch the plants at the most succulent period of their growth, just when the sap is rising, and they may suffer. I have seen in various seasons Oak, Ash, Bracken Fern, and Bramble killed by such spring frosts; yet we do not in consequence hesitate to call these plants hardy.

The young foliage of some of the more precocious Himalayan Rhododendrons is in greater danger than that of the later sorts, and the term "hardy" must, I conceive, always be regarded more or less as a comparative term.

The very extensive class of hardy hybrid Rhododendrons has been gradually developed over a series of years, and their production is dealt with by Burbidge in his "Propagation and Improvement of Cultivated Plants," pages 292 *et seq.*, where he tells us how many raisers of seedlings during the past fifty years have gradually improved them. *Altaclerense* was raised from the seed of *catawbiense* fertilised with the pollen of a crimson *arboreum*, and it was one of the earliest and most hardy kinds. It was figured in the year 1835.

Catawbiense, *maximum*, *caucasicum*, and *arboreum* were the principal parents employed in producing this class, which is

well known and much appreciated, and which occupies a middle position, in point of time, between the early-blooming Himalayans and the later *ponticum*.

To prolong my blooming season I turn to the many beautiful and interesting species which come to us from the Himalayas. Some have thought that because they come from India they cannot be hardy; but if you reflect for a moment what a vast district is represented by the Himalayas—Nepal (west), Sikkim, Bhotan (east)—rising in elevation from the hot plains to the everlasting snows, you may appreciate to some extent the conditions under which, in suitable districts of our British Islands, these Himalayan species find a congenial home.

Judging by the description and habitat given by Sir Joseph Hooker in his "Flora of British India," I would draw a line at an elevation of 9,000 feet in their native country, and say generally that those which in the Himalayas flourish above that line are hardy here, and those below it are not.

My experience gained in South Wales may not coincide with that obtained in Ireland, Scotland, or other parts of England, and comparisons may be very interesting if they can be elicited. I think, however, that the above limit will prove approximately correct.

Sir Joseph Hooker, in his "Flora of British India," thus describes the genus *Rhododendron*, vol. iii. p. 462: "Trees or shrubs, sometimes very small, often scaly or aromatic. Leaves alternate, often clustered towards the ends of the branches, rarely subopposite or falsely whorled, entire, coriaceous. Flowers fascicled or subcorymbose, terminal, rarely solitary or axillary; bracts broad, generally caducous; bracteoles linear. Calyx 5-lobed, sometimes small or obsolete, rarely saucer-shaped, persistent. Corolla campanulate, widely funnel-shaped or cylindric, tube long or short, lobes 5-10. Stamens 5-18, usually 10; anthers oblong; dehiscing by terminal pores. Ovary 5-20-celled, style long or short, stigma capitate, ovules very many in each cell. Capsule short woody or elongate thinner, 4-20-celled—septicidally 4-20-valved from the apex, valves breaking away from the placenta. Seeds very many, ellipsoid, albuminous; testa close or loose, often shortly crested or tailed at one or both ends. Species 130, in the mountains of Europe, Asia, Malaya, and North America."

Sir Joseph then proceeds to describe forty-six species, of which the last three were then imperfectly known, as belonging to British India, and I believe others have since been discovered.

The same high authority, in the *Botanical Magazine* for 1890, table 7149, writes: "Judging by the results of botanical explorations lately made in Western China, it would appear that all previous estimates of the number of species of this magnificent genus of plants are far below the mark, and that the discoveries made in the Eastern Himalaya are only harbingers of what are to be expected from the vast mountain regions still further to the east. It is interesting to trace the development of the genus across the Old World, and it may be thus summarised. In Europe three occur in the extreme west—*lapponicum* in Norway, *ponticum* in South Spain, and *ferrugineum* in the Pyrenees; the latter occurs in the Alps of Middle Europe with *hirsutum*, but does not extend into Asia, where *ponticum* reappears in Asia Minor, Syria, and in the Southern Caucasus with *flavum* and *caucasicum*. The latter country (the Caucasus) is the eastern limit of these three. Excluding the few high Northern Asiatic species, none are found east of the Caucasus till entering the Afghan region, to which *afghanicum* and *Collettianum* are confined. On reaching the Himalayan region the development of the genus advances with rapid strides. Four species are found in the Western Himalaya between Cashmir and Nepal, *arboreum*, *campanulatum*, *barbatum*, and *anthopogon*, all of which advance to Sikkim, where twenty-nine have been collected. East of this province again, Bhotan has only twenty-five, seventeen of which are Sikkim species, but considering how imperfectly that great and lofty province has been explored (its alpine regions not at all), it may safely be assumed that this number does not include half of what it contains. Proceeding eastwards little is known of the vegetation till China is entered, and as Mr. Hemsley informs me that between sixty and seventy species have been collected in its barely entered western mountains by Père David, Dr. Henry, and others, it may be regarded as probable that the Celestial Empire contains more species of this genus than all the world besides."

I may here add that in the current June number of the *Botanical Magazine*, table 7301, is figured *Rhododendron race-*

mosum, from the province of Yunnan in Western China, growing in its habitat at 8,000 to 10,000 feet, and near our Indian *glaucum*.

Eastward of China there is a rapid decrease to fourteen in Japan, two or three in Western North America, and about six in Eastern North America, including *R. lapponicum* with which this summary began.

From the Himalaya a stream from the genus flows south along the Malayan peninsula to the Malay Islands, New Guinea, and S. Australia. Most of its members belong to a section with thin valve capsules and long-tailed seeds, and of these one alone is Himalayan, *R. vaccinioides* of Sikkim.

Now for some of the species which I find hardy.

I begin with the earliest and hardiest, beginning in February. *R. barbatum* is so called from the peculiarity of the hairy petiole of the leaf. The truss is closely appressed, but of a glowing crimson colour, and, with its smooth bluish bark, the effect in a bright early spring sunshine is very effective. Twelve degrees of frost on the morning of February 27 last spoilt some of my bloom, but a week later other trusses had developed, and eight degrees of frost on March 18 left no perceptible effect on the *barbatum*, which was then in full bloom.

Following *barbatum* comes an especial favourite of mine—*R. Thomsoni*. Instead of a closely appressed truss of many pips, here we have a lax campanulate truss, by which I mean, instead of a too crowded truss we here have six to ten corollas or individual blossoms in a loose cluster—each blossom an elegant bell of the deepest crimson, with five large drops of honey in the base of the corolla, which give an appearance through its waxy substance of a black base to the bell, which is peculiarly effective as it hangs between the eye and the light.

Thomsoni is a general favourite from its very neat and brilliant bloom. An illustration of its adaptability to our frosty spring weather will be interesting. A plant in my garden was bursting into bloom late in March—the trusses were already showing colour—when a sharp frost set in, and lasted upwards of three weeks. During the whole of this time the Rhododendron remained quiescent and did not move, but the very day after the frost broke up the blooms began to resume their expansion, and developed as though nothing had occurred to retard their growth,

Ciliatum, a dwarf shrub, is a very free bloomer—a pale pinkish white—very early, and has the peculiarity (unlike any other I know) to bloom at three years old from seed.

In its own India probably the most common *Rhododendron* is *arboreum*, and its comparative hardiness in England probably depends upon what Indian locality the seed may have come from. Correctly it is a glowing scarlet bloom. Most of those we have in South Wales are the pink or white variety. One of mine, a pure white, is 20 feet high, 14 or 15 through, and when in bloom is a very fine sight.

Campbelli, blooming at the end of March and in April, is an exceptionally fine thing in size and shape, and though I believe it is classed as a variety of *arboreum*, I do not think it can be so.

Cinnamomeum is pink and *ochraceum* white, and both may perhaps be varieties of *arboreum*.

Falconeri is well worth growing for its magnificent foliage. The leaves are clothed on the under surface with a dense rich yellowish tomentum, and the plant is worth growing for its foliage alone, which in winter is doubly acceptable. The flower is a dull white. As an example I produce some leaves of this species—15 or 17 by 6½ or 7 inches.

Eximium has a purple bloom, but in other respects resembles *Falconeri*, and is classed by Sir J. Hooker as a variety of the latter. The plants of these, as also of *barbatum*, are over 20 feet high by 18 through. Perhaps *eximium* is a natural hybrid between *Falconeri* and *niveum*, as it is intermediate between these two in its characters.

Campanulatum, with its lax truss of white bell-shaped flowers, and its lilac variety called *Wallichii*, are general favourites, and have, I believe, been very successfully used in hybridising. Here again the foliage, though comparatively small, is very bright in winter from the rich brown tomentum which thickly clothes the under side of each leaf.

Campylocarpum is a little gem, a shrub of 5 or 6 feet high, and the same through, with delicate trusses of soft primrose-yellow bloom.

Niveum, *glaucum*, *cinnabarinum*, *Roylei*, *Hodgsoni*, *fulgens*, are species which I have out of doors, and of whose hardiness I entertain no doubt.

Grande or *argenteum* is a fine species which I have grown

out of doors for several years, through winters of varying degrees of severity, and it has seen twenty-eight degrees of frost; but though bloom-buds have been formed, they have succumbed, while the plant in its foliage has not suffered.

Aucklandi appears to be hardy, and some of its hybrids, notably the fine variety called *kewense*, ought to be in every collection.

R. Fortunei is possibly the Chinese form of *Aucklandi*, and I have some interesting hybrids raised by the late Mr. Mangles, of Valewood, Haslemere, between this parent and such hardy hybrid varieties as John Waterer, and with the species *Thomsoni*.

Edgeworthii and *Nuttalli* have been successfully bloomed out of doors, but I have not yet so grown them.

Edgeworthii is a sweet and large white flower, and the parent plant of a numerous and popular class of greenhouse varieties raised by Mr. Isaac Davies, of Ormskirk.

The hybrid variety called *Sesterianum* is grown successfully, and has bloomed very well out of doors at Lord Swansea's place, Singleton, near Swansea, where also *Edgeworthii* grew out for many years.

It is a fallacy to say Rhododendrons require a peaty soil wherein to flourish; any fairly moist loam will do so long as there is *no lime*, which is poison to them.

They do not like a stiff, dry clay, but I believe they will thrive in any loamy soil in which the top spit is well forked into the ground, and a good admixture is to be found in the dead last season's Bracken Fern, which, if dry and well forked in, will be found very beneficial to the roots, and the stiffer the soil the more advantageous will it be, for it acts mechanically as it were. Each stick or stem of Fern is a little hollow pipe forming a miniature subterranean tunnel, in which the delicate Rhododendron rootlets can travel, and which afterwards, rotting down, affords nutriment to the growing root.

Then the Rhododendrons like to layer down their lowest branches and shade their own roots, and these branches on touching the ground form fresh rootlets, and fresh life is imparted to that part of the plant, so that subdivision by layering is a very easy and successful form of increase.

If these layers are not removed the plant goes on increasing in diameter, so that one I had measured last week is now 349

feet in circumference. This is one of the original *ponticum*, and has always been looked upon as a large example.

To most people the Azalea is known as of more deciduous habit, and of slenderer and more delicate growth, than the Rhododendron. I follow, however, the high authority of Hooker, who tells us that "botanists are now pretty well agreed in considering that the Azalea can no longer be considered a distinct genus from the Rhododendron," the characters, taken from habit, foliage, form of corolla, number of stamens and ovarian cells, which have hitherto been used to distinguish Azalea all reappearing, singly or several together, in many of the numerous species of Rhododendron which have lately been discovered. I have therefore followed the eminent Japanese traveller and botanist Maximowicz in assuming Sweet's old name of *Rhododendron sinense* for the *Azalea mollis* of more recent authors.

The current number of the *Gardeners' Chronicle* holds the same doctrine, and describes and figures an Azaleo-Dendron, a cross of interest and beauty (*B.M.* 5905).

Two sorts of Azalea were common in our ancestors' gardens, going back into the last century: 1, *Pontica*; 2, The Ghent varieties.

We may take *pontica* as the commonest species. Large, sweet, hardy and brilliant, it forms a standard of beauty as a species, but nature does not appear to offer us much variety of colouring from which the hybridist or raiser of seedling varieties has an opportunity of starting. Sow a thousand seeds, and you obtain a thousand duplicates, or nearly so, and a white variety of *pontica* is figured in the *Botanical Magazine* in 1821, table 2383, as a curiosity.

But with respect to the other above-named sorts, the Ghent Azaleas, we have sweetness and hardiness, and a splendid variation of colouring, but at the expense of size, as they are mostly small, and used to be called "Honeysuckle Azaleas." They were called Ghent Azaleas because they were raised by the Ghent nurserymen, though they are in reality, I believe, American, and obtained by the intercrossing of three, if not more, American species: *Nudiflora* (*B.M.* 180), *calendulacea* (*B.M.* 1721 and 2143), and *occidentalis* (*B.M.* 5005). Of *Azalea indica* I do not here propose to speak, as it is not hardy—though *indica alba* lives and blooms out in favoured spots. *Azalea amœna* (*B.M.*

4728) and *Azalea ovata* (B.M. 5064) are small species from North China, and are, I believe, quite hardy.

One of the most valuable floral introductions into England in this century has been the *Rhododendron sinense*, or, as it is more usually called, *Azalea mollis*, above referred to.

In the *Botanical Magazine*, table 5905, we are told it is a native of Japan, and introduced into England by Fortune in 1845, and figured in the *Magazine* in 1870 from Mr. Bull's establishment at Chelsea—being then still a very scarce plant in English gardens. As it lends itself very kindly to forcing, and can be got into bloom easily very early in the year, we usually see it as a pot plant; but it seems to be quite hardy, very floriferous, and easy to raise from seed, and useful to the hybridist. Indeed our prospects in this latter direction are brilliant, and the results already obtained raise still brighter hopes of the seedlings which we may yet see from ringing the changes on *pontica*, Ghent, *mollis* and other Azaleas, and should encourage us to further work in the same line.

DISCUSSION.

Sir ALEXANDER ARBUTHNOT, referring to the lecturer's statement that anything like lime was fatal to Rhododendrons, and that peat was by no means essential to their wellbeing, said that it was often the case that plants grown in good soil and apparently in a healthy condition did not produce nearly as much bloom as might have been expected from them. A friend had told him that in the neighbourhood of Cobham peat and loam were given to the plants, and in the autumn a dressing of cow-manure, which had an excellent effect in inducing very vigorous growth, larger buds, and eventually larger flowers. He would be glad to hear if this treatment might be recommended by the lecturer, whose experience was probably confined to the south-west of Wales, and would therefore possibly be different from those living in the southern counties in England. Sir John Arbuthnot said his own place was within a few miles of Highclere—one of the first places in the country where any attention had been devoted to Rhododendrons—and he said they suffered there more from the hard frosts than in the more northern counties. Every year he found some of the commoner sorts were lost through the frosts in the early autumn (September) whenever there had been much rain in the preceding summer.

Sir JOHN LLEWELYN, in reply, stated that he had never personally tried manuring Rhododendrons, and should not like to say that this treatment was not a good thing for the plants. Rhododendrons, like other plants, prefer to grow in a certain kind of soil, and it is possible that in certain situations they might require manure. If there is a long dry summer, followed by a damp autumn, the wood will not ripen sufficiently to resist the effects of the early frosts. Under such conditions the buds of Rhododendrons, although apparently healthy, will, if examined, be found to contain a black speck, the first sign of decay. For this reason *R. catawbiense* has been more largely used than *R. ponticum*, owing to the fact that the latter suffers much sooner from winter frosts. In a hard winter, preceded by a damp autumn, it will be found that *R. catawbiense* has produced more pips than *R. ponticum*. The woolly kinds of Himalayan Rhododendrons suffer also a great deal from frost, because their leaves absorb and retain more moisture than the smooth-leaved varieties, and if a severe frost occurs they will suffer to a very great extent.

Prof. CHESHIRE, referring to the statement that cow-manure was beneficial to Rhododendrons, explained that the reason of this was probably because cow-manure contained only .4 per cent. of tricalcic phosphate, the animals retaining almost all the lime. The manure, therefore, being almost deficient in this commodity, was more acceptable to Rhododendrons than manure from the stable.

Mr. W. ROUPELL mentioned that it would be found advisable, instead of using manure for Rhododendrons, to use cocoa-nut fibre, as it was very valuable for mixing with the soil as a manure, and at the same time to retain sufficient moisture for the needs of the plant. Manure, he said, was not suitable for soil that was liable to crack; and cocoa-nut fibre, on account of retaining moisture and preventing cracking, was therefore more valuable in every way.

Sir ALEXANDER ARBUTHNOT, in regard to Himalayan Rhododendrons, said there were many instances of absolute failure. He had received many years ago from Dr. Geo. King, of the Botanic Gardens, Calcutta, a large quantity of seeds from Darjeeling, all of which were sown or distributed among friends in Hampshire and elsewhere; and he believed that with hardly a single exception no one succeeded in raising plants from them which

would stand the winter in the open ground. As to the plants when grown in houses, no flowers could be obtained from them. A friend, however, managed from one of the plants raised from these particular seeds to produce a large number of flowers. His own plants were put out with hybrid Rhododendrons; but all of them were cut down to the ground by the frost, although they were not killed at the root. This occurred in the southern counties, where it is possible that, owing to the short distance from the sea, the soil is damper than in Wales and the frosts are most destructive.

Sir JOHN LLEWELYN said that *R. arboreum* was a very common species in India, especially in the Neilgherries, and it would not be hardy in this country. He said he had drawn a line in his paper, and he had tested its application again and again. If a plant had been found at an altitude of over 9,000 feet in the Himalayas, it would grow fairly well in this country.

AMERICAN BLIGHT, AND ITS SUCCESSFUL TREATMENT.

By L. BURGOYNE PILLIN, L.D.S.Eng., F.R.H.S., &c.

THE terrible ravage of the "American blight" amongst our Apple-orchards, and more or less all our Apple-trees, has been so alarmingly rapid and serious during the last twenty years, and is still increasing with such vehemence in nearly all parts of the kingdom, few gardens escaping its attacks and resultant evils, that a study of the subject, and its treatment or eradication, cannot but be of some interest, particularly to those whose industry may lie in the farming of that valuable fruit. The nature of the blight is so insidious that it is no wonder the contamination takes place so generally. An affected tree will vitiate a whole neighbourhood; indeed so virulent is its presence that its ramifications are soon evident unless the pest is at once taken in hand, with a vigorous determination to arrest its advance and cause its obliteration.

To bring about such a desirable result many ways and

agents have been employed, but none successfully without more or less injuring the bark and roots, ultimately destroying the tree itself.

A knowledge of what the insect really is, and how it performs its destructive function, will probably interest and enable the student to battle with the enemy more thoroughly than were he working in the dark.

American blight—*Eriosoma lanigera*, *E. mali*, or *Aphis lanigera*—is comparatively of recent establishment in this country, and is explained by Johnson as being abdomenless and without tubercles, antennæ, or horns, the males having wings, but the females none. It was thought at one time that the russet class of Apple was exempt from its ravages, but this is a great error, as some of the worst cases have been of that particular class.

Examined under the microscope, it will be found that the male has no true antennæ, but the two foremost legs are armed with very sharp penetrating sickle-like terminations, which cut into and through the bark and wood of the tree attacked, it being remarkable the great power these little creatures possess in cutting down into the sap-cells, and thrusting the proboscis into the wound. When disturbed, they hold on by burying these sharp extremities into the tissue of the stem, and will submit to be torn to atoms rather than relinquish their hold.

The wings are not large. In the female they are said to be absent, but this is not the case. The soft white cottony surrounding of these pests is formed partly from a desquamation that seems to be perpetually going on, and a gelatinous ex-crescence which holds it more or less together. In this medium the female lays most of her eggs, and in dry weather, from its extreme lightness, it gets detached and scattered by the wind, attaching itself to the trees that lie in its way, or it falls on the ground, there to germinate. In the winter the larvæ attack the roots in a similar way to that of their parents on the upper part of the tree. About the end of February great activity commences amongst the colony under the soil to establish its summer quarters above, and it is at this time that the attack is easiest, and the enemy least organised and weakest. At this time the larvæ and pupæ ascend the main trunk to their chosen quarters. Before commencing they lie about on the surface of the earth, or immediately below it, to germinate and revivify. Many

remedies have been tried, but all of little or no use, the remedy in most cases being as destructive as the pest itself.

The following methods, carried out accurately, will be found to thoroughly meet the evil without the least injury to the tree ; in fact they impart an extra stimulus to it, and the bark assumes the bright, smooth, robust appearance alone common to health. All preparations containing spirit are to be condemned as positively injurious ; turpentine, naphtha, and benzoline being positively the worst. Paraffin oil, latterly so frequently resorted to as a remedy for nearly all evils, is most generally used to the great injury of the already wounded tree, and after all to little or no permanent good. Spirit unites with the natural resins, causing congestion of the already affected parts—hence further trouble and mischief—besides which spirit rapidly evaporates, leaving the ova frequently uninjured. The material the writer has found—a really reliable one—is that known as creolin ; a commoner preparation, equally good, being commercially known as Jeyes' concentrated fluid. It is a by-product from coal in the manufacture of gas, looking and smelling very like ordinary tar, but, unlike it, it is readily miscible with water, therefore very easily controlled and applied, and, except in its actually pure state, is perfectly harmless to all but very young wood. Used in the manner described below the best results have been attained. At the end of February and during March wash every part of the bark possible with a solution composed of half a pint of the concentrated fluid to a gallon of water, using a moderately hard brush, and working into all the interstices, repeating the operation two or three times at intervals of a week or ten days, and well soaking the surrounding earth with a solution of half that strength.

As a matter of course, the parts very much injured are better cut away and the wounds painted over with the solution suggested. In cases where the blight has been of long standing it will require longer treatment, but care must be exercised, and the surrounding soil must be treated as well as the tree. Where the affected part is manifested by the presence of the cottony secretion, carefully paint it, without disturbing more than necessary, with the following : 2 ounces creolin fluid ; 20 grains corrosive sublimate (perchloride of mercury) ; 1 pint water. Mix, and shake well together, allowing

a day at least to intervene before using. It must be used with caution, as it is a virulent poison, and should be put into some peculiar-shaped vessel and labelled "Poison" distinctly, that no accident may happen. Let this solution be applied freely so as to soak into every crevice of the affected part.

An occasional syringing of the whole of the tree with a weak solution, say two ounces of creolin to the gallon (except during blooming), during spring and summer, may be necessary at first. On planting or root-pruning it is well to take the opportunity to thoroughly apply this remedy to the roots, bearing in mind that you are treating a more tender and vital part of the tree.

The foregoing remarks are deductions from a large number of experiments made by the writer on some of the worst cases for the past four years, all of which have been eminently satisfactory. Apart from the desired extermination of the Eriosoma, the treatment improves the constitution of the tree, and doubtless rids it of other enemies. Other trees would be benefited by a vernal and autumnal dressing similarly. The old-fashioned custom of plastering the trunks of orchard trees with lime, soot, and the draining abominations of the farmyard cannot be too thoroughly deprecated, the germs of all manner of vermin being introduced thus, and the bark being prevented from performing its natural functions at the most important time of year.

Trees, like all other natural productions, thrive better in cleanliness than in dirt.

ANTIQUITY OF THE CITRON-TREE IN EGYPT.

By Dr. E. BONAVIDA, F.R.H.S.

[Read April 11, 1893.]

M. V. LORET has recently (Paris, 1891) published a pamphlet entitled "Le Cédration dans l'Antiquité."

We knew that the Citron had been called *Malum persicum*,

medicum, or *assyricum*. Theophrastus, under one of these names, described the Citron-tree so minutely that it is not possible to mistake it for any other fruit-bearing tree. Theophrastus wrote of it in the fourth century B.C.

Then the Citron was not eaten, but only used medicinally, and mainly as an antidote for *all* sorts of poisons !

M. Loret mentions several ancient authors who wrote of the Citron-tree, viz. Florentinus, who probably lived in the second century B.C. ; Diophane de Nicée, who lived in the first century B.C. ; the brothers Gordianus and Maximus Quintilius, who lived between 140 and 183 A.D. ; Sextus Julius Africanus, who lived 209-235 A.D. ; Anatolius, who died 360 A.D.

Palladius in the fifth century A.D. writes that it was well established then in Italy, and it appears that he cultivated it himself in Naples and Sardinia.

Antiphanes mentions seeds having been imported into Greece from Persia. This not improbably was soon after it had been discovered by the Greeks in Media and Persia. Then its introduction into Italy would have been soon after.

From the researches of M. Loret, it appears that at the commencement of the fourth century A.D. the Citron-tree, under the Coptic name of *Ghitré*, *Kithri*, or *Kétri*, was commonly cultivated in Upper Egypt, which would mean that it was known to the Egyptians long before. There appears to be, indeed, documentary evidence to show that it was known there about the middle of the second century A.D., and even sold among the lower classes.

On the authority of MM. Bonastre and Decaisne, there exists in the Louvre a Citrus discovered in an Egyptian tomb in Thebes, belonging to the epoch of the Ramessides in the twelfth century B.C.

But there appears to be sufficient evidence to show that the Citron-tree was known to the ancient Egyptians even before that period, for Mr. G. Ebers has observed it in a document *still older*.

In a part of the Temple of Karnak, built by Thotmés III. in the fifteenth century B.C., is a chamber, on the walls of which are figured many fruit-trees, brought during Pharaonic expeditions into Asia.

Among these fruit-trees is one reproduced below (fig. 14). No one, I think, would interpret it into any other than a Lemon or Citron tree, and the artist makes it clearer by painting the fruits separately above it. It has rounded fruits also, but these often occur among Citrons and Lemons.



FIG. 14.—From wall-painting in the Temple of Karnak, built by Thotmés III. in the 15th century B.C. (*Babylonian Record*.)

This is not all; for during the ninth Oriental Congress, held in London in September 1892, I saw some copies of Egyptian wall-paintings in frames in the reception-room. In one of them there was a procession of men carrying baskets of Grapes and other things. One of these things was that in a basket shown in the accompanying figure (fig. 15). I do not think that this can be other than a *fingered Citron* (fig. 16), and if we compare it with Penzig's fingered Lemon, we are not left in much doubt about what it was meant for (fig. 17).



FIG. 15.—Basket containing some rare fruit, from wall-painting of El Kab, Egypt. (*Babylonian Record*.)

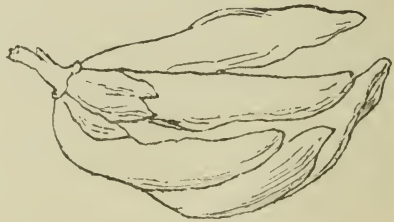


FIG. 16.—Fingered Citron, from *Gardeners' Chronicle* (reduced). (*Babylonian Record*.)

So that we have something approaching unmistakable evidence showing that the Citron-tree was known to the ancient Egyptians something near thirty-three centuries ago! And, making allowance for the fact that the fruits on the Egyptian walls are *painted*, whilst those on the Assyrian walls are *sculptured*, there can be no reasonable doubt but that the figure shown in Mr. Layard's "Nineveh" (fig. 18) is carrying a fingered Citron roughly and conventionally delineated, thus proving the Citron to have been known in Media and Assyria, as well as in Egypt, in very ancient times.

The sources from which it came to Egypt may have been various. It was known to Theophrastus in Media and Persia in the fourth century B.C.

The ancient Arab and Persian navigators traded between the Persian Gulf and the Red Sea on the one side, and India, Ceylon, and China on the other. The large number of varieties of the Citron found in India shows a cultivation there of a very ancient date.

In studying the Oranges and Lemons of India and Ceylon, I came to the conclusion that *all* the varieties originated in Southern China; that they first found a location in the Malay Archipelago, then in India, then in Western Asia, then in



FIG. 17.—Fingered Lemon
(Penzig, *Studj sugli agrumi*,
fig. 8, pl. 9).



FIG. 18.—From the
Babylonian Record.

Europe, and afterwards all over the world. But now we know that the ancient Egyptians had the Citron among them long before it was known in Greece or Italy.

Græco-Roman and Arab writers mention a great number of fictitious medicinal properties attributed to the Citron. But, curiously enough, one of them mentioned by M. Loret *appears to be true*. He says, "Broyé et pris en potion dans du vin, est bon pour les maladies de la rate." (Gargilius Martialis, "Medic. ex Oleribus et Pomis," xlv. 2.)

I tried the Lemon in enlargements of the spleen and in cachexia after intermittent fevers, prepared according to the recipe of Dr. Maglieri, who saw it used by the Italian peasants, and I found that it had a *very satisfactory effect*.

DISCUSSION.

MR. PHILIP CROWLEY said that he had grown the Citron in England for many years in an ordinary stove temperature, and

had always found it fruit very freely and grow to a large size, some attaining to as much as eight inches in diameter. He considered the Citron a very useful fruit to grow, as it could be preserved in all stages of its growth, either as small green thinnings from the trees, or when nearly full-grown, but still green, or when fully ripe. He considered the home-grown specimens produced far better "peel" than the ordinary "Citron-peel" of commerce, while the marmalade made from either green or ripe fruits was, in his opinion, far superior to Orange marmalade, although he admitted it might be a somewhat acquired taste; but in any case the Citron, he thought, was far less grown in this country than its merits deserved.

Sir JOHN LLEWELYN said that it might be interesting if he stated that there were some very fine Citron-trees in Glamorganshire whose history was somewhat remarkable. The trees were being brought by sea from Spain as a present to King William III. when the ship was wrecked on the coast of Wales, and the trees, after being washed ashore, were carried up to Margam, where a house was built to put them in. Soon after, the story having gone abroad, the trees were claimed by the Crown, and the claim was duly allowed—that there the trees were, and the Crown could have them by fetching them; but this the Crown has never done, and there at Margam they are flourishing to this day, and very fine trees they are. With regard to the antiquity of the Citron, Sir John had seen the drawings at Karnak, and he had no doubt Dr. Bonavia was right in his recognition of them; but he would suggest that the occurrence of these fruits in pictures in the tombs was no proof that the tree was grown in Egypt, as most of the things figured were of foreign origin brought into Egypt from countries which had been conquered by the Egyptian kings, and therefore finding the Citron on these historic pictures raised a presumption in his mind that it was regarded as somewhat of a curiosity rather than that it formed any part of the ordinary produce of the gardens of the land.

EXAMINATION IN HORTICULTURE.

ON May 4, 1893, the Society held an Examination in the Principles and Practice of Horticulture, in various centres in the United Kingdom, and 204 candidates presented themselves for examination.

The Examination papers were divided into Higher and Lower Grades. In the Higher Grade seventy-six entered, with the result that six were placed in the First Class (200 to 300 marks); twenty in the Second Class (150 to 200 marks); thirty-six in the Third Class (100 to 150 marks); and fourteen, failing to obtain 100 marks, were not classed. In the Lower Grade six candidates were placed in the First Class (200 to 300 marks); sixteen in the Second Class (150 to 200 marks); thirty-eight in the Third Class (100 to 150 marks); and sixty-eight were not classed.

It may be mentioned that the candidates came from widely different parts of the British Islands—from West Clare to Kent, from Aberdeen to Cornwall, &c.; a centre being established wherever a magistrate, or clergyman, or schoolmaster, or other responsible person accustomed to examinations would consent to superintend one on the Society's behalf, and in accordance with the rules laid down for its conduct. No limits as to the age or position or previous training of the candidates was imposed, and the Examination was open to both sexes.

The names and addresses of the successful candidates, together with the number of marks assigned to each, are given in the following Class List, to which is appended the questions set in each grade by the Examiners.

CLASS LIST.

(Maximum number of Marks obtainable 300.)

HIGHER GRADE—76 Candidates.

First Class.

	Marks.
1. *F. V. Dutton, 21 Oakley Crescent, Chelsea	235
2. { W. Busby, Overbury School, Tewkesbury	205
{ John Lewis, National School, Farnham	205
{ H. Nickolls, Badminton, Chippenham	200
4. { A. E. Smith, Horticultural College, Swanley	200
{ J. D. Stretch Dowse, Bassaleg, Newport, Mon.	200

Second Class.

1. E. G. Gilmore, Horticultural College, Swanley	195
2. A. J. Manning, Trebeswell, Penryn, Cornwall	185
3. Geo. Witts, School House, Bengeworth, Evesham	180
4. { Stephen Morrill, Board School, Carshalton	175
{ Hy. Ames, Church School, Hedley, Epsom	175
{ A. N. Pierce, London Road, Redhill	170
6. { J. T. Emmott, Howden, Yorks.	170
{ G. Butcher, 182 Wellfield Road, Streatham	170
{ Geo. A. Bishop, Wightwick Manor Gardens, Wolverhampton	170
{ Winifred Blake, Horticultural College, Swanley	165
10. { W. J. Stokes, Hilperton Marsh, Trowbridge	165
{ William West, Lady Boswell's School, Sevenoaks	165
{ C. J. Dicker, Busbridge Hall Gardens, Godalming	165
{ John Barrett, Berwick Gardens, Shrewsbury	160
14. { Maurice Byrne, Shirley Schools, Croydon	160
{ H. Fincham, Cranbrook, Staplehurst	160
{ J. H. Rewcastle, National School, Morden, Mitcham	150
17. { S. C. Meire, Castle Hill, Much Wenlock	150
{ E. Caesar, The Bishop's School, Farnham	150
{ E. Farris, Horticultural College, Swanley	150

Third Class.

1.	{ G. F. Tinley, Horticultural College, Swanley	145
	{ C. F. F. Hutchings, Board School, Carshalton	145
	{ F. Gudgin, Sydenham Road School, Croydon	145
5.	{ A. Ashdown, Horticultural College, Swanley	145
	{ F. Tufnail, Donnington Road, Reading	140
	{ R. J. Tabor, Horticultural College, Swanley	140
9.	{ J. H. Morton, Horticultural College, Swanley	140
	{ A. J. Bridges, Carville Hall Gardens, Brentford	140
	{ J. H. Parkin, K. and C. School, Epsom	135
11.	{ R. C. Gant, Berwick Hall Gardens, Shrewsbury	135
	{ W. T. Wagstaff, Fairclose Road, Beccles	130
	{ F. W. Humphreys, Boys' National School, Cheam	130
	{ J. Morrison, Beggarbush, Levenhall, Musselburgh, N.B.	130

* Wins the Society's Silver Gilt Medal.

	Marks.
14. { David Somerville, The Gardens, Dalkeith, N.B.	125
{ A. G. Rule, Horticultural College, Swanley	125
{ A. C. Bailey, Horticultural College, Swanley	125
17. { T. A. Young, Horticultural College, Swanley	120
{ G. Beech, Morton Hall, Silverton, Edinboro'	120
{ E. J. Eggleton, Eagle House Gardens, Downham	120
{ S. E. Yetman, Horticultural College, Swanley.	115
20. { W. Pascoe, Hamble, Southampton	115
{ W. F. Gullick, Abbey Gardens, Woburn	115
{ E. Waller, Leith Walk Nurseries, Edinboro'	115
{ H. F. Tagg, Horticultural College, Swanley	110
{ W. N. Sands, Horticultural College, Swanley	110
24. { Harry Overy, Horticultural College, Swanley	110
{ Lilian E. Clarke, District Schools, Banstead	110
{ Alfred Catt, Station Road, Walmer	110
{ W. Chamberlain, The Gardens, New Lodge, Windsor Forest	110
{ Arthur E. Philbrick, District Schools, Sutton, Surrey	105
30. { W. Milne, New Hailes, Musselburgh, N.B.	105
{ E. J. Elliott, National School, Godalming	105
{ A. G. Dangerfield, South Norwood	105
{ J. Carter, Bilting, Wye, Kent	105
35. { G. R. Saunders, Ewell, Surrey	100
{ W. Douglas, Easter Duddingston, Portobello	100

LOWER GRADE—128 Candidates.

First Class.

1. *H. S. Daine, Woodfall Hall Farm, Huyton, Liverpool	240
2. { W. R. Goff, Church Street, Effingham, Leatherhead	225
{ J. J. Miles, National School, Ash, Surrey	225
4. George Lamb, Botanical Gardens, Cambridge	220
5. W. Stroud, Grammar School, Farnham	205
6. G. R. Waterson, Wrecclesham School, Farnham	200

Second Class.

1. W. E. Watkins, Bradford-on-Avon	195
{ F. E. J. Woollard, Kingsgate Street, Reading	190
2. { A. H. Dudley, Gibson Street, Liverpool	190
{ C. Pine, Villiers Road, New Bushey, Watford	190
5. C. J. Berry, Exeter Road, Teignmouth	185
6. E. Chopping, Periwinkle Mills, Milton, Sittingbourne	180
7. Maurice T. O'Connell, Killadysert, West Clare	175
8. George Wall, Grims Dyke, Harrow Weald	170
{ Alfred D. Morris, Barrowmore Hall Gardens, Chester	155
{ D. Clague, Stoneycroft, Liverpool	155
9. { F. G. Drew, Enville Gardens, Stourbridge	155
{ C. Barnett, Decker Hill, Shifnal	155
{ A. D. Hogg, The Gardens, Dalkeith	155
{ C. W. Avins, Rookery Gardens, Down, Kent	155
{ J. R. Ismay, Carey House, Watford	150
15. { H. P. Bridges, Batley Road, Heckmondwike	150

* Wins the Society's Silver Medal.

Third Class.

	Marks
1. C. Weston, Drumlanrig Gardens, Dumfries	145
2. { A. Melville, Drumlanrig Gardens, Dumfries	140
{ W. S. Walker, Derwent Road, Stoneycroft, Liverpool	140
{ Frances E. Oldham, Southbank, Swanley	135
4. { F. A. Littlejohn, Barrow Point Gardens, Pinner	135
{ G. A. Murrell, Park Place, Farnham	135
{ A. C. Bartlett, Dropmore Gardens, Maidenhead	135
{ T. F. Badcock, Horticultural College, Swanley	130
8. { J. Newman, Overbury, Tewkesbury	130
{ Jas. Simpson, Loirsbank, Cults, Aberdeen	130
{ P. J. Gray, Walnut Grove, Glasnevin	125
11. { Frances Mildred Cooper, Horticultural College, Swanley	125
{ J. Blomfield, The Cemetery, Luton	120
{ Jas. Davis, Woodlands, Upper Batley, Yorks	120
{ W. Farr, The Gardens, Maiden Erlegh, Reading	120
13. { G. Beale, King's Road, Reading	120
{ Gertrude Gaskell, Horticultural College, Swanley	120
{ G. M. Stuart, Eden House Gardens, Banff	120
{ Frank Allen, Houghton Regis, Dunstable	115
{ Annie G. Stephens, Horticultural College, Swanley	115
19. { J. H. Aitken, Tunstall, Sittingbourne, Kent	115
{ J. H. Matthews, Avenue Road, Southampton	115
{ W. McCreath, Stoke Castle Gardens, Peebleshire	115
{ F. N. Woodward, Ewell, Surrey	115
{ J. F. Dancer, Grims Dyke Gardens, Harrow Weald	110
25. { Edmund Fry, Heatherley Road, Reading	110
{ T. Gardner, Queen's Road, Watford	110
{ Henry Bates, Salisbury Villa, Robertsbridge	105
{ W. E. Loe, Selwood, Farnham	105
28. { A. Crossley, Technical School, Batley	105
{ A. Blake, Mill House, Westerham, Kent	105
{ W. Burgess, The Gardens, Bredon's Norton, Tewkesbury	105
{ W. Bygraves, Barkway, Royston, Herts	100
{ W. J. Woolley, Oak Street, Evesham	100
33. { Arthur Osborn, Sonning, Reading	100
{ G. Hinton, Somerstown, Reading	100
{ Gilbert Hart, Bush Hotel, Farnham	100
{ G. T. Bridges, Batley Road, Heckmondwike	100

HIGHER GRADE QUESTIONS.

Eight questions only to be answered ; any eight the candidate prefers.

1. Explain the mode of formation of the soil.
2. What evils arise from stagnant moisture in the soil ; and why is access of air necessary to the roots of plants ?
3. In the selection of a site for the formation of a garden, what are the principal conditions to be observed ? Describe those of most importance.
4. Describe the usual system of rotation of cropping in the kitchen garden, and what are the advantages derived therefrom ?

5. Mention a few common weeds which usually grow--
 - (1) On clay soils ;
 - (2) On sandy soils ;
 - (3) On limestone soils.
6. Explain the ill effects which arise from too deep planting.
7. How may a succession of vegetables be obtained during every month in the year ?
8. Explain the process of grafting, and state what objects are served by it.
9. By what circumstances is the work of the leaves impeded ?
10. Why is a combination of various substances in manure generally preferable to the application of one substance alone ?
11. Describe the method of preparing the ground for Strawberries ; the preparation of the runners ; also the best time and method of planting.
12. Give some illustrations where Fungi, so far from being injurious, contribute to the welfare of the plant on which they grow.
13. What are the relative advantages of training fruit-trees on the espalier system, and on walls ?
14. What variations occur in the mode of growth of a cutting ?

LOWER GRADE QUESTIONS.

Eight questions only to be answered ; any eight the candidate prefers.

1. On what circumstances does the productiveness of the soil depend ?
2. Describe the method of preparing the ground for fruit-trees, and the method of planting standard, pyramid, and bush trees on free, and on dwarfing stocks.
3. In laying out a garden, what are the first operations to be performed ? Describe them in detail.
4. What do plants derive from the soil, and how do they take up nourishment from it ?
5. What purposes are served by digging and hoeing ?
6. What are the best manures for fruit-trees ? Describe the best way of applying them.
7. Describe the method of preparing the ground for such crops as Carrots, Beet, and Parsnips.
8. What are the circumstances favourable to the germination of seed ?
9. What is understood by wireworms, and what are the best methods of dealing with them ?
10. What are the conditions most favourable to the growth of Asparagus ?
11. Why is blanching required in the case of Sea-kale, Celery, and some other crops ?
12. Some plants produce their flowers from the old, others from the new wood. Mention the method and season of pruning adapted to both circumstances.
13. At what season of the year does the Celery-fly attack the plants ? How may it be prevented ?
14. Describe the system of culture by which Cucumbers can be grown out of doors in England at a profit.

NOTICES OF BOOKS RECEIVED.

JOHNSON'S "GARDENERS' DICTIONARY." London: Geo. Bell & Sons. 1893.

Probably no book has ever attained the same degree of popularity among all classes of gardeners as Johnson's "Gardeners' Dictionary." The first edition appeared in 1846, but since that time the ideas and methods of gardeners have undergone a very considerable change, and vast numbers of new plants have been introduced to cultivation. A handbook which did not keep pace with these important developments would be of little use in the course of a few years, and although two supplements have been added since 1863, the publishers have wisely decided to have the whole work recast and brought up to date. This task has been entrusted to Mr. C. H. Wright, F.R.M.S., and Mr. D. Dewar, curator of Glasgow Botanic Gardens, and until recently chief of the Herbaceous Department in the Royal Gardens, Kew. Many improvements on the previous editions of the book are noticeable, both in the style and in the arrangement of the matter, and there can be little doubt that this new edition will prove most acceptable to every gardener.

The "Genera Plantarum" has been followed in the main as the authority for the nomenclature, although it has not been strictly adhered to. The generic names are printed in clear black type, and are in all cases followed by cultural information. The species are arranged alphabetically under their respective genera, with concise particulars as to height, prevailing colour, date of introduction, and, in many instances, references are given to figures in the principal botanical and horticultural works, while, to make matters clearer, sketches are frequently added. The meaning of the specific names will form a list at the end of the work, while the derivation of the generic names is given immediately after each. In short, the work is a gardener's dictionary in every sense of the term, and, in addition to its other good qualities, has the further recommendation of being published at such a price as to bring it within the reach of all. It is estimated that it will be completed in eight one-shilling parts; six of these have already been issued, with an aggregate of 768 double-column pages. The last part yet issued brings us down to the description of "Pleopeltis," a genus of Ferns closely allied to Polypodium.

MANUAL OF ORCHIDACEOUS PLANTS. London: James Veitch & Sons.

Every orchidologist should possess this most excellent work. The ninth part has now been issued, and it may practically be considered the final one—so far, at least, as the description of genera

and species is concerned. To make the work fully complete, however, at least one other part will be issued, containing a general review of the whole Orchid family. A glance from Part I. (issued in 1887) to Part IX. shows the enormous amount of good work which has been done during the past six years, and the result, if bound together, would form a bulky volume of 1,089 pages. The species—more or less in cultivation—of over ninety genera have been described minutely and well, while the history of introduction and references to figures and synonymy have received careful attention. The “*Genera Plantarum*” has been taken as the standard of classification, but in some cases (*e.g.* *Colax*, *Thunia*, *Paphinia*, &c.) has not been strictly adhered to. Before the work is quite closed a general index to the whole of it should be added, as at present it is somewhat troublesome to be obliged to refer to the index of each part in succession when in search of a certain genus or species. Such a general index would not only be a valuable addition to an already most admirable work, but would save much time to the student.

ART OUT OF DOORS. By Mrs. SCHUYLER VAN RENSSELAER. London : T. Fisher Unwin. 1893.

A book full from beginning to end of most excellent common sense, and quite true to its subordinate title of “*Hints on Good Taste in Gardening*,” but written in almost too literary a style, and in language somewhat above the immediate comprehension of the ordinary working gardener. Indeed it hardly contemplates the ordinary gardener, but is written more for the landscape gardener and the owners of residential estates, though, at the same time, by far the greater part of the principles it lays down are in themselves as applicable to the garden proper as to the “*grounds*.” The authoress herself says “*two trees and six shrubs, a scrap of lawn, and a dozen flowering plants may form either a beautiful little picture or a huddled disarray of forms and colours*”; and she warns us against “*thinking that art is needed only for broad landscape effects. It is needed wherever we do more than grow plants for the money we may gain by them.*” In the selection of trees and shrubs the desirability of employing a large proportion of native or thoroughly naturalised plants is well insisted on; “*local plants are essential as a foundation, and then, to give variety and the true gardenlike air, exotics should be mingled with them; but these exotics should never be chosen for their variety or novelty alone,*” but simply and solely for their harmonious effect. “*If a tall shrub is planted it should be because a tall one is needed, not because a particularly handsome tall one has been seen in a nursery or in some neighbour’s grounds.*” The place of variegated foliage is also very well dealt with: “*One monotonous tint of green is to be avoided, but still more an excessive use of bright-hued plants. . . . Anything that is eccentric in form or colour (Copper Beech for*

example) should be used very sparingly . . . too many places are disfigured by an accumulation of abnormally coloured plants . . . they destroy all peacefulness and unity, as well as all naturalness of effect." Equally true is it that "a lawn is a place for grass . . . to spot bright beds all over it is to ruin it. . . . Lawns are marred by shrieking spots of colour set down here and there with little thought. Cultivators love them because they show how skilfully they can grow and trim their plants, and owners love them—well, I fear simply because they are showier than anything else." There are some excellent chapters on the form and colour of trees, but we have quoted enough to show how full of suggestion this excellent little book is.

LES ORCHIDÉES. By D. BOIS. Paris : J. B. Baillièrre et Fils. 1893.

To the Orchid-grower who combines a knowledge of French with his other accomplishments this little book would prove useful. It consists of some 300 and odd pages, and not only gives particulars as to most of the Orchids which are usually grown under glass, but also tersely describes the Orchid family as a whole, by calling attention to the peculiarities of stems, leaves, inflorescence, &c. The part insects play in the fertilisation of Orchids is also gone into, although there is not much to be said on the subject beyond what we owe to Mr. Darwin's researches. There are also chapters on the prices of Orchids, culture, Orchid-houses, watering, propagation, enemies of Orchids, seedlings, &c. To these is appended a vocabulary explaining the meaning of technical terms most frequently met with, and a list of authorities, as well as of the chief works devoted to the literature of Orchids. We notice that, although the book is dated 1893, there are several well-known plants which appear to have escaped attention, and among them may be cited the beautiful *Phaius Humblotii* and others. On the whole, however, we are glad to be able to recommend the book as a useful addition to the literature of Orchids.

THE ORCHID REVIEW.

This is an illustrated monthly journal devoted exclusively to Orchids, under the editorship of Mr. R. A. Rolfe, A.L.S., and Mr. F. Leslie. The first number appeared in January 1893, and since that time eight numbers have been issued. New Orchids are described and articles on various subjects of interest to orchidologists are contributed by different writers. There are now so many growers of Orchids in the English-speaking world, that a journal such as the *Orchid Review* should not lack support, and we heartily wish it success.

REICHENBACHIA.

This sumptuous work on "Orchids" continues to be sent out by Messrs. Sander & Co., of St. Albans, with its usual regularity, and when complete will form one of the most magnificent additions to the already numerous treatises on Orchids. The large coloured plates

drawn by Mr. H. G. Moon are unrivalled as far as the portraiture of the plants is concerned, and what they lack in botanical detail is amply made up for in the analytical drawings which accompany the text.

BULBOUS IRISES. By Prof. MICHAEL FOSTER, Sec. R.S., F.R.H.S., &c. London: Royal Horticultural Society. 1893.

There has been a great advance of late years in our knowledge of Bulbous Irises, more than twice as many species being now known to us as there were twenty years, or even fifteen years ago; and Professor Foster's book upon them comes just when it is most wanted, and forms a complete monograph of Bulbous Irises as at present known. About thirty species with their varieties are described in minutest detail, and cultural requirements are given so clearly and so fully that the book should be of the utmost value to all practical growers of this most lovely and interesting group of plants. In addition to the popular account of each species and its varieties, a synopsis is given, with particulars as to synonymy, time of flowering, habitat, and the standard works in which figures and illustrations may be found. It should be mentioned that as many as fifty-eight woodcuts and diagrammatic sketches of the flowers are given, thereby greatly enhancing the value of the treatise, and enabling the reader at a glance to identify any flower he may be searching for. Professor Foster, himself a practical gardener, has treated his subject chiefly from the gardener's point of view, and it is in the gardener's loose meaning, and not in the botanist's restricted sense, that he uses the term "bulbous." A bulb he defines as being "a specially fed bud which separates of its own accord from the mother stock in order to live an independent existence." This definition is probably somewhat more than a botanist could accept, but it will admirably serve for all the practical purposes of a gardener. The handbook is published at the Society's offices at 5s., but may be obtained by Fellows (and no Fellow should be without it) at half that price.

THE GENUS MASDEVALLIA. Issued by the MARQUIS OF LOTHIAN, K.T. London: R. H. Porter.

The genus *Masdevallia* is a deservedly popular one with orchidists, many of whom take a pride in the enlargement of their collections by every possible means, and with hardly a thought of the expense which their enthusiasm entails. To these *Masdevallia* lovers the magnificent monograph of the genus which is being issued by the Marquis of Lothian should prove not only interesting but valuable. Four parts have now been issued, each one containing ten beautifully coloured drawings (natural size) of as many species by Miss Florence H. Woolward, who has made them for the most part from plants in the Marquis of Lothian's collection at Newbattle Abbey. The value of

the work is immensely enhanced by the dissections of the flowers and leaves, and the vignette engravings from photographs, which are given to show (without any addition of the artistic imagination) the actual and natural habit of each species. The descriptions and historical matter are mostly done by Miss Woolward, but not an inconsiderable amount of valuable and interesting information is also contributed by Mr. F. C. Lehmann, German Consul of the Colombian Republic, whose experience in the orchidic regions of Central and South America entitles him to a high place as an authority. Drawings of species entirely unknown in this country, or, if so, only as dried specimens, are promised by Mr. Lehmann, and will be published in the later parts of the monograph, with names and descriptions, particulars as to geographical distribution, and accompanied by a map, as well as by notes on the temperature and elevation of the locality in which he has discovered the plants. There are somewhat more than a hundred species of *Masdevallia* known, and it is to be hoped that in addition to the forty species already described, the Marquis of Lothian will continue his magnificent work until it embraces them all.

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HOUSES FOR ALPINE PLANTS.

By Mr. H. SELFE LEONARD, F.R.H.S.

[Read July 25, 1893.]

IN what I have to say to-day on the subject of Alpine Plants, I think it well to premise that I shall use that term as properly denoting mountain plants from temperate climates. But popular usage has, all too successfully, so enlarged the meaning of the term as to cover by it a great number of dwarf plants which have little or nothing in common with true Alpines except their dwarfness. "Words," it has been said, "are the fool's money, but only the wise man's counters." By common agreement any word may be made to mean anything. And it is more profitable to decide on the one sense, out of perhaps many, in which a term shall be used, than to insist that one of those senses alone is the right one. And having regard to my purpose to-day, which is to recommend a certain mode of culture of Alpines, it would obviously be misleading that I should use the term "Alpines" as including other than mountain plants, or any at least which have different cultural requirements. But it chances that there are a number of hardy plants not coming from a mountain habitat, but which, either from their natural adaptability to varying conditions or from circumstances which may be called accidental, the same culture happens sufficiently to suit; these may therefore be, and commonly are, associated with true

Alpines. I would instance the moisture-loving bog and wood plants of North America, such as the Trilliums and hardy Cypripediums, or the small hardy Bamboos of North Japan. To such the term Alpine can in no *proper* sense be applied; but, for the reason given, we need not be at much pains to prevent its extension to them.

How far is artificial protection essential or desirable in the culture of Alpine plants? and what is the best mode of protection? are questions which have been much agitated. One can give, of course, only the result of one's own observation and experience; and, personally, I should answer, that protection is essential for few, but desirable for many. Great numbers of species can be grown without it, even in the border, and still more in a cunningly constructed rockery or rock garden. And if one were confined to the alternative of growing Alpines either only in the open or only by help of glass protection in the winter, I for one should certainly choose the former alternative. But the Alpine house, or Alpine shelter of any kind, is not an *alternative* to open-air culture. It is, and should be, its supplement and complement.

It has often been pointed out, and I believe with complete truth, that the value of protection is, to say the very least, much more as a shelter from wet, and from the drying winds of spring, than from frost. Of frost merely, Alpine plants will naturally stand very much, and where it injures it is probably oftener by lifting the plants out of the ground and leaving the roots wrecked and naked on the surface than by what I may call the legitimate action of extreme cold. It is the soaking rains of wet autumns and winters, and the cutting, drying winds of spring, all foreign to the natural experience of the plants in their habitats, which raise so alarmingly the death-rate of many of the choicer plants in our gardens, and which a few species rarely survive.

But how is protection best given? Glass in some form is the usual, and probably the best, material for the purpose, and I propose to touch on the methods of using it with special reference to Alpines.

Some use the hand-light in many or in any of its forms, the all-important matter of ventilation being dealt with in several familiar ways. And this method is effectual enough from most points of view; only it must be borne in mind in using it that

the whole of the rain thrown off by the hand-light is poured into the adjoining soil, and that if the plant so protected has neighbours, more harm than good may result. For similar reasons, while the head of the plant is thus protected from wet its root is in many cases by no means equally so. The same objection applies to the method adopted by others—a method which, with that drawback, is useful enough—of fixing a single sloping pane of glass, by strong wire standards, over the head of the plant. This plan has the recommendation of allowing complete access of air on all sides.

I have myself long practised, and would still recommend, the following similar but more wholesale method of protection. A bank or rockery, say 6 feet by 4 feet, is planted closely, and as naturally as may be, with the plants to be protected. It may be a heavy planting of one or two things, such as *Onosma taurica*, *Androsace lanuginosa*, or *Cyananthus lobatus*; or, if preferred, it may comprise a numerous and varied selection. Four stones of sufficient size are posted at the corners, and upon them a common garden-light of the size indicated is placed, say, from November to March. The protection thus obtained is generally sufficient for a considerable stock of plants. Of course if the bed is flat (it is a sloping bank in my case which has been dealt with) the light is sufficiently tilted to fling off the rain, and it must be so placed that the water is carried in a direction in which it will injure nothing. A little ingenuity in the arrangement may insure that, when the light is removed about March, the planting need bear no indication of having been thus roofed over during winter, and may show only as part of the larger bank, border, or rockery of which it is a part. The light is removed occasionally in suitable weather, the better to air the plants, and it is held in place against strong wind by three or four large iron nails, or rather clamps, driven into the ground at intervals, and grasping the frame without piercing it.

In addition to these methods of protection there is that of unheated frames and pits, and all these methods are perhaps on the whole nearly equally good, judged merely in regard to their cultural utility. Some will suit best in one case, some in another. But none of them, in my judgment, equals that of the Alpine house “proper,” which it is my purpose to-day to recommend to those who would commence the culture of this beautiful class of

plants. It combines, I think, all or most of the advantages of other methods, and to them it adds the following :—

First, a far drier winter condition, the plants being raised upon stages, and air being freely admitted from below.

Secondly, that the plants can be visited and tended without the labour and inconvenience of constantly lifting the lights for the purpose ; that it protects not the plants only, but those who would cultivate and enjoy them. This is of great consequence in the rough days of autumn, winter, or spring. Indeed, as mere matter of economy of labour, and therefore of money, I have, for the reason indicated, found it worth while to transform into cheap low-pitched houses most of the stock of lights which I formerly used upon frames for the purpose in hand.

Thirdly, a distinct advantage of the Alpine house is that it can be made perpetually beautiful throughout the year, not excepting even December and January, with hardy plants brought to the level of the eye.

For this last purpose it is desirable—almost essential—that a part of the furniture of the house should consist of the many Alpines of perpetually beautiful foliage. The Saxifrages in infinite variety are a host in themselves for this purpose. But they do not by any means stand alone. There are besides, dwarf evergreen shrubs which combine a short season of beauty of flower and a continual season of beauty of habit and foliage. Plants of such more or less perennial beauty will generally constitute what may be called the permanent furniture of the house, as distinct from the large class which are only beautiful for a season. These latter may at other times be well kept plunged in large open-air “ cradles ” of cocoanut fibre or ashes, or, if hardy enough, even in a select open-air border close to the house, and those needing protection may be relegated to frames. For although an Alpine house may not unsatisfactorily be furnished permanently with one set of inhabitants, the plan which I have just indicated is perhaps on the whole the better. Let the house contain only the plants which for the time being are in beauty, whether of foliage or of flower, and let it be “ served ” from a frame outside (somewhat as a conservatory is supplied from a hot-house) with that half of its occupants which have but

a season of beauty ; and not only by a frame, or frames, but also by a simple cradle of ashes or of fibre, in which the "hardies" may be plunged when "off duty."

The construction of Alpine houses is, or may be, of the simplest. Its essential conditions are few. The first is an amount of free air ("ventilation" is too weak a word) such as perhaps no other class of plants exacts. The second is that the plants shall be brought near the glass, and so not become "drawn." This is best secured by giving the house a low-pitched roof, and by avoiding side-lights.

But while the ventilation must be unusually complete, there should not be a draught, and the movable roof must be sound enough not to allow of drip. In other respects the work may be rough and inexpensive, though for choice of course it should be good at all points. The roof must, in my judgment, be removable, and that fact constitutes the only real peculiarity of these structures. Such simple low houses as are occasionally built for Auriculas will generally answer the purpose.

The best mode of ventilation at seasons when the roof is in place is by large wooden shutters beneath the staging on each side ; and the roof should be made of movable lights, which may, and should be, wholly removed in summer, late spring, and early autumn. At other seasons they may, for additional ventilation, be lifted, or drawn up or down at pleasure. Air should by *all* these means be freely admitted night and day throughout the year, unless it is unavoidably excluded in shutting out fog or perhaps extreme frost.

The small houses which I have made and used for some years for the purpose answer all the foregoing conditions ; and as they are both simple and cheap, I may as well describe them with a little more particularity, though I shall suggest some improvements as the result of my experience with them.

They are, so to speak, "home-made," each consisting of ten ordinary garden-lights, 6 feet by 4, five lights on each side, giving a house 21 feet long by 10 feet broad. The rest is of wood, and is put up by a local carpenter under direction. The cost of each house is from £20 to £30. It is painted slate or stone colour within, the darkest green without, and these, I think, are the most suitable colours. The floor is only the natural soil, and it and the staging are kept well watered daily in spring and sum-

mer to maintain a humid atmosphere, and, of course, water (preferably soft) is freely supplied to the plants themselves during the seasons they need it. The houses are fully exposed on all sides. Any shelter, as of overhanging trees should, if possible, be avoided. For the bulk of Alpines no such particularity need perhaps be considered; but for the small minority of choice and less easily grown kinds such consideration has consequence.

Although in nature, in their high, cool mountain homes, Alpine plants generally thrive in full sun, in the English garden at least some need shade and more like it. The house, therefore, needs shading during any month between April and October inclusive during which the plants may remain in it and the roof is not wholly removed. The shading is well and quickly effected by clouding the lights with the usual wash mixed with size.

For some plants, *e.g.* Ramondias and a few of the choicest Saxifrages, shade is essential even in nature. Such shade may be given in the Alpine house, without appreciably excluding air, by leaving on the clouded lights on only one side, facing west (upon which the hot afternoon sun faces), and for this reason my houses are made to run from north to south; and, at least in such exceptionally hot seasons as we have just passed through, a stretched canvas shading may be advisedly substituted for the lights on both sides.

Economy and movability are the specific advantages of the structures which I have just described. They can readily be made to stand by their own weight, and are thus "tenants' fixtures," removable on expiration of lease. But, such considerations apart, it will evidently be better to substitute for wood, brick or stone in the ends and sides of the house. Greater strength and permanence are not the only advantages thus gained, though they are the most obvious ones. The substitution of brick for wood will secure a more equably cool temperature, and will better enable the tasteful furnishing of the ends of the building with either creepers or small permanent rockeries. Those who would desire to save themselves trouble rather than cost will doubtless prefer to order such houses from a builder, and though the current catalogues of horticultural builders do not, I think, yet figure any structure quite completely suitable to the purpose, they figure many which are so nearly so that they would need but little adaptation.

Personally, I find these houses well devoted to Alpine plants all the year round, although in summer, by removal of the roof, they almost cease to be houses. But some may find it convenient (as I have occasionally done) to utilise the house during the summer for the choicer Carnations, Begonias, Zonal Geraniums, or other plants valuing so much of protection; and in that case the Alpines (which for this purpose must be in pots) may be plunged in ashes or fibre, or placed under a north wall in the open, hot sun thus being prevented from reaching the sides of pots, and ample watering being given.

And now I am brought to the matter of the furnishing and arrangement of the Alpine house.

There is much to be said, no doubt, in favour of the planting-out system in such houses; furnishing them, in whole or in part, with suitable rockeries or beds, and so planting the Alpines in a more picturesque fashion. I have myself so planted one of my little houses, thus substituting a pleasing and closely furnished rockery (on a small scale of course) for a pot arrangement. This planting-out system will, naturally and best, be followed by those who should adopt the plan of so constructing the house as to make it during the summer, by removal of the glass roof, merely a part of the outside rock garden (of which, perhaps, more presently). And the plan better suits those plants (not a few) which, on the ground of the great length of their roots, or for other reasons, are unsuited to pot-culture.

But otherwise and generally the result of my own experience thus far, leads me rather to favour the plan of furnishing the house with Alpines in pots. Its evident advantages are that we thus have the plants under more complete control, that each can be kept to the sort of soil which it needs, and that the house can be kept perpetually beautiful by the system, already described, of substituting for any plants whose beauty is past others taken from the "reserve forces." My own little houses, 21 feet by 10 feet, will each hold 300 or 400 of the 6-inch pans which I most use; proportionally fewer, of course, if the ends are furnished with rockeries or with larger pots of Conifers and choice shrubs. For the "ends" will, in the absence of any rockery to assist, be best hidden with a small bank of shrubs, Ferns, &c., furnishing them nearly or quite to the top. Suitable for this purpose are the smaller hardy Bamboos, *Prumnopitys elegans*, Junipers (especially

the Chinese species), *Pernettyas*, *Retinosporas*, New Zealand shrubby *Veronicas* in a score of choice kinds, *Daphnes*, *Azalea amœna*, and many others, all planted in pots.

Lists of plants suitable, in my experience and judgment, for this and for the other purposes of these houses I will append to this paper, as they would be too long to read. But a few general indications of the most suitable plants may not be unwelcome.

The first place will naturally be accorded to those plants, or classes of plants, which to their claims on the score of beauty or otherwise, add this, that they either exact, or at least value, the protection afforded. Among Saxifrages, which generally and as a whole do not either need or even value protection, I may mention the following species which do (at least under frequent conditions), and they are among the most beautiful. First, the Japanese *Saxifraga Fortunei*, an October and November bloomer; next, those two most beautiful little Tyrolean Saxifrages, *S. squarrosa* and its hybrid *S. tyrolensis*, *S. cœsia*, the other parent of this hybrid, *S. Rochelliana*, *S. coriophylla*, and *S. tombeanensis*. Burser's Saxifrage, with its many beautiful hybrids, such as *Boydii* and *Frederici Augusti*, and others, are with me, and with most, perfectly hardy in the open generally; but they may not be so upon all soils, and if in doubt, their beauty and earliness mark them out for inclusion. The same may be said of the Juniper Saxifrage, and of the Grecian *S. sancta*. The best and tenderer of the large-leaved or Megasea section of Saxifrages may also well be included, notably *Megasea purpurascens* for its lovely vermilion foliage in November, and *Megasea Stracheyi* and *M. ciliata* for their foliage and early blooms.

Speaking broadly, all the *Androsaces* either actually need or highly value the shelter, especially the woolly-leaved species, whether European or Hungarian—although in summer they are better without it. It is scarcely too much to say that this is the secret, albeit an open one, to the permanent and successful culture of *Androsaces*. Once grow a collection of these thus into exhibition size, and the hardy-plant lover will, if I mistake not, never again willingly be without some such security for their health and beauty. For pots, the neater European species—*e.g.* *A. carnea*, *A. villosa*, *A. lactea*, *A. ciliata*, and others—are preferable to the Himalayan species, *A. lanuginosa* and *A. sarmentosa*, which, though quite as beautiful, are of straggling growth.

By choosing suitable subjects there need be no difficulty in almost or wholly concealing the pots, even without plunging, so that on entering the house the picture presented to the eye may be of a mass of Alpine plant-life rather than a pot collection.

Before leaving the Saxifrages, I should observe that though but a limited number are tender enough to value the protection much, a great number are choice and lovely enough at all times to make them welcome occupants in winter of the Alpine house. Indeed, a house almost filled, in addition to the kinds before named, with fine specimens of, *e.g.* the magnificent Pyrenean Saxifrage of *S. lantoscana*, and *S. paradoxa*, the many choice forms of *S. Aizoon*, and with *S. Cotyledon*, *S. Macnabiana*, and others among the encrusted group, and a score or so of equal beauty in the mossy section, makes a highly satisfactory plant picture throughout the dead winter months, and this with foliage only. Blossom may be had with ease up to November.

But how about blossom in December and January? Certainly, if the winter be severe, one may then have to be content with foliage only, unless a little help from a greenhouse be at hand, and be not on principle rejected by the hardy-plant lover. But not so if the winter be even fairly mild. Rarely will Burser's Saxifrage, or *S. juniperina* or *S. sancta*, fail to open in fair plenty during January. Often, too, will *Primula villosa* and *P. nivalis* show bloom before that month is out, and *P. rosea* its carmine buds. It is quite an exceptional mid-winter in which I am without the bloom of *Polygala chamæbuxus purpurea*, of *Iris histrio*, and of *Primula capitata*; the latter a gloriously beautiful Himalayan *Primula* of the richest purple blossom, and it seems to have the quality of blooming in any and every month of the year. As I write this on January 5, 1893, with the thermometer registering 27° of frost outside, the plant is still in fair bloom in one of my unheated Alpine houses, as is *Primula ciliata*, and that beautiful and scarce gem, the true *Viola alpina*, which during the whole of the winter has been an ornament to the house.

Pernettyas and other berried shrubs potted up for the purpose add lovely and varied colour during the deadest time of the year. And if other dwarf plants than true Alpines be permitted, winter bloomers like *Iris stylosa* and *I. alata*, *Sisyrinchium grandiflorum*, and the perpetual-blooming *Primulas*, *P. obconica* and

P. floribunda, will furnish colour in abundance, some of them, however, needing at times to be first brought forward in a house from which frost is excluded.

The large and important genus *Primula* must be named as needing for some of its species, and appreciating for many more, like its congener *Androsace*, such a winter shelter as I am commending. Good collections of this charming genus of Alpines are now rarely seen. They would be common if such shelters were frequent. The culture would not be so often abandoned as it is, if it were undertaken with the assurance thus secured for success.

Cyananthus lobatus, *Omphalodes Luciliæ*, *Cypripedia*, *Haberlea rhodopensis*, *Eritrichium nanum*, *Ramondias*, and *Ranunculus glacialis* are but a few samples of the scores of other choice things which occur to me, whose culture may be made more easy and certain, or otherwise more completely successful, by the protection in question. The list is too long to rehearse.

In conclusion I ought to point out, what indeed is otherwise evident, that such small and simple houses as I have to-day described, sufficient though they may be, are but the rudiments so to speak, of the Alpine house of the future. For if it may not readily be made lofty, it may otherwise be as large as can be desired; and in proportion to its size, other things being equal, would be its beauty and effect. For instance, it would be well to make the house of double width at least, and to have a centre staging, or rockery, rising nearly up to the roof. Again, let the whole of the house, save its movable roof, be so constructed as to form a part of a larger outside rock garden, its walls—if walls it must have—being made of rough stone or of rockwork, and any artificial appearance which may otherwise remain being hidden by surrounding rockeries designed for the purpose. By such means I think a structure may be devised, in many cases without difficulty, affording the maximum of utility and the minimum of “artificiality.”

The floors of my little houses, beneath the front rows of the staging, I furnish with hardy or half-hardy Ferns, which may be either in pots or planted in the soil of the floor; and such plants as *Spergula pilifera*, *S. aurea*, *Linnaea borealis*, *Lobelia ilicifolia*, and many others may well be added.

I cannot but think (although at this point I pass from matters

of which I have had practical experience to one on which I have had none) that Alpine-plant lovers who may live in or near the smoke of large towns might find in these houses, with an important variation in their structure, a probable means of largely defeating smoke, smut, and fog, and so of cultivating a favourite class of plants which have hitherto defied their efforts. The variation in question will be that the air should be admitted through large wire-gauze-covered ventilators, fine enough to arrest the bulk of atmospheric impurities, and capable of being frequently removed and cleansed.

The following lists or "selections" are in no way exhaustive, and may readily be added to; but they represent those plants with which the writer has practical acquaintance.

LIST I.

General Selection of Alpine Plants suitable for the Alpine House.

In the following list are comprised as well plants in no way needing the protection (but whose introduction to the house, "on occasion," is recommended on the score of their beauty), as also plants which, *so far as the writer's experience extends*, either need or (more often) benefit by the shelter given. Plants of the latter class are contained in the *first* part of the list; of the former class in the *second* part of it. The third part consists of suitable Ferns; and at the end of the list (Part IV.) are given those plants which are best *for the front line*, by reason of their falling or trailing habit. All kinds which are judged too coarse, however beautiful as outside garden plants, are excluded. This list may therefore be found useful by some, as a select assortment of the choicer and neater Alpines, irrespective of the special and more limited purpose for which it is compiled. No description of the plants is attempted, but this can readily be found by reference to the best Alpine catalogues.

PART I.—CONTAINING THE MORE DELICATE KINDS.

Acantholimon venustum	Androsace ciliata
Achillea umbellata	„ chamæjasme
Æthionema coridifolium	„ coronopifolia
„ pulchellum	„ cylindrica
Andromeda fastigiata	„ foliosa
Androsace carnea	„ glacialis
„ „ eximia	„ helvetica

Androsace lanuginosa	Linaria alpina nana rosea
„ sarmentosa v. Chumbyi	„ pallida
„ lactea	„ pilosa
„ obtusifolia	Lithospermum Gastoni
„ pyrenaica	Lychnis alpina or lapponica
„ villosa	„ Lagascae (Petrocoptis)
„ (Aretia) vitaliana	Myosotis rupicola
„ Wulfeniana	Omphalodes Luciliæ
Anemone palmata	Onosma taurica
„ „ alba	„ alba rosea
„ vernalis	Oxytropis campestris
Anthemis Aizoon	„ pyrenaica
Arabis blepharophylla	Petrocallis pyrenaica
Arenaria cæspitosa	Phyteuma comosum
„ „ aurea	Pinguicula alpina
Asperula Athoa	„ grandiflora
Astragalus hypoglottis v. albus	„ longifolia
Bellium bellidioides	Polygonum vacciniifolium
„ cærulescens	Potentilla nitida in var.
Campanula Allioni	„ speciosa
„ cenisia	Primula Allioni
„ garganica (in var.)	„ Auricula v. marginata
„ Raineri (vera)	„ „ v. carinthiaca
„ Waldsteiniana	„ auriculata
„ Zoyssii	„ Balbisi
Cathcartia villosa	„ bellunensis
Cerastium lanatum	„ cashmeriana
Cyananthus lobatus	„ carniolica
Cyclamen Coum	„ calycina
„ repandum	„ capitata (Roylei)
Cypripedium Calceolus	„ ciliata
Dianthus alpinus	„ „ v. purpurea
„ Fischeri	„ „ v. coccinea
„ Callizonus	„ „ v. Balfouri
„ glacialis	„ „ “Crimson Beauty”
„ neglectus	„ Clusiana
Edraianthus dalmaticus	„ Dumoulini
„ Pumilio	„ denticulata
„ pumiliorum	„ „ alba
„ serpyllifolius	„ „ rubra
Epilobium obcordatum	„ farinosa
Erinus alpinus	„ Fachinii
„ „ albus	„ Flærkeana
Eritrichium nanum	„ Forsteri
Gentiana* brachyphylla	„ glaucescens
„ bavarica	„ glutinosa
„ pyrenaica	„ Heeri
Geranium argenteum	„ hirsuta
Geum reptans	„ integrifolia
Gnaphalium leontopodium (Edelweiss)	„ involucrata
Haberlea rhodopensis	„ longifolia
Hypericum reptans	„ minima
Iberis jucunda	„ nivalis (viscosa nivalis)
„ stylosa	„ piedemontana
„ Pruiti	„ pubescens

* These and some others, while benefiting by *winter* protection, need in *summer* full exposure.

Primula scotica	Saxifraga Cotyledon v. pyramidalis
„ spectabilis	„ *longifolia vera
„ Steini	„ marginata
„ Steeri	„ squarrosa
„ tyrolensis	„ tombeanensis
„ Venzoi	„ tyrolensis
„ villosa	„ Fortunei
„ viscosa	„ juniperina
„ „ minor	„ mutata
„ vochinensis	Selaginella helvetica
„ Warei	„ oregona
Ramondia pyrenaica	Sempervivum arachnoides
„ alba	„ Laggeri
„ serbica	„ Powellii
Ranunculus anemonoides	Serapias cordigera
„ parnassifolius	Sibthorpia europæa
„ pyrenæus	„ „ fol. var.
„ rutæfolius	Silene Elizabethæ
„ Seguieri	„ Pumilio
Rhododendron chamæcistus	Soldanella alpina
Saxifraga aretioides	„ minima
„ „ var. primulina	„ pusilla
„ Burseriana	„ montana
„ „ major	Thymus azoricus
„ „ micrantha	Viola alpina
„ „ hybrida	„ Zoysii
„ cæsia	Wulfenia Amherstii
„ coriophylla	

PART II.—KINDS RECOMMENDED ON THE SCORE OF THEIR BEAUTY.

Acantholimon glumaceum	Antennaria dioica
Achillea tomentosa	Anthyllis montana
„ rupestris	Aquilegia alpina (true)
Adonis pyrenaica	„ pyrenaica (true)
„ vernalis	„ glandulosa
Alsine Rosani	„ Stuarti
„ sedoides	Arnebia echioides
„ verna	Aster alpinus
Alyssum montanum	„ „ v. albus
„ Mœllendorffianum	„ „ v. ruber
„ pyrenaicum	Aubrietia tauricola
„ serpyllifolium	Bellidiastrum Michelli
„ spinosum	Calamintha alpina
Andromeda tetragona	Campanula abietina
Anemone apennina	„ alpina
„ blanda	„ “G. F. Wilson”
„ „ alba	„ pulla
„ baldensis	Cardamine trifolia
„ montana	Carlina acaulis
„ nemorosa major	Convolvulus lineatus
„ „ flore pleno	Coronilla minima
„ „ Robinsoniana	Crocus (any mountain species)
„ „ rubra	Cyclamen europæum

* This plant is unequalled for permanently furnishing the house.

- Cyclamen hederæfolium
 Daphne alpina
 " Blagayana
 " Cneorum
 " Fioniana
 " Phillipi
 Doronicum columnæ
 Dracocephalum grandiflorum
 (altaïense)
 Dryas Drummondii
 " octopetala
 Erica minima
 " Foxi
 Erodium macradenum
 Ferns (*see* Part III.)
 Gentiana acaulis
 " excisa
 " verna
 " " alba
 " Clusii
 Geranium cinereum
 Geum montanum
 Globularia cordifolia
 " nana
 " nudicaulis
 " trichosantha
 Gypsophila cerastoides
 " repens
 Hepatica angulosa
 Hypericum nummularium
 " coris
 Iris reticulata
 " " Krelagei
 Isopyrum thalictroides
 Leucocjum vernum
 Linum alpinum
 Meum athamanticum
 Myosotis azoricus var. " Imperatrice
 Elizabeth "
 Myosotis Rechsteineri
 " arvernensis
 Papaver alpinum or pyrenaicum (true)
 Polygala chamæbuxus
 " " purpurea
 Potentilla tridentata
 " dubia
 " splendens
 Primula Auricula
 " marginata
 " " cærulea
 " " grandiflora
 Primula rosea var. grandiflora
 " Wulfeniana
 Ranunculus alpestris
 " amplexicaulis
 " graminifolius
 " montanus
 " Traunfellneri
 Salix retusa
 Saponaria cæspitosa
 " ocymoides
 " " splendens
 Saxifraga Aizoon in its many *choice*
 vars.
 Saxifraga Boydi
 " " alba
 " carinthiaca
 " cochlearis
 " Cotyledon
 " Frederici Augusti
 " lantoscana
 " " superba
 " Macnabiana
 " paradoxa
 " Rochelliana
 " valdensis
 " oppositifolia
 " " pyrenaica superba
 Saxifraga Bucklandii
 " Engleri
 " sedoides
 " Taygetea
 Sempervivum acuminatum
 " californicum
 " Reginae Amalie
 " tristis
 Silene acaulis
 " alpestris
 " Schafta
 Swertia perennis
 Trollius. The many fine species may
 be introduced from outside "on oc-
 casión," but are a little too large for
 general inclusion
 Veronica repens
 " saxatilis
 " nummularia
 " telephifolia
 Viola biflora
 " lutea in var.
 Wulfenia carinthiaca

PART III.—FERNS.

A. TRUE DWARF MOUNTAIN SPECIES, suitable for association with choice Alpines.

Allosorus crispus (Parsley Fern)
 Aspleniums, most species

Athyrium felix *alpestre* (Polypodium
alpestre), several vars.

PART III.—FERNS—*continued.*

Blechnums, in several species and many distinct vars.	Polypodium Phegopteris (Beech Fern)
Ceterach officinarum (<i>must have lime mixed with the soil</i>)	Polystichum, a few dwarf species.
Cystopteris, all the species	Most species of this genus are of too large habit for the purpose
Lastreas. dwarf species only	Scolopendriums, a great number of dwarf species
Polypodium alpestre	Woodsia alpina
" calcareum	" ilvensis
" Dryopteris (Oak Fern)	" obtusa

B. LARGE-HABITED SPECIES, suitable for the floor of the Alpine house beneath staging. The "evergreen" species are to be preferred.

Athyriums	Polystichums
Lastreas	Scolopendriums

C. SOME FINE EXOTIC SPECIES, not of mountain origin, but suitable for association with Alpines either on staging or beneath it.

Adiantum Capillus-Veneris	Onoclea sensibilis
" pedatum	Osmunda cinnamomea
Cyrtomium caryotideum	" interrupta
" falcatum	Struthiopteris germanica
Davallia Novæ-Zelandiæ	" pennsylvanica
Microlepia anthriscifolia	

PART IV.—PLANTS TO BE NOTED FOR THE FRONT ROW BY REASON OF THEIR TRAILING OR FALLING HABIT.

Androsace lanuginosa	Omphalodes verna alba
" sarmentosa	Onosma taurica
Antennaria hyperborea	" alba rosea
" sylvestris	Polygonum vaccinifolium
Arenaria balearica	Salix Jacquini
" cæspitosa	" serpyllifolia
" " aurea	" pyrenaica
" montana var. grandiflora	Saponaria ocymoides
" purpurascens	" " var. splendens
Astragalus hypoglottis var. albus	Saxifraga coriophylla
Aubrietia Leichtlini	" oppositifolia
Campanula Portenschlagiana	" " splendens
" pumila	" " alba
Coronilla iberica	" atropurpurea
Cyananthus lobatus	" Stansfieldi
Dryas octopetala	" tenella
Epilobium obovatum	" Whitlavi
Eriogonum subumbellatum	" Rhœi
Geranium Wallichianum	" sancta
Herniaria glabra	Selaginella helvetica
" " aurea	Sibthorpia europæa
Hutchinsia alpina	Thymus lanuginosus
Linaria alpina	Veronica prostrata
" anticaria	" telephifolia
" pilosa	Vicia pyrenaica
Omphalodes verna	Waldsteinia trifoliata

LIST II.

Selection of some small Shrubs, Conifers, and large Plants, not generally Alpine, but suitable for furnishing the ends of the house, or for other reasons deserving a place in the Collection.

Abies pygmaea	Helleborus foetidus
" Clanbrasiliana	" viridis
" Remonti	Juniperus communis var. nana
Arundo donax variegata	" tamarascifolia
Andromeda japonica	" chinensis
Azalea amœna	Ledum buxifolium
Azara microphylla	" Lyoni
Bambusa Fortunei variegata	Muhlenbeckia complexa
" nana	Olearia dentata
" Simoni	" Haasti
" striatifolia aurea	" Gunki (Eurybia)
" Metake	Pernettya mucronata in var.
" Ragamowski	Prumnopitys elegans
" (Arundinaria) falcata	Retinosporas in var.
Berberis dulcis nana	Rhododendron ferrugineum
" empetrifolia	" " album
Buxus arborescens	" præcox
" elegantissima variegata	" hirsutum
" variegata aurea	" arbutifolium
Cotoneaster microphylla	Santolina alpina (not incana)
" thymifolia	Spiræa astilboides
" congesta	" Bumalda
" lanata	" " ruberrima
" horizontalis	" crispifolia (Ballota)
Desfontainea spinosa	Veronica buxifolia
Diplopappus chrysophyllus	" carnosula
Epimedium in var.	" cupressoides
Eulalia japonica zebrina	" epacridea
Ferns, hardy and half-hardy (see List I. Part III).	" Kirkii
Euonymus radicans fol. var.	" Lyalli
" buxifolius	" pinguifolia
Genista Andreana	" salicifolia
Hedera arborea ("Tree-Ivies") of sorts	" Traversii
" conglomerata	" Colensoi
" helix aurantiaca	" " glauca
" " minima	" anomala
Helleborus niger in var.	" Haasti

LIST III.

A Selection of Dwarf Plants not believed to be properly Alpines, but suitable at times for association with them.

As to many of these they succeed under substantially the same culture. But as regards the rest (for instance, the majority of the bulbs, which must be ripened off in the usual way), their

special requirements must be borne in mind, and they cannot be regarded as *permanent* occupants of the Alpine house.

To this list the writer has thought it well to add, in Part II., a small number of plants which, while otherwise suitable for the purpose in hand (notably as to some for supplying bloom in dead winter), are not strictly hardy even under glass, unless in very mild localities and seasons; for instance, *Primula obconica* and *P. floribunda*, *Iris alata*, and *Parochetus communis*. Such plants will probably be only introduced where a cool greenhouse or conservatory is available for bringing them into bloom. When thus brought on, they may generally, at least in ordinarily mild seasons, be introduced to the Alpine house with good result.

PART I.

Anemone fulgens	Iris cristata
Callixene polyphylla	„ histrio
Caltha biflora	„ histrioides
„ leptosepala	„ junceus
Campanula grandiflora (Platycodon),	„ pumila
var. Mariesi or pumila	„ persica
Chionodoxa Luciliæ	„ Bakeriana
„ sardensis	„ Bornmulleri
Cistus formosus	„ Danfordiæ
„ ocymoides	„ stylosa
Cornus canadensis	„ „ speciosa
Cypripedium spectabile	„ „ alba
„ pubescens	Leucojum (Acis) autumnale
„ arietinum	Lewisia rediviva
„ acaule	Linum monogynum
„ candidum	„ narbonense
Dondia (Astrantia) Epipactis	„ arboreum
Epigæa repens	Lithospermum graminifolium
Eomecon Chionantha	„ prostratum
Erodium Reichardi	Margyricarpus setosus
Erpetion reniforme	Mazus pumilio
Erythronium dens-canis	Meconopsis Wallichii
Euphorbia capitata	„ nepalensis
Fritillarias in variety	Megasea cordifolia purpurea
Fuchsia pumila	„ ligulata
„ procumbens	„ „ ubra
Galanthus	„ Milesi
Galax aphylla	„ purpurascens
Gaultheria procumbens	„ Stracheyi
„ Shallon	Menyanthes trifoliata
„ nummulariæfolia	Mertensia virginica
Gillenia trifoliata	„ dahurica
Heuchera sanguinea (var. splendens)	Mimulus cupreus var. Prince Bismarck
Hyacinthus amethystinus	Muscari botryoides
„ „ albus	„ „ alba
„ azureus	„ pallida
Ionopsidium acaule (annual)	Nierembergia rivularis
Iris iberica	Ourisia coccinea
„ arenaria	Pentstemon heterophyllus
„ caucasica	„ pubescens

Pentstemon speciosus	Sibthorpia europæa
" Jeffreyanus	" " variegata
" glaber	Sisyrinchium grandiflorum
" " roseus	" " " var. album
Philesia buxifolia	Shortia galacifolia
Phlox amœna	Sternbergia lutea
" Carolina or ovata	Thalictrum anemonoides
" divaricata or canadensis	" alpinus
" verna (= reptans)	" minus var. adiantifolium
" setacea vars.	Trillium erythrocarpum
Puschkinia libanotica	" erectum
Rubus arcticus	" grandiflorum
Sanguinaria canadensis	Tulipa Greigii in var.
Scilla bifolia	" montana
" " alba	Vancouveria hexandra
" " carnea	Veronica chathamica
" sibirica	Zephyranthes candida

PART II.—THE FOLLOWING ARE MORE OR LESS TENDER.

Calceolaria violacea	Primula obconica
Iris alata in var.	" floribunda
Lithospermum rosmarinifolium	" mollis
Megasea ciliata	Spigelia marilandica
Parochetus communis	Zephyranthes carinata

ON THE SPECIES AND GARDEN FORMS OF CANNA.

By J. G. BAKER, F.R.S., F.L.S.,

Keeper of the Herbarium of the Royal Gardens, Kew.

[Read August 8, 1893.]

TRUE CANNAS.

§ <i>Stems short.</i>	
1. indica	8. Lamberti
patens	9. polyclada
limbata	10. speciosa (nepalensis)
orientalis	11. discolor
coccinea	§§§ <i>Rootstock tuberous.</i>
lutea	12. edulis
2. lanuginosa	SUBGENUS DISTEMON.
3. Warcewiczii	13. C. paniculata
4. pedunculata	SUBGENUS EURYSTYLUS.
5. glauca	14. C. flaccida
6. Fintelmanni	SUBGENUS ACHIRIDIA.
§§ <i>Stems tall and branched.</i>	15. C. iridiflora
7. latifolia (gigantea)	16. C. liliiflora

ORGANOGRAPHY.

The natural order Scitamineæ, with which the Marantaceæ and Musaceæ are united by Bentham and Hooker, exhibits a

very distinct type of floral structure. The flower-wrapper, which is distinctly dichlamydeous, is comparatively small and inconspicuous. The three small green oblong lobes which are persistent on the top of the fruit represent the calyx. The three segments of the corolla are longer, quite equal, usually lanceolate, and show but little bright colour. It is the abortive stamens, which are much longer than the petals, and brightly coloured, usually red or yellow, which form the handsome part of the flower. In the whole genus *Canna* there is only developed a single one-celled anther, which is placed on one side near the summit of a petaloid staminode. The number of petaloid staminodia which are developed varies in the different species. The style is simple and adnate at the base to the tube, which is formed by the connate claws of the staminodia. It is free upwards, and flattened, with a single simple terminal stigma. The fruit is an echinate capsule, with numerous seeds in each of its three cells. In the Bananas, five out of the six stamens take on the ordinary form, and there are no brightly coloured petaloid staminodia, the sixth stamen being represented by a small subulate process, which is destitute of any anther. In the Gingers there is a single two-celled anther, an undivided or bifid labellum, which represents a stamen, not a petal of the inner row, as in the Orchids, and two other petaloid staminodia are developed in *Hedychium* and *Kæmpferia*, but nearly or quite suppressed in *Amomum*, *Zingiber*, *Alpinia*, and *Costus*. In the Arrowroots (*Maranta*, *Phrynium*, *Calathea*, &c.) there is only a single one-celled anther, as in the Cannas; but in several of the genera the ovary has only one developed cell, the two other cells being minute and sterile. The curious genus *Lowia*, *Scortechini* (= *Orchidantha*, N. E. Brown), has the habit of a Ginger, five perfect stamens, and three very unequal petals, the two upper small and lanceolate, and the lower large and oblong-unguiculate, like the labellum of an Orchis.

THE SUBGENERA AND SPECIES OF CANNA.

All the species of *Canna* resemble one another closely in habit, foliage, and the structure of the flower, fruit, and seed. There are four well-marked sections, which Horaninow has treated as genera, which differ from one another mainly in the number of

petaloid staminodia which are developed, and the length to which their claws are united. In the typical *Cannas*, the petals and staminodia are joined only for a short distance above the base. The staminodia are oblong-spathulate or oblanceolate-spathulate, and either two or three of those of the outer row are developed, protruding far beyond the petals, and spreading in the expanded flower. In the section *Distemon* the tube is short, and all the staminodia of the outer row are suppressed. In the section *Eurystylus* there is a comparatively long tube, three large oblong outer staminodia, and an orbicular labellum. In the sub-genus *Achiridia* there is a very long tube, and the large pendulous flowers have the three obovate-unguiculate staminodia of the outer row fully developed.

As I have recently described all the species in full detail in the *Gardeners' Chronicle* (1893, vol. i., pp. 42, 70, 164, and 196), I will on the present occasion only give a general summary. All the true *Cannas* are so closely allied to one another that it is very difficult to judge how many of the forms should be treated as species, and the differential characters are so slight that they are almost lost in herbarium specimens. Some of the forms have only two outer staminodia, and some have three; but I do not think that this really constitutes a specific difference, as it is clearly variable both in *C. speciosa* and *C. Warcewiczii*. In the "Index Kewensis" there are given under the genus *Canna* nearly a hundred specific names, and upwards of eighty belong to this section; but the number of species in any broad sense is not, I think, more than ten or a dozen.

From a gardening point of view they are best classified in two groups: first, low-growing kinds with a simple or slightly forked raceme; and secondly, species with tall deeply-forked stems and a very compound inflorescence. First we get a group of species with stems not more than three or four feet long, simple or slightly compound racemes, narrow staminodia a couple of inches long, and globose muricated capsules about an inch in diameter. This corresponds to the *Canna indica* of Linnæus, which has been subdivided by Roscoe and others into many so-called species, which differ from one another in the colour of the staminodia, whether they are entire or emarginate at the tip, and whether there are two or three in the outer rows. The principal New World forms with three outer staminodia are *patens*, *limbata*

and *coccinea*; of Old World forms with three staminodia, *orientalis* and *flavescens*; and of New World forms with two outer staminodia, *compacta*, *lutea*, *pallida*, *aurantiaca*, and *variabilis*. *C. lanuginosa* of Roscoe (*C. Achiras* of Gillies) has pubescent stems and two oblanceolate red-yellow staminodia. *C. pedunculata*, Sims, figured *Bot. Mag.* t. 2323, has flowers considerably smaller than in *indica*, with three pale yellow outer staminodia. *C. Warcewiczii* of Dietrich, figured *Bot. Mag.* t. 4854, introduced from Costa Rica by Von Warcewicz in 1849, has stem and leaves tinged with red-brown, and much larger flowers than in *indica*, of plain bright scarlet. *C. Fintelmanni*, first figured by Bouché in 1858, may be a garden product. It has the habit and foliage of *indica*, with three larger staminodia of a plain bright lemon-yellow. And, finally, in this group *C. glauca* is a well-marked species universally diffused throughout Tropical America, with narrower, more acute, more glaucous leaves than in *indica*, three much longer pale yellow outer staminodia, and much larger capsules and seeds.

Of the tall species of true Canna with deeply forked stems, one belongs to the Old World. This is *C. speciosa* of Roscoe, figured *Bot. Mag.* t. 2317, which has green stems 5 to 6 feet long, oblong leaves $1\frac{1}{2}$ to 2 feet long, and two bright red emarginate outer staminodia, longer but scarcely broader than those of *C. indica*. There are four tall South American species. *C. edulis* of Kew, figured *Bot. Mag.* t. 2498, is widely cultivated throughout the Tropics for the sake of its tuberous rootstock, which yields Canna starch, or *tous les mois*, of which a full account will be found in Bentley and Trimen's "Medicinal Plants" under plate 266. The type has three bright red outer staminodia, which are both longer and broader than in *C. indica*. The stem is much more robust and the capsule larger. *C. Lamberti*, Lindl., figured *Bot. Mag.* t. 470, scarcely differs in flower and leaf from *C. edulis*. *C. latifolia* of Miller, called also *gigantea* and *macrophylla*, reaches a height of 12 to 16 feet, with lower leaves sometimes 3 to 4 feet long. It extends to 8,000 feet in the mountains of New Granada, and has three oblanceolate bright red outer staminodia not larger than those of *C. indica*. *C. polyclada* is a tall, deeply forked Brazilian species, with two small bright red outer staminodia not longer than the petals. And finally, *C. discolor*, Lindl., figured *Bot. Reg.* t. 1231, intro-

duced into Europe from the botanic garden of Trinidad in 1829, has red-brown stems 6 to 10 feet long, leaves reaching a length of 3 feet, more or less suffused with red-brown, and two bright red oblanceolate outer staminodia scarcely longer than those of *C. indica*.

In the section *Distemon* there is only one species, for which the oldest name is *paniculata*. It is not worth cultivating except as a botanical curiosity. I have not seen it alive, but it is figured by Roscoe and Loddiges. It has tall, slender, deeply forked stems, and the outer row of staminodia is entirely suppressed.

The subgenus *Eurystylus* also contains only a single species. It grows in swamps in the Southern United States, and was grown in Sherard's garden at Eltham in the days of Dillenius. It is a very distinct plant, with a flower 4 or 5 inches long, a corolla tube as long as the lobes, three pale yellow obovate staminodia an inch broad, and an orbicular labellum. The same species was imported from China and figured by Lindley (*Bot. Reg. t. 2004*) under the name of *Canna Reevesii*. Although it comes from the same country as *Yucca gloriosa* and *Y. filamentosa*, it appears to be much less hardy.

The two species of the subgenus *Achiridia*, *C. iridiflora* and *C. liliiflora*, are by far the most gorgeous plants in the genus. *C. iridiflora* was introduced into cultivation from the Andes of Peru by Mr. A. B. Lambert in 1816. It grows to a height of 10 feet, and has a panicle composed of several corymbs of drooping rose-crimson flowers 5 or 6 inches long, with a tube as long as the segments, and three obovate-unguiculate outer staminodia an inch broad. *C. liliiflora*, introduced by Von Warcewicz from Veragua about 1855, is very similar in habit, but the flowers are white and fragrant.

HISTORY OF THE GENUS.

The following is a rough sketch of the chronological history of the genus. *Canna indica* was introduced into England by Gerard in 1596; *Canna glauca* was rudely figured by Piso in 1648. In 1719 Tournefort names six species. One of them appears to be a *Curcuma*; the five others, *indica*, *latifolia*, *lutea*, *coccinea*, and *glauca*. Dillenius, in 1732, gives an excellent figure of *C. flaccida*. Rheede and Rumphius both figure *C. orientalis*.

Linnæus.—In the second edition of the “Species Plantarum” (1762) Linnæus reduces the number of species to three. For his *C. indica* he cites both New and Old World synonyms. For his *C. angustifolia* he cites Morison’s copy of Piso’s figure of *C. glauca*; but the specimen preserved in his herbarium is not distinguishable from ordinary *indica*. Under his *C. glauca* he cites the excellent figure given by Dillenius of *C. flaccida*, so that it is evident his knowledge of Cannas was very small.

Philip Miller.—In the sixth edition of the “Gardener’s Dictionary,” issued in 1871, Philip Miller gives a full account of the four forms known to him as being in cultivation in England. These he calls *indica*, *latifolia*, *glauca*, and *lutea*. *C. indica*, he says, grows naturally in both Indies; the inhabitants of the British islands in America call it Indian shot, from the roundness and hardness of the seeds. *C. latifolia*, he says, “grows naturally in Carolina” (this is a mistake) “and some of the other northern provinces of America. Whilst *indica* requires to be placed in a moderate stove in winter, the roots of *latifolia* will live through the winter in the open air if planted in a warm border in a dry soil.” Of *C. glauca* he received the seeds from Carthage in 1733. “The roots of this are much larger than either of the former sorts, and strike down strong fleshy fibres deep in the ground.” *C. lutea* he received from Brazil, and recommends it should be treated in the same way as *C. indica*.

Aiton.—In the first edition of the “Hortus Kewensis,” published in 1789, Aiton treats *lutea*, *coccinea*, and *patens* as varieties of *indica*, and gives *glauca* as a distinct species, citing under the latter the Dillenian figure of the totally different *flaccida*.

Roscoe first monographed the Scitamineæ in 1806, in the eighth volume of the “Transactions of the Linnean Society,” p. 330. For many years he made a special study of the order, and his magnificent monograph entitled “Monandrian Plants of the Order Scitamineæ, chiefly drawn from living Specimens in the Botanic Garden at Liverpool,” issued in 1828, still remains the principal book on the subject. It contains altogether 112 coloured folio plates, of which twenty-four are devoted to the genus *Canna*. Roscoe here admits twenty-one species. Of most of these Mr. Shepherd sent specimens, with careful dissection of the flower, to Sir J. E. Smith and Sir W. J. Hooker, and these

specimens are still extant at the Linnean Society and at Kew. Roscoe was the first to clearly separate as a species the common *Canna* of India and other regions of the Old World, which he called *C. orientalis*, from the *Canna indica* of the West Indies.

Bouché.—Between 1830 and 1850 the two Bouchés, father and son, paid great attention to the cultivation of Cannas at Berlin. In 1833 the younger Bouché wrote a paper on the genus in the eighth volume of the “*Linnæa*,” in which he estimates the number of species at forty-eight, of which he had thirty-seven in cultivation. In 1843 he was appointed inspector of the Berlin garden, and in 1844 he contributed a paper to the eighteenth volume of the “*Linnæa*,” in which he characterises as genera *Eurystylus* and *Distemon*, estimating the number of species of *Canna* at eighty-two, of *Eurystylus* at two, and of *Distemon* at seven. Of many of the species, as understood by Bouché, there are type specimens from the collection of Auerswald in the herbarium of the Natural History Museum at South Kensington. The account of the genus in Horaninow’s “*Prodromus of the Scitamineæ*,” published at St. Petersburg in 1862, is taken almost entirely from Bouché’s papers.

Année.—From 1840 to about 1865 the principal cultivator of Cannas and raiser of new forms was M. Année, who, after travelling in South America, settled at Passy, near Paris, and finally removed to Nice. He paid special attention to the tall species of true Cannas, and made these so popular for decorative purposes that M. André states that in 1861 above twenty thousand tufts of *Canna Annæi* were used in the parks and squares of Paris. This *Canna Annæi* was raised in 1848 from seeds of *C. nepalensis*, fertilised probably with the pollen of some other species. It is fully described, with an uncoloured woodcut, by M. André in the *Revue Horticole* for 1861, p. 469. The type has a slender rootstock; stems reaching a height of 12 to 13 feet; long internodes; oblong-acute leaves reaching a length of 2 feet; a long, erect peduncle, and ample panicle of many erecto-patent racemes; ternate flowers, and three oblanceolate outer staminodia, scarcely larger than those of *C. indica*, salmon-yellow or orange-yellow or tinged with rose-red. From this have originated a large number of the tall garden forms grown for the sake of their foliage, with leaves ranging from tender green to red-purple. M. André compares it with *C.*

glauca, and Regel classifies it as a variety of that species; but its affinity seems to me to be with *C. speciosa* and *C. nepalensis*, the only tall Old World species. Another valuable hybrid which was raised by M. Année is described and figured in colours by André in the *Revue Horticole* for 1862, p. 371. This has stems not more than 4 or 5 feet high, brilliant scarlet flowers, as large as those of *C. Warcewiczii*, and orbicular leaves, which are either claret-brown or green. It was raised from *C. discolor*, already crossed for several generations.

Kolb.—Up to 1863, so far as I know, all the hybrids were between different species and varieties of the true Cannas, but in this year *iridiflora* was crossed with *Warcewiczii*. The product was a very fine form, closely resembling *iridiflora* in the size and colour of its staminodia, but with the tube much shortened. This, I believe, was first raised at Paris, but was widely distributed by M. Kolb, inspector of the botanic garden at Munich. It was first called *iridiflora hybrida*, and afterwards *Ehemanni*. It is figured under the name of *iridiflora* in the *Revue Horticole* for 1875, p. 291, and there is a fine coloured picture of it by Miss North in her gallery at Kew (No. 839).

Regel.—In 1866 Dr. Edouard von Regel monographed the known species in the supplement of the “Annual Seed List of the Imperial Botanic Garden,” p. 83. He took substantially the same view of species-limitation as Roscoe.

Count Léonce de Lambertye.—In 1869 Count Léonce de Lambertye contributed to the *Revue Horticole* (pp. 25–29) a valuable paper on the best cultivated Cannas known at that time in the French gardens. He says that at Paris the rage for the tall kinds with ornamental foliage, which began in 1856, had by 1869 quite died out. He classifies the forms under three groups, viz.: first, tall species with large ornamental leaves; second, forms grown for the sake of their beautiful flowers; and, third, forms with leaves and flowers both highly decorative. He gives under each of these groups a list of the types which he specially recommends, with a short description, the name of its raiser, and the date of its origin. Upon this paper the account of the cultivated Cannas in Nicholson’s “Dictionary of Gardening” is mainly based. Count Lambertye also contributed to the *Revue Horticole* five years later (1874, pp. 106, 446) a second paper,

which contains a large amount of additional information. Both of these are valuable helps in tracing out the history of the cultivated forms.

CANNAS OF THE LAST TWENTY YEARS.

Latterly the attention of the raisers of new varieties has been mainly directed to endeavouring to obtain large, bright-coloured, copiously flowering forms of late growth which flower early. The principal new forms of this group have been sent out by Crozy and Sisley of Lyons, Vilmorin of Antibes, and Lemoine of Nancy; and these are the Cannas which are most widely diffused in cultivation at the present day. They are all, I believe, hybrids between *iridiflora* and forms of *Eucanna*, with the short tube of the latter but the large staminodia of *iridiflora*. The red-flowered are probably mainly hybrids between *Ehemanni* and *Warcewiczii*. Amongst these are W. Pfitzer, Revoil Massot, Victor Hugo, Paul Bert, Edouard André, and Maurice Revoise. The yellow-flowered forms are allied to Bouché's *Fintelmanni*, and are probably hybrids between *Ehemanni* and *glauca*. Amongst these are Capricieux, Guillaume Constan, *lutea splendens*, Deputy Hénon, and Henri Louis Vilmorin. Figures of some of these will be found in the *Revue Horticole*, 1866, p. 150; *Gartenflora*, tab. 1303, and the *Garden* for May 2, 1889.

Maron.—M. Maron, of Saint-Germain-les-Corbeil, has succeeded in raising a cross between *C. liliiflora* and some of the Crozy Cannas nearly allied to *C. Warcewiczii*. This is described and figured in the *Revue Horticole* for 1892, p. 540, under the name of Madame Jeanne Sallier. It resembles closely *C. Ehemanni*, having a short tube and three spreading bright red staminodia a couple of inches long by half as broad.

Petersen.—The 107th fasciculus (vol. iii. part 3) of the great "Flora Brasiliensis," published by authority of the Brazilian Government, published in 1890, contains an excellent monograph of the South American Cannas by Dr. O. G. Petersen, of the University of Copenhagen, with uncoloured plates of several of the species. Dr. Petersen estimates the number of species at twenty, and gives many notes on the types of Bouché, having studied the coloured unpublished figures in the herbarium at Berlin.

Damman.—Herr Sprenger, of the firm of Messrs. Damman

& Co., of San Giovanni a Teduccio, near Naples, has lately experimented largely with Cannas, and has very kindly sent me a large series of specimens to illustrate the result of his labours. These bring out more clearly than has hitherto been shown that the forms of at any rate three out of the four subgenera can be made to cross freely with one another. Two of the finest forms sent to me by Herr Sprenger he has obtained by crossing *flaccida* with *iridiflora*. These have very large bright green leaves, flowers about 3 inches long, a short corolla-tube, long corolla-lobes, and obovate staminodia an inch broad. In *Amathusia* the corolla-lobes are pale yellow and the staminodia bright yellow with a few red spots. In *Antigone* the corolla-lobes are reddish, and the staminodia have a plain bright yellow limb shading off into a reddish claw. He has also raised numerous hybrids between *flaccida* and forms of *Eucanna*. Most of these have plain yellow staminodia, and resemble the *iridiflora* × *glauca* hybrids. To this set belong *Bacchus*, *Virginia*, *Ithaca*, *Penelope*, *Andromache*, *Laertes*, and *Odysseus*. Two of the finest *flaccida* hybrids, which he has named Professor Michael Foster and J. G. Baker, have brilliant yellow flowers, much spotted and flushed with scarlet. Many of the forms he has sent me are short-tubed hybrids between *Ehemanni* and forms of *Eucanna*. Of these, amongst the yellow-flowered forms of which *glauca* is one of the parents, are *lutea grandiflora*, *Chameleon*, *Aurore*, *albo-rosea grandiflora*, *Mdlle. Rose Lambard*, and *Sirius*. Amongst the red-flowered forms with green leaves are *Ferdinand Lambard*, *George d'Harcourt*, *Antoine Crozy*, *Professeur Chagnerand*, and *Souvenir de François Gaulin*. *Diana* and *Ceres* have red staminodia with a yellow claw. *Astræa* is a very fine hybrid between *discolor* and *Ehemanni*, with a large dark purple leaf and red-yellow staminodia. Other hybrids between *discolor* and *Ehemanni* are *macrophylla marmorata*, and *Doyen de Jean Sisley*. And, finally, there are two hybrids between *zebrina* and *iridiflora* called *Laforcarelle* and *Edouard von Regel*.

SUMMARY.

Pure Species.—In considering the origin of the ordinary garden forms the subgenus *Distemon* may be left out of account. The species or forms of this subgenus have never been grown except casually as botanical curiosities. The other three

subgenera, *Eucanna*, *Eurystylus*, and *Achiridia*, have all been cultivated largely, but now in England, France, and Germany, as is the case in *Hippeastrum* and *Gladiolus*, the artificially produced hybrids have almost entirely driven the pure species out of cultivation. A few of the taller *Eucannas* with dark-coloured leaves, forms of *latifolia* and *discolor*, still remain. This does not apply to the Tropics, where *indica*, *glauca*, and *edulis* are still largely cultivated.

Hybrids.—It is evident that these three subgenera can all be made to fertilise with one another. The hybrids in cultivation may be classed in four groups:—

1. Hybrids between the different species and varieties of *Eucanna*. These were very popular twenty or thirty years ago, but are now seldom seen.

2. Hybrids between *Eucanna* and *Achiridia*. I know of one only of which *liliflora* is the *Achiridia* parent. The majority of the *Cannas* cultivated at the present time are crosses between *Ehemanni* and different species and varieties of *Eucanna*. *Ehemanni* is a cross between *iridiflora* and some *Eucanna*, probably *Warcewiczii*. The *Ehemanni* *Eucanna* hybrids have all short tubes, and the yellow ones are doubtless mainly hybrids between *Ehemanni* and *glauca*, and the red ones hybrids between *Ehemanni* and *Warcewiczii*. To this group belong all the *Crozy* *Cannas* I have seen.

3. Hybrids between *Eucanna* and *Eurystylus*. Of these we have little or no experience in England. These forms closely resemble those of the last group, but ought to be more hardy. *Flaccida* is a native of the Southern United States, *iridiflora* of Peru.

4. Hybrids between *Achiridia* and *Eurystylus*. These are very fine plants, as yet but very little known.

PENTSTEMONS AND PHLOXES.

By Mr. JAMES DOUGLAS, F.R.H.S.

[Read September 12, 1893.]

THESE are both very useful plants for the flower garden in autumn, and, as they are very easy to cultivate, should find a place in every garden, large or small. In the following remarks

I shall confine myself strictly to garden varieties—those which have been produced by the skill of the gardener.

THE PENTSTEMON.—Garden varieties are very numerous, and have probably been produced by cross-fertilisation between the two species, *P. Hartwegi* (or *P. gentianoides*) and *P. Cobæa*.

P. Hartwegi is figured in the *Botanical Register* of 1838 from a plant flowered by Mr. Groom, of Walworth, in September of the previous year. It is stated that the plant had come from Belgium, after having been discovered in the first place in Mexico by Humboldt and Bonpland, in cold situations on the slopes of the snow-capped mountain of Toluco, at the height of 10,500 feet above the sea. The *Botanical Register* specimen is poor compared with that figured a year later in the *Botanical Magazine*. The latter is of a bright red colour, and the flowers well-formed. Probably many of the garden varieties have been produced from this plant, being gradually improved by selection.

P. Cobæa has been grown in English gardens for upwards of sixty years. It is also a Mexican plant, and was sent from that country in 1834 by Mr. Drummond, who also introduced with it another highly ornamental species, *P. Murrayanus*.

There are about sixty-six distinct species of Pentstemon, most of them in cultivation in gardens. Of these some are quite hardy, while others, including the garden varieties, often die off in the winter, owing to the fickleness of our climate, the alternations of wet and frost destroying the vitality of the plants.

The garden Pentstemon produces roots very freely, and requires good deep soil to grow in, and an ample supply of rich manure to sustain its vigour. The details of culture may be given in very few words, and to make the matter as simple as possible I will begin with the seed and the cutting. But before the seed can be sown it must be obtained either by purchase or by careful fertilisation in the garden. Seeds are produced in abundance—so freely indeed, that unless the seed-pods are removed they quickly exhaust the plants, and the production of flowers ceases. In order to obtain new varieties cross-fertilisation must be effected by transferring the pollen from one flower to another. This is done constantly by bees, moths, and butterflies, but the insects, of course, flit from flower to flower, and do

not select the varieties. The careful florist selects as the seed parent a plant of compact, vigorous habit, with well-formed flowers, and the corolla of good substance. The flowers of the pollen-parent should be of bright and decided colours; of course the habit and constitution of the pollen-bearing plant is of much importance, but as all good qualities are seldom to be found combined in any one plant, we have to select one plant for one quality, and the other for another, and by uniting the two, distinct and special features are obtained in the seedlings.

The readiest way to obtain flowering plants from seed is to sow the seeds on a slight hotbed in February, preferably early in that month. When the young plants have made a little growth prick them out in boxes or pans, and keep them on the hotbed until they have made a good start. When they are established gradually inure them to a cooler temperature, such as an ordinary garden-frame, and they will be strong plants by the first week in May, and will flower freely in the autumn of the same year. They begin to flower in six months after sowing the seed.

Cuttings should be taken in September, or even as late as October. There are always plenty to be had from the points of the growing shoots. They should be pricked into flower-pots, or merely under frames or hand-lights, and to make sure of almost every cutting forming roots some soil should be prepared of loam, leaf-mould, and sand, in equal portions. About two inches of this spread upon the surface is sufficient to give the roots a fair start. They may be kept in the frames or hand-lights until the spring, and be planted out in the open ground in April.

Pentstemons are well adapted to fill open spaces in the herbaceous border, as a strong plant in May will grow to a large size by September, and produce hundreds of blossoms, and continue to do so sometimes as late as November; but this is only when the seed-pods have been constantly and promptly removed. In dry weather the plants must be well watered. It is also generally necessary to stake them, and if one stiff stick is placed in the centre the side-growths can be drawn up towards it, but not so much as to pull the plants out of their natural form.

The colours of the flowers are greatly varied. Some varieties are white with the merest tinge of rose or pale pink; others

are pale red, and the tints of some are so deep that they may be described as rich crimson or crimson-scarlet. There are also pale purple or lilac varieties, and the shades of colour run into deep reddish purple. Many are streaked and marked with two or more shades of the same colour, and relieved by the interior of the corolla being white or cream-coloured. The spikes of flowers, if cut with long stems, may be used for vases, and they last well in water in rooms that are kept fairly cool.

THE PHLOX.—This handsome garden-plant has been coupled with the Pentstemon because they have many similar characteristics, and much of the treatment of the one applies to the other. There is one advantage the Phlox has over the Pentstemon, and that is in its absolute hardiness. It does not seem to be injured in the least by the severest weather in winter. There are also two distinct types of Phloxes; that is to say, they have been derived from two distinct original specific forms, which probably are not now to be found in gardens. Both are North American plants, the most prominent species being *P. suffruticosa*, established as a distinct species by Willdenow in his account of the plants cultivated in the Berlin Botanic Garden before 1815. It is also included in Pursh's "North American Flora" under the name of *P. nitida*. The plant is well figured under Willdenow's name in the *Botanical Register*, tab. 68; and another variety in the *Botanical Magazine*, tab. 2155, as *P. carnea*. Sweet, in the "British Flower Garden," figures it under the name of *P. Carolina*, tab. 190. The same plant was figured in the *Botanical Magazine*, tab. 1344, in 1811 as *P. Carolina*.

P. paniculata has also been published under numerous synonyms. It is figured in Sweet's "Flower Garden" as *P. cordata*, ser. ii. 13; *P. scabra*, tab. 248; and *P. corymbosa*, ser. ii. 114. But they have become so intermingled by cross-fertilisation in gardens that no florist could, I think, be found who would absolutely identify either. In my own recollection, some thirty-five years ago, the tall late-flowering varieties could be distinctly traced to *P. paniculata*, or *decussata* of the florists, and at that time these were of little use for flowering in Scotland or in the northern districts of England, whilst the varieties of *P. suffruticosa* flowered a month earlier, and were much esteemed as garden flowers. One of them, named

Countess of Home, published in the *Florist* in 1854, is a good type of these early-flowering varieties. But they were not vigorous enough in habit, and had, at least in the South of England, to give place to the late-flowering sorts.

The cultural requirements of the Phlox are very simple indeed, but I am afraid that because it is so easily grown it does not receive the attention its merits deserve. A not uncommon way of propagating the plants is to dig them out of the ground in the spring, chop the stools into three or four pieces with a spade, replanting each of them separately. By this clumsy method the plants will flower, but the spikes produced are poor in comparison with those obtained from cuttings. The best way to deal with them is to take cuttings early in the spring as soon as they have grown an inch or so high; plant each cutting in the centre of a small pot in fine sandy soil, and plunge them in a hotbed. They speedily form roots, and if grown on in frames, and then shifted into five- or six-inch pots, each of these small plants will flower well the same season; and although the Phlox is a hardy border plant it is not to be despised as an object of beauty in the greenhouse or conservatory in autumn. When the flowering period is over the plants should at once be planted out in the open garden where they are to blossom next year, and if they are planted in beds of rich deep soil a space of at least 2 feet should be allowed between each. Plants prepared thus will flower with very great vigour, and are in every respect superior to those increased by division of the old roots.

Every lover of plants who takes a special interest in any particular genus is not content merely to propagate the same varieties over and over again, but longs to produce something new and distinct, and to do this seedlings must be raised. The Phlox is very easily produced from seed, which can be obtained plentifully in warm seasons such as the present 1893. Gather it when ripe and lay it out on a shelf in a dry place until it is quite dried. Sow about the 1st of February in flower-pots or seed-pans, and place them in a frame over a hotbed. By starting thus early the plants may be grown on in boxes, and planted out in the open ground about the last week in April or early in May. Every one of the plants, if well cared for, will flower by the end of the season; and by planting the seedlings about a foot apart, in rich deep soil, a grand display of these beautiful hardy flowers is

obtained at small cost. Both classes, *suffruticosa*, the early blooming, and *decussata*, the later blooming varieties, can be cultivated by those who cannot afford ranges of glass houses, or who do not care to have such in their garden. There is still plenty of room for improvement, both in the size, form, and colour of the flowers; and this is most likely to be best effected by amateurs taking up the work and improving the plants by cross-fertilisation. One of the greatest charms of gardening is the pleasure to be derived from watching the development of the flowers of seedlings. It is necessary to obtain the best varieties in cultivation to start with, for only in this way can the work be carried on from the point where our predecessors were obliged to leave off.

While I was engaged in writing this paper a note came from our Secretary, the Rev. W. Wilks, in which he says: "Pentstemons are perfectly hardy with me. I have never known the winter to kill a single plant, but they are short-lived, and die out of old age every third, or at most every fourth, year. I find the best way is take cuttings every alternate year and replant."

DISCUSSION.

Mr. A. DEAN was of opinion that very beautiful Pentstemons could be obtained by the ordinary methods of cultivation, without having recourse to special means. He did not think it was necessary to sow the seeds in peaty soil, as they germinated by hundreds if sown in ordinary garden-mould. When the time for planting arrived there was no difficulty in obtaining a good supply of vigorous plants, which would in due course give a fine display of bloom for three months. He recommended treating the Pentstemon as an annual. Exceptionally good varieties might be propagated by means of cuttings, and these should be put 5, 10, or 15 in a pot and wintered in a cold house. Mr. Dean was astonished at the recommendation of staking Pentstemons, and thought it was quite unnecessary if the plants were well grown, as they would then be vigorous enough to require no tying up.

In regard to Phloxes, Mr. Dean said cuttings would root freely in a cold frame, would grow rapidly, and produce gigantic heads of bloom. He called attention to the magnificent display of these plants which was to be seen at Chiswick.

Phloxes had now such large blooms that it would be difficult to improve in this direction much more. In the olden times the stems were 3 or 4 feet high, but now, as the Chiswick collection demonstrated, fine specimens not more than 18 inches high were becoming a very common occurrence.

CAUSES OF FAILURE IN EUCHARIS CULTURE.

By Mr. W. IGGULDEN, F.R.H.S.

[Read September 26, 1893.]

THAT there are, and have been, very many failures with the Eucharis cannot be denied, but when it comes to deciding what are the causes of these unfortunate occurrences, then a difference of opinion will be found to exist. That I have formed rather decided ideas on the matter is pretty well known, and if I could have placed the stock of plants under my charge before this meeting, it would have been equally plain that the treatment I am about to advocate cannot be very far wide of the mark. As it is, my word must be taken that they are in perfect health and condition, the only fault being that they are somewhat "leggy," owing to having overgrown their allotted space. Yet those plants were at one time in a very wretched plight, the bulbs being overrun with the mite and tumbling out of the soil if roughly handled.

The mention of the word "mite" will probably at once convey the idea that it is to that terrible bugbear that I, in common with most other writers who have commented on Eucharis failures, attribute all the trouble; but, as it happens, I am of a somewhat different opinion. Whether rightly or wrongly, I hold that the mite is not the cause of nearly so many failures as people think. It is rather the consequence than the cause, and other insects besides mites quickly take possession of the bulbs when in a sickly state. Who has not tried all sorts of remedies for destroying the mite, and yet failed conspicuously in the attempt? The bulbs have been reduced to about half their original size, and then pickled in strong insecticides for several hours, and even

days ; but, presumably, so tenacious of life are these insects that this barbarous treatment does not destroy their vitality, for with the first fresh roots put forth by the long-suffering bulbs the mite also appears with them ; or at any rate they are very soon to be found, but where they come from I cannot say.

If all that has been done to Eucharis bulbs with a view to getting rid of the mite could be condensed into book form, there would be some very curious, if not particularly instructive reading. At Powderham Castle, Devon, my friend Mr. Powell became so disgusted with his stock of Eucharis that he threw the whole lot into a wood at the back of a conservatory. There they remained the whole winter through, and, to the surprise of Mr. Powell and others who saw them, they not only survived, but commenced growing afresh in spring. I saw them some time after they had been given another chance in the stove, but cannot say they looked particularly happy. I have had plenty since that time looking equally feeble, and I know the reason.

The Eucharis will stand a fair amount of hard work and rough treatment before they give signs of becoming sickly, but if once they get into a bad plight they cannot be recovered in a hurry. The wonder is, not that strong plants *do* break down, but rather that they stand so much as they do. Nothing less than three crops of flowers will content the owners of a good stock of bulbs ! The same bulbs may not flower three times in a year, but, all the same, they are treated with a view to cause them to do so—let the consequences be what they may. In order to make them flower at certain times, they are rested and dried off in comparatively low temperatures, being shifted about from one place to another, and in due course suddenly returned into the stove and subjected to a strong heat, the excitement bringing up the flower-scapes in due course. Another favourite practice with those who have a healthy stock of plants is to shake them out clear of soil every spring, sorting over and repotting as they think fit. This has the effect of bringing up the first batch of flowers quickly, two more crops during the season being obtained by the drying-off, resting, and exciting process. This, and the practice of repotting less often, but including the other part of drying off and resting in low temperature, may answer for a few years, but, sooner or later, the “pitcher goes to the well once too often,” and then the mite is heard of.

Whether or not the *Eucharis* in its natural home is dried off at one time and flooded with water at another I am unable to say, and in any case it does not affect my argument, for the simple reason that gardeners are supposed to improve on, not imitate, Nature. That the *Eucharis* does like plenty of water I am well aware. The bulbs will thrive well and flower in nothing but water, but this must not be cold or stagnant, or the points of the roots will die, and then the whole of the strongest roots will soon follow suit if the water is not quickly changed. To a dose (or probably several doses) of cold water is attributed the failure of the finest pots of *Eucharis* in the West of England, the said pots being as much as two men could lift, and filling the centre of a large span-roofed house. I saw them in their prime. I have seen them since their fall, but this time the mite is not blamed.

If the pots are well filled with roots the mite may be defied, but the question is how to attain this desirable end. When once there are mites in the bulbs they are most undoubtedly very difficult things to restore to a clean, healthy state. But may not the weak root-action which makes them so very liable to attacks of mite be due to the bulbs being already and previously in an enfeebled state? All, or nearly all, other bulbous-rooted plants are potted or repotted when in a dry and almost rootless state, and some cannot be relied upon to flower properly unless prevented from forming top-growth before the pots are well filled with roots. Contrast this treatment with what the poor *Eucharis* has to put up with. The latter are shaken out when in full leaf, repotted, and allowed to flower, if they will, almost directly after. In some cases the bulbs are equal to supporting the leaves and flower-scapes, and also to the formation of fresh roots, but more often than not it is the flowers that get the best of it, the leaves and roots faring very badly indeed. Pots of such poorly established plants only want to be dried off just as they are beginning to gain some strength to complete their temporary or permanent ruin—and then once more the mite is the scapegoat. Flagging leaves do not assist the roots, but rather contrariwise, and those bulbs become the most surely and quickly re-established in fresh soil that have their leaves all cut off prior to repotting.

No fanciful composts are needed; they are a mistake in fact.

Good fibrous loam, with some sharp sand and a 7-inch potful of bone-meal, and rather less of soot, added to every barrowful suits them well. I cannot always get good yellow fibrous loam, and object to the more spongy light fibrous soils. What I have of late years found to answer remarkably well is a yellow loam without a particle of fibre in it, lime being substituted for the soot. It need hardly be added that the drainage of pots is both heavy and good, moss being used to prevent the fine soil from clogging the crocks. If I soaked the bulbs in anything previous to repotting them it would be in clear water for not less than two days, this being quite as likely to drive out or destroy the mite (if there) as any strong insecticide, and that, too, without running the risk of injuring the bulbs.

I hold that the most critical time in the life of a *Eucharis* is during the first six weeks after being repotted or shifted from smaller pots to larger ones. If once the fresh soil gets soured from being kept too moist the plants will never thrive in it, and that is a strong point against the plan of frequently repotting. It may answer well when the man in charge knows what he is about, but entrust the watering to a careless hand and failure is most likely to occur. A brisk bottom-heat ought to hasten root-action, but I do not like it nevertheless. It is the plunged plants that are most likely to get too much water, and, seeing that the *Eucharis* can be grown equally well, or even better, without this aid, it is well to dispense with it. The fresh soil should be kept just moist till well filled with roots, when water may be given more freely; but not till the roots are interlacing each other ought liquid manure to be given.

All the foregoing details may be carefully observed, and yet so fickle are the plants that they will fail to do well if other conditions are not exactly to their liking. They have their favourite sites, and, once these are found out, be content to "let well alone." To be plain, if a certain house, or part of a house, suits them well, avoid shifting them to other quarters as much as possible. That suitability of house or position has much to do with successful culture is proved by the fact that many good gardeners succeed well with them in one place and fail badly in another, or in a fresh garden. Modern plant-stoves do not suit them, as a rule, nearly so well as do the older structures in which there is very much more woodwork and comparatively small

squares of glass. In my case several sites were tried, till at last it was found that a Pine-pit—that is to say, a large pit in the body of a low, flat-roofed house—suited them admirably. According as the Pines were fruited, the stock was got rid of, and more space given up to the Eucharis, till at last the whole of the pit was filled with them and *Pancratiums*. The roof is wholly covered with a *Stephanotis*, and, in addition, a blind is run over whenever the sun shines brightly. According to my ideas, the Eucharis must have plenty of shade, as well as heat and moisture; sunshine striking fiercely on the leaves quickly takes a great deal out of them. Too little shade is, then, another cause of partial or complete failure.

I should further state that a staging is placed over the bottom-heat pipes in the pit alluded to, this being heavily covered with cinders, and the pots set on or blocked up on this. Water being frequently distributed between the pots, the plants are never subjected to a dry heat, and can be examined as often as need be. When the pots are well filled with roots (and most of our larger specimens have been in the same pots three or four years, pulling to pieces and repotting being thought preferable to giving shifts) clear soot-water is frequently given them, and occasionally very weak lime-water, by way of a corrective to sourness of the soil. But the use of anything, such as badly prepared soot-water, that will clog the surface of the soil ought always to be avoided.

Thanks to the arrangement of bottom-heat pipes, we have only to shut down the valves connected with these to considerably lower the temperature of the house, and this, coupled with the application of rather less moisture at the roots, is all the resting necessary. In about three weeks we have only to suddenly raise the temperature of the house, say to about 70° by night, with a slight increase in the daytime, to cause the bulk of the plants to flower strongly. As it happens, large numbers of flowers at one time are not often wanted, and I prefer to have a few almost constantly. These can be had by being content with moderately high (or ordinary stove) temperature all the time, keeping a few plants on the dry side for about three weeks being all the rest they appear to require.

I am convinced that it is the practice of shifting plants from one place to another and drying off recklessly that leads to many failures. If this method of resting the plants cannot be de-

parted from (and I do not dispute the fact of its answering well in some places), then take particular care that the resting or drying-off is not commenced before a batch of young leaves have had time to mature.

Another very frequent cause of failure has still to be touched upon, and that is mealy-bug. If there are any of these pests in the place, it will not be long before they find their way to the Eucharis, and, once established, they are not easily got rid of again. We find syringing the *Stephanotis* and other climbers with clear soot-water an excellent remedy for mealy-bug, and it will keep the upper surface of the foliage of the Eucharis growing underneath quite free from these insects. Syringing with soot-water frequently among the pots and wetting the underside of the leaves also does much good, but it is not quite enough. This remedy, though not complete, is perfectly safe, and that is more than can be said of others too often tried. Either dipping in or sponging with a strong insecticide—notably any with a suspicion of petroleum about it—is most harmful; at least it has proved so in my case. The great succulent leaves of the Eucharis are most porous, and, consequently, very susceptible of injury from strong insecticides. It is also my firm belief that the roots are equally tender, and insecticides, finding their way down to them, do much damage. If my experience is any criterion, more Eucharis are badly crippled by remedies applied with a view to getting rid of mealy-bug than from any other cause, not even excepting the mite. If once the foliage is crippled, or the roots destroyed, the Eucharis grower's troubles may be said to have fairly set in. Let me strongly advise that there should be no dipping of the plants infested with mealy-bug in strong insecticides, as it is very certain that anything that is powerful enough to kill the insects will at the same time greatly injure the plants. Sponging the leaves with strong insecticides ought also to be avoided. Sponging is undoubtedly one of the best remedies, only it should be done carefully, thoroughly, and with clean, warm soft water, in which only a small lump of soft soap has been dissolved, or, say, not more than one ounce of soft soap to a gallon of water. A very effective remedy, long since practised by a friend of mine, was to cut off all the leaves and stalks and have a fresh start, and this will answer well if no other occupants of the house are infested with the mealy-bug.

PEARS.

By Mr. W. CRUMP, F.R.H.S.

[Read October 10, 1893.]

THERE have always been conflicting testimonies concerning the merits or demerits of certain Pears, and probably there always will be differences of opinion; but this is not greatly to be wondered at when we consider the varying character and composition of soils, the extremely subtle influences of stocks, the elevation, shelter, and other different climatic surroundings under which cultivators find themselves situated.

Especially owing to climate, the cultivation of Pears in this country is, and always must be, a somewhat precarious business; although, on the other hand, it is equally certain that there is no other English-grown fruit more highly appreciated by the public, and the demand for good, moderate-priced Pears is enormous and ever increasing. It is more than remarkable to notice, on the one hand, what a demand there always is for luscious, wholesome Pears, especially among railway travellers, and to see, on the other, how inadequately the purchasing public are served, for there is nothing more thoroughly refreshing or so highly appreciated on a long dusty journey as really good juicy Pears.

Pears may be classed in three distinct sections, viz. : First, imported Pears and choice dessert Pears grown under glass, or with the assistance of walls; secondly, the ordinary Pears of commerce as grown on standard or bush trees in the open air in favoured counties; and, thirdly, the little, hard, indigestible Pears grown solely for the manufacture of that very wholesome beverage, perry. In passing, it may be observed that in these days of universal depression the manufacture of perry, and cider also, is receiving very considerable attention from intelligent growers of fruit. Scientific principles are being applied, inferior fruit is economised, and a better article is produced than hitherto, and one certainly more wholesome than the cheap foreign wines with which it is intended to compete.

As regards dessert Pears, in size and appearance it is fairly certain we shall never be able to compete successfully outdoors with the superior climate of France and the Channel Islands, or of California, in the production of large fruit of first quality, especially in the case of Duchesse d'Angoulême, Beurré Magni-

fique, and similar varieties. The last-named and Beurré Clairgeau are from foreign sources, so infinitely superior in flavour to the same kinds grown in England, even under the best cultivation, as scarcely to be recognised as the same when compared. On the other hand, however, there are some of our best early Pears, notably the Bon Chrétien, which greatly deteriorate in flavour when grown on south or west walls in the southern, western, or midland counties of England. Though doubtless improved in size and appearance, they have really no comparison whatever in flavour and juiciness with similar fruits grown on bush trees or standards. It is a waste of wall-space to plant early kinds, and the best sites and aspects should always be reserved for those later kinds which require some assistance and a long period of growth to develop their most desirable juices, instead of that hard, indigestible grit so commonly met with in late Pears.

It is possible that a house of very late cordon Pears would be found the best thing, and certainly it would be an interesting novelty to the amateur, and possibly preferable to the bush trees of an orchard-house, especially if cordons were trained close to the glass. Such a house need not be an elaborate or expensive structure; but it must be artificially heated and abundant ventilation provided, in order to prevent a damp, stagnant atmosphere, which is almost a worse enemy than frost during the flowering period. Amongst other kinds for this purpose, I should recommend Beurré Rance, Beurré l'Inconnue, Van Mons, Beurré de Jonghe Beurré Diel, Easter Beurré, Marie Benoist, Chaumontel, Knight's Monarch, Bergamotte d'Esperen, and Ne Plus Meuris, all of which in certain seasons fail or are unsatisfactory on our walls, apparently wanting sufficient warmth to thoroughly ripen and develop their qualities.

The ripening of Pears is of supreme importance, and, in order to assist this operation, it is necessary to maintain a kind of reciprocal balance between root and branch. To better illustrate my meaning, we may fairly accept the theory that the fibrous roots that are to be found near the surface, assisted by the solar warmth of the atmosphere, supply the tree with its fruit-forming requirements, whilst the deeper, gross-feeding roots send up the crude wood-forming elements. With the Quince stock there is no difficulty in securing an abundance of these desirable fibrous roots, and nearly all Pears will either succeed on this stock, or

by first grafting on it a kind that does succeed and afterwards regrafting the refractory kind thereon. It is not so easy, however, to secure these fibrous roots in the case of the "free" or wild Pear stock, unless the stock be rigorously dealt with in its youthful stages, converting their natural stubborn tap-roots into fibrous-forming ones by regular annual, or at least biennial, lifting and relaying.

In the case of standard or orchard trees free stocks are indispensable, as some strong roots are required to withstand wind, &c. Moreover, the free stock is the best for light, sandy soils for all forms of trees, cordons only excepted.

For horizontal or other trained trees on walls the free stock also answers well; but it is absolutely necessary in most soils to lift the roots from the subsoil frequently during the first few years of their existence—not to be pruned off, but to be relaid in a more horizontal position nearer the surface, working in a little fresh loam from time to time; it is best done in November. This beneficial operation is generally neglected (especially by amateurs) until the roots have become so large and stubborn, and the wood so gross and unfruitful, that the severity with which the operation has then to be performed often throws the tree into a state of chronic debility from which it seldom recovers. Hence the disrepute into which root-pruning has fallen, and the failure which in so many instances attends Pear cultivation.

It is astonishing what liberties may be taken with the roots of Pear-trees, and with infinite advantage to the crop, when done at the right time of year and in a judicious manner, more especially where the subsoil is strong and heavy. Indeed, to plant Pear-trees on free stocks in the rich soil of a garden, and allow them to grow on unchecked for some years, only produces trees with strong, deep-rooting tap-roots, almost fibreless, which continue to pump up ever so late in the season a quantity of crude sap into the already gross wood, which wood can never ripen, and therefore it seldom bears fruit. Such a system of cultivation—if indeed it can be called cultivation—always ends in disaster and disappointment. No pains should be considered too great to lay a good foundation of fibrous roots, and no trouble should be spared afterwards to maintain these fibrous roots in a healthy condition and near to the surface by suitable manurial mulchings, and the judicious use of liquid nourishing stimulants.

A change of diet is also recommended from time to time, such as farmyard liquid (diluted), house-sewage, soot, guano, fish manure, &c. ; but amongst the artificial fertilisers I have found nothing to equal an occasional application of muriate of potash and superphosphate, mixed together in the proportion of one of the former to two of the latter. About two ounces to the square yard should be applied on the surface. These fertilising agents undoubtedly induce fruitfulness, without an undue amount of wood-growth. On wet clay land a lesser quantity may be used. In a hot, dry season like the past any kind of salts have been useful to keep moisture in the mulchings, as well as maintain a healthy fertility in the surface soil, so acceptable to the hungry roots.

In most cases it is more satisfactory to grow a few sorts of Pears well than to attempt a quantity of different varieties and only half do them, thus realising the homely truth of an old saying, that "the gardener who places first-class fruit on his employer's table covers a multitude of minor imperfections;" and as my motto is always "quality before quantity," my favourite method is to grow the best mid-season and moderately late varieties as single cordons, obliquely trained on walls of various aspects, on Quince stocks, planted 18 inches apart in a narrow prepared border consisting of turfy loam, old mortar rubbish, a few half-inch bones, and chopped rags. The different varieties should be grouped together in quantities, and as far as possible arranged in their respective order of ripening. Cordon trees are inexpensive, early in bearing, can be easily replaced, require only moderate attention, with a minimum of pruning or root-pruning, and, if protected when in bloom, can nearly always be relied upon to return crops of perfect specimens of the very highest quality, which is more than can be said of the old fan-trained and gridiron trees seen on the walls of the majority of gardens, whose crop generally consists of a few fair fruits growing at the extremities of the branches, and the middle of the tree nearly barren.

The best varieties for cordon planting on walls are as follows : Louise Bonne of Jersey, Marie Louise, Beurré Superfin, Triomphe de Vienne, Doyenné du Comice (the best Pear in the world), Pitmaston Duchesse, Thompson's, Princess, Winter Nelis, Fondante d'Automne, Glou Moreceau, Beurré Diel, Hayshe's Victoria, Passe Colmar, and Josephine de Malines.

Early varieties also succeed very well as single cordons planted on the margins of walks and trained overhead to form an arched avenue. They are thus both profitable and pleasant to look upon, especially when they are carrying valuable cargoes of rich ripe fruit. Some of the best varieties for this purpose are: Beurré Giffard (the best early Pear), Beurré de l'Assomption, Clapp's Favourite, Doyenné Boussoch, Williams' Bon Chrétien, Emile d'Heyst, Madame Treyve, Beurré d'Amanlis, Dr. Jules Guyot, Magnate, and Souvenir de Congrès. These same varieties also succeed well as dwarf open bushes, or as pyramids on Quince stocks. Beurré Hardy makes a splendid bush, very handsome, planted 9 feet apart on the margins of walks, or in an open sunny quarter of the garden, planted in quincunx order, 9 feet each way, and this will often be found the most convenient arrangement for netting against the attacks of tomtits and other destructive birds during the ripening period.

It is not every man who calls himself a gardener who understands pruning. We have ample proof of this in many gardens where the average jobbing gardener is employed. Pruning is an operation that can only be learnt by long training and patient experience, and by a study of the differing habits and requirements of different varieties of Pears. For instance, some are naturally of erect growth, others open growers; whilst others, again, partake of a partially drooping character. There are also those kinds which form some of their best flower-buds on the extremities of their branches, notably Marie Louise, and therefore each sort, or each group of sorts, requires different manipulation and individual consideration.

I have touched upon pruning because, before we can get good Pears, it is absolutely necessary we should have good trees. The skilful pruner will always carry his mind well forward and be careful to lay the foundation of a good model tree. In the case of bush, pyramid, or standard trees in the open, every branch should have sufficient space allowed it to form itself into a well-furnished, cordon-like style of branch, with fruit-spurs regularly placed from the base to the summit. Avoid over-cropping. When once the balance is struck, pruning of whatever kind will be reduced to a minimum. At the same time, the fact must not be overlooked that, to maintain Pear or other trees fruitful and healthy for any length of time, *some* extension of growth must

be made, and allowed to remain, year by year. The systematic pruner will therefore look ahead and periodically train in some portions of new growth—such shoots as spring from suitable positions near the base—which are intended ultimately to take the place of old and exhausted branches. This adds vitality and longevity to the tree; whereas a tree whose growth is too closely restricted soon collapses.

For convenience and expediency pruning may well be done just before the leaves fall, with a final going over in spring immediately the fruit is set and the state of the crop can be seen. The useless spray growth should be always removed from the middle of the trees early in August.

If stewing Pears are required, Catillac, Uvedale's St. Germain, Grosse Calebasse, Beurré Clairgeau, and the Black Pear of Worcester will be found suitable grown as orchard standards.

In some of the Worcestershire orchards there are found patriarchal old trees with quite local names, such as Swan, Hunter, Smoky Jennet, &c. The fruit of these is small and of poor quality, but very early, and they are much sought after at remunerative prices by costermongers and other small dealers in fruit. The origin of these Pears is very obscure, having died out of commerce; earliness is their only feature. In these same orchards perry Pears are represented by sometimes giant trees of Barland, Oldfield, Taynton Squash, Longland, Huffcap, &c. Evidently very few of these sorts have been planted within the last half-century; but latterly they have again come into demand by farmers and others, who find it more profitable to grow cider and perry fruit than corn and other farm produce. A good brand of choice perry will sometimes fetch 20s. to 28s. per dozen reputed quarts, the ordinary perry being sold in bulk wholesale at 1s. to 1s. 6d. per gallon.

Reverting to dessert Pears, we have not yet touched upon open orchard standards, which supply costers' barrows and the small shops which retail for the million. The one Pear, *par excellence*, for this purpose is Williams' Bon Chrétien, although Jargonelle, Hessle, Lammas, Windsor, Bishop's Thumb, Swan's Egg, Capiaumont, Louise Bonne, Marie Louise, Fertility, and Josephine de Malines, all contribute to this popular medium of distribution. When once these sorts begin to ripen, the bulk must be consumed within a few days, as over-ripeness and

rotteness quickly set in. This very season I have known some of the above-named kinds sold wholesale at 3s. per pot of 80 lbs. net, and I have afterwards seen the very selfsame Pears ticketed up at 2*d.* each in railway refreshment-rooms! Now as there would be at least three Pears to a pound, a profit of something over a thousand per cent. has to be accounted for between leaving the grower's premises and reaching the consumer! Surely, then, some alteration and improvement in the method of distribution is urgently needed.

The gathering of Pears at the proper time requires close personal attention, and no general rule, applicable to all kinds alike, can be laid down; but there is one fairly safe test when they may safely be picked, viz.: by lifting the fully developed fruits individually from the perpendicular (or natural) position to the horizontal, and if the fruit is quite fit to gather it will part easily at the stalk. If it does not part freely, it is much better to wait a few days, for at this particular stage the fruit swells very rapidly, and the rich, saccharine, juicy flavours are being developed and perfected. Moreover, Pears gathered too early never keep well, but, on the contrary, become tough and shrivelled. In order to make the most of Pears, it is recommended to make two or more gatherings from each tree, applying the aforesaid test of ripeness at intervals of three or four days, and these deferred gatherings by instalments will prolong the season of their respective kinds, which proves a considerable advantage.

The matter of storing is also of primary importance, and there can be no doubt that choice varieties of Pears, like choice wines, should be kept in an always even and equable temperature, neither too damp nor too cold; yet I have always observed that when kept beyond their normal season it is at the expense of their flavour. If the storage at command is of a damp and very cold nature, or of fluctuating temperature, it very greatly improves the fruit to place it in a closed box and remove it to the warm temperature of a hothouse for a few days before it is required for consumption; especially is this the case as regards the late sorts. Nests of roomy drawers for separate sorts, in a moderately even and dry fruit-room, is, I think, the best storage.

A word or two must be said about the insects to which the Pear is subject, and my experience has been of the most varied and perplexing character.

It seems that certain seasons, or other unknown climatic influences, are favourable to the propagation of certain species of insects. So much is this the case that at times the insects seriously threaten the crop, and their attacks are so persistent as to baffle the gardener's most patient and plucky attempts to defeat them. And no sooner has one become familiar with the habits and compassed the destruction of one species, than probably in the very next season another kind of insect springs into existence, and in numbers quite overwhelming, and of totally different habits. We have already had considerable experience with the winter moth (*Cheimatobia brunata*) and his allied species, but we have so far conquered him and been able to cope with his attacks, either by the precaution of grease-banding the trunks of the trees in the winter or by spraying the leaves in the spring with a solution of "Paris green."

Our latest and most formidable foe, although less significant in appearance, whom we have had to battle with the last two seasons, and so far without the least sign of success, is a small gnat-like fly, or midge, named *Diplosis pyrivora*, or *Cecidomyia nigra* of some entomologists. I have consulted some of the best authorities on entomology, and very valuable information has been supplied by Miss Ormerod, Mr. Whitehead, of the Board of Agriculture, and others. Professor Riley, in some official reports, quotes the observations of Schmidberger, who says: "The number of eggs these midges lay varies from one to thirty, which hatch in warm weather in four days from being laid. A gall midge has been seen with its long ovipositor (which is longer than the rest of its body) inserted in the side of the blossom before it opened, and generally it lays its eggs in the middle of one or more blossoms by piercing the petals. Before the blossom is expanded the larvæ descend to the core, remaining there until the inside is exhausted. They generally leave at a rainy time, coming out to the exterior by cracks or by boring, from whence they spring to the ground, but oftentimes remaining till the fruit falls." Mr. Whitehead says: "The female fly is about one-twelfth part of an inch in length, and places its eggs in the flower part of the fruit just as it sets, or before setting. The larvæ from these follow the pistils into the ovary, feeding upon the tiny fruitlets, and may be found burrowing into the flesh. After a while they work through the calyx or some crack

and fall to the ground. The larvæ generally go into the ground about the middle of June, varying with the season. They pupate after a while and remain till the spring following, there being, happily, but one generation. It would seem the only remedy is to pick off the infested Pears, which may easily be seen, before the larvæ have escaped, and destroy them. The larva is yellowish, about one-twelfth of an inch long, and has the power of skipping. The fly is dark grey or blackish. The larva burrows into the ground about an inch, and soot, lime, or other caustic and offensive substance is recommended to be forked in around the tree." Such is a lucid description of the history, but how to successfully combat such a minute insect in one of his favourable seasons is a problem I have not yet been able to solve. This season I have counted as many as twenty-seven of the yellowish maggots inside a single young fruit, and every one of the pears on well-set trees has contained one or more maggots, thus causing the entire loss of the crop. Marie Louise seems a favourite sort for this pest's attack. At first the tiny Pears do not show signs of the fatal injury, but, as swelling progresses, the little fruits become deformed or irregular in shape, their colour changes to sickly yellow, and ultimately they drop off wholesale. We were badly attacked by the "Diplosis" in the spring of 1892, so much so that we resolved to make a vigorous onslaught on him. All the fallen Pears, and those infested on the trees, were collected and burnt, and to make sure, as we thought, in the early autumn we scraped off all the loose soil to the depth of two inches and beyond the diameter of the branches, wheeling it right away, and replacing with fresh loam. We served all the garden trees thus, and hoped to have entirely cleared out the chrysalids then dormant. But, behold, after all this trouble, how great was our disappointment to discover in the following spring we seemed to be even worse attacked than before! We can only surmise that adult insects came on the wing from other trees in the neighbourhood, which only adds to our perplexity—how to prevent future attacks. The only remedy we can imagine will be to syringe the trees daily with some form of mild, but not volatile, insecticide; probably soft soap and quassia would be sufficient. This would require to be done from the time the flower-buds were just visible until the flowers open, when it must cease for the obvious reasons of setting.

THE ONION.

By Mr. A. DEAN, F.R.H.S.

[Read October 24, 1893.]

UNQUESTIONABLY the Onion is entitled to rank amongst the oldest of cultivated garden vegetables. Except that the ordinary garden forms are derived from *Allium Cepa*, it is not absolutely certain as to its native habitat; but M. Regel, junr., having discovered in Turkestan a bulb which had every appearance of the wild Onion, that incident has led to the belief that *Allium Cepa* is a native of that portion of Asia. M. Vilmorin, in his admirable book "The Vegetable Garden," tells us that it has also been found in the Himalayas. How very interesting, therefore, would it be now could we have before us for comparison bulbs of the species and the giant Onions of to-day! The same authority tells us that the culture and use of the Onion dates back to remote antiquity, its strong flavour being in man's somewhat barbaric period evidently much appreciated, and it seems to have been carried for cultivation into every part of the world. But of cultivated forms of the *Allium*, the common Onion does not stand alone. Perhaps to-day the next most popular is the Leek, the national emblem of Wales, and so much appreciated in Scotland; also here now becoming very popular, not only because its culture is perhaps better understood, but also because in the fine varieties of to-day we have such as present most acceptable food when properly cooked. Whilst the Onion has been encouraged to make bulb or base, the Leek has equally been encouraged to eliminate base or bulb, and to develop stem, so that now we often see these latter perfectly blanched, of snowy whiteness, and from twelve to fourteen inches in length. The Leek is *Allium Porrum*, and declared to be a native of Switzerland. However, that one form affords of itself ample material for a paper of this character. The Shallot, the product of *Allium ascalonicum*, a native of Palestine, next commands attention, as being widely grown. This still has wide popularity for its pleasant nutty flavour, is very easily grown from year to year from small cloves or bulbs, and is found in nearly all good gardens. A very old Onion is that known as the "Potato" or "Underground," derived from *Allium aggregatum*. It very much

resembles the Shallot in habit, growth, and increase, the bulbs or offsets planted in November throwing off several others in the ensuing year, and ripening off early. This form is seldom grown in gardens now. The common Garlic (*Allium sativum*) was once widely grown, but now is seldom found. It is of such very strong, rank flavour that more cultivated tastes on the part of humanity would seem to have rendered Garlic unacceptable as a flavouring ingredient. This is grown from cloves or offsets planted both in the autumn and spring. The Rocambole (*Allium Scorodoprasum*), a native of Denmark, is now much less cultivated than is the Garlic. The stems will produce clusters of bulblets at the top, and these may be saved and planted in due season. Ordinarily, however, the cloves of the underground bulbs are best for planting. There is one more section of the cultivated Onion that needs reference. This is the tree form, one that is very curious and interesting, and where grown now it is generally more as a curiosity than otherwise. This is from *Allium proliferum*, and there would seem to be two forms—the Egyptian and the Catawissa. Both throw up from the planted bulbs stout stems as do the common Onion; but whilst the latter produces clusters or head of flowers and seed, the former produces clusters of bulblets of a brownish-red colour; and sometimes from strong ones of these other stems will break out and produce much smaller clusters of bulbs. All these will keep for planting to form new stock. Whilst the Egyptian form produces a new tier of bulbs rarely, the Catawissa, which is a somewhat stronger grower, will do so commonly. Neither variety has special usefulness to recommend it. The Welsh or pipe-leaved Onion (*Allium fistulosum*) is perhaps less known than any other, and is only mentioned to show that it sometimes ranks amongst cultivated forms.

Now the object of this paper is not the furnishing of a mere *résumé* of forms or species. We propose to limit what further is said exclusively to the Onion proper of our gardens and commerce, and of which so many wonderfully fine examples are shown to-day. Amongst the various subjects which from time to time undergo the somewhat severe ordeal of a trial at Chiswick, Onions have this year been included, and, in spite of a season that has proved to be of exceptional difficulty to all Onion growers, the trial of numerous varieties proved to be a very successful and

satisfactory one ; and whilst in hardly any case did seed fail to germinate, still further, maggot or mildew, the two chief pests of Onions, gave very little trouble. The bulb produce was good—in some cases very so ; not large, but even, firm, and especially expository of the merits of the respective varieties. The Fellows of the Society generally perhaps do not visit the Chiswick Gardens so frequently as they might, and when there do not, perhaps, take that technical interest in trials, or other matters conducted there, which they should. Especially, no doubt, would a trial of Onions prove unattractive to the bulk, but, happily, there are some members who can find in anything horticultural, however unattractive or humble, material of interest ; and thus even an Onion trial has found admirers. Indeed, as Onions are of two diverse sections, those suitable for spring sowing and winter keeping, and those for autumn sowing, and are short-lived, a further trial of this latter section has already commenced, although some were in the trial to which allusion is made. Now out of some forty so-called varieties in fifty rows—for several were duplicates—the members of the Fruit and Vegetable Committee, who attended at Chiswick on summons at a specified date for the purpose of deciding on the merits of the respective sorts, did for the honour of three marks select seven, some old, some new, or at least reputed new. In awarding such the Committee put aside every partial or preconceived impression, and judged of what was before them purely by their merits as presented, and for this unbiassed action they have been severely taken to task. The criticism is amusing, because it comes from sources that are evidently strongly partisan, but it would be an evil day for the Royal Horticultural Society were its committees, who should be in their awards absolutely honourable and courageous, to be pressed or otherwise intimidated from doing what is but right and just by any external influence. When it is remembered that at the Vegetable Conference held at Chiswick in 1889 Certificates of Merit were awarded to no less than twenty-two Onions diversely named, it surely should have been regarded as an exhibition of high virtue and severe self-restraint that this year only seven varieties were “*Highly Commended.*” Passing from this somewhat contentious theme to the consideration of Onions in their diverse forms and varieties, we find them divided into flat and globular or round. In these forms there are,

however, variations, as some flat Onions have very flat or almost concave bases—such as is seen in Rousham Park Hero, a large form of the White Spanish—whilst others have deep or convex bases, adding materially to thickness and weight. Both these forms may be found in the Onions to-day exhibited. Then there are the globular or round forms, which again have distinctions, as whilst some are roundish, others are almost egg-shaped, or spherical, whilst others have almost pear shapes. These forms practically include all that are in commerce. But these distinctions are trifling where so many so-called sorts are concerned, and we have to fall back, so far as relates to many of them, upon colour of skin or coating in which the bulbs are encased. These colours are white, or the silver-skinned, as found in the little pickling Silver-skin of gardens, the precocious Queen and Early White Nocera, the White Lisbon, White Tripoli, and White Globe. It is worthy of note that none of the white-skinned varieties are keepers, excepting, perhaps, the globular White Portugal, a variety not much known in this country, but which has thicker skin than is usually found in these Onions—hence is a better keeper. The Queen Onion, the very earliest of all to bulb from seed, is yet very hardy. I have had it when, owing to a wet, cold summer, it failed to ripen fully, to stand the winter, and then throw up seed-heads the following year, and then—to verify what M. Vilmorin says in his book as to Onions sometimes becoming other than biennial—have found some bulbs to clove, or divide, remain green all the winter, and then carry a second crop of seed the following year. M. Vilmorin describes nine that seem to be to him diverse varieties that have white or silver skins. One of the most striking additions to this class is the Southport or Silver Globe, a beautiful bulb, but a poor keeper.

Next we have the so-called White Spanish, or really brownish white-skinned forms, of which the old White Spanish is the type. The report of the Vegetable Conference classes under this section no less than nineteen named sorts, many of which bear unquestionably singular resemblance to each other. I will not recapitulate the names, as they may be found in the *Journal* of the Society, vol. xii., Part I., 1890, p. 84. These are all of the flat section, but have since received several notable additions. Of the globular varieties there are twelve, to which section also others have been added, and of these very perfect examples

are found in Cranston's Excelsior, Deverill's Cocomat, the Sutton Globe, and the Southport Yellow, and the largest of the section is the huge, but not always handsome, Ailsa Craig. There is also the red-skinned section, not a large one happily, including bulbs that are both flattish and round, the former being represented by the old Blood-red, never a large bulb, deep in colour, and very firm; and the latter by the Southport Red Globe, or Crimson Globe, bearing bulbs double the size, very handsome, and a capital keeper. It would be extremely interesting did any vegetable physiologist seek to explain the reasons why white or silver-skinned Onions should be the earliest to decay, and the red onions the longest to endure. In the case of the yellow or brown-skin section, the browner the skins usually the better the keepers. But of this very large and widely cultivated section there is one fact in relation to keeping qualities that admits of no disputation. It is that the globular or deeply spherical bulbs always prove to be the best keepers. So well known is this fact that such varieties as James's Keeping, Brown Globe, and Bedfordshire Champion have for ages almost had the best keeping reputations, and these seem to be maintained by the finer spherical or globular varieties that are in gardens largely superseding them. Here we have again an interesting problem presented, which we would like to have solved—why it is that the conical or globular form of bulb should thus prove so enduring, whilst the flatter the bulb the sooner does it decay. Of course it is well understood that endurance or keeping properties are intimately associated with proper ripening or maturing of the bulbs; but when flat and globular forms are grown side by side, and under the same treatment, it becomes obvious that other causes must enter into the solution of the problem, and it may be found in the harder, firmer flesh of the globular Onion, which would thus relatively contain less of water than do the flat, broad, thinner Onions. Many years ago so much of stress did gardeners lay upon the securing of keeping bulbs that such a variety as James's Keeping was universally grown. Still further, light soils were held to be so conducive to the production of thin cellular tissue, and also a greater proportion of water in the bulbs, that ground, after being prepared by digging and manuring, was rolled, trodden, and relevelled; then drills were literally beaten out with the aid of stout half-bent stakes, in order to render the soil exceptionally firm. Such a

practice is never adopted now. All the same, some of the finest crops of Onions I have seen have been produced on fairly stiff soil. That is notably the case every year at Hackwood Park, where the large Onion-bed, from seed sown in March, and in rows 14 inches apart, becomes in the autumn a remarkable sight. Last year the produce was 80 bushels of fine, clean, serviceable bulbs on about 15 rods of ground. And this year there were 70 bushels on the same area, giving at this ratio the enormous crops of 800 bushels and 640 bushels per acre, which, sold at the very low price of 2s. per bushel only, would give the splendid return of £80 and £64 per acre—a truly wonderful result. The fact is worth mentioning as showing what sorts of Onion crops are possible on well-prepared and manured stiff, holding soil. The trial crop of onions at Chiswick was much below either of these averages; but then the Chiswick soil is exceptionally light, and under the circumstance the crop was a really good one. I have not by me any reference to the sorts grown at Hackwood last year, but those grown this year—when with moister weather the crop would no doubt have been 20 bushels heavier, so good were the samples produced—were Maincrop, Bedfordshire Champion, Ne Plus Ultra, Sutton's A1, and the Sutton Globe. There is very little to be said in relation to what may be called the ordinary culture of Onions that is new. In all our horticultural writing and essays we are compelled to admit the force of the old axiom, "There is nothing new under the sun." But that being so, it does seem still perpetually needful to reproduce the old stories, the old ideas, the old and often unexcelled practice, which has in the past won in gardening such triumphs and produced such splendid results. I do not say that we have nothing new in culture to learn, but what I do say is that present practice, based upon that of a century ago, shows that development is slow, and is based more on material than it is on method. But if we have only in the most trifling degree departed from the practice of our forefathers in Onion culture for ordinary purposes, we have certainly done so in relation to the production of what are now termed show or exhibition bulbs. The gardener or competitor at shows who has failed to produce Onions under the newer method, howsoever handsome, firm, clean—nay, even beautiful—his bulbs are, will

find that he is quite out of the running, because his competitors have, under the modern system of culture, produced bulbs that are twice, thrice, or four times bigger than his are. The practice to which I refer is summed up in a few words. Sow seed in warmth early in January, transplant the seedlings into pans or boxes so soon as 3 inches in height, grow on in warmth until the plants are doubly strong, then stand them in a cooler house or frame to gradually harden. Some, perhaps, may be put singly into small pots. In any case, towards the end of April, the plants being stout, hardened, and each having a mass of roots, are transplanted out on to warm borders or in sheltered places, and on soil that has been trenched and heavily dressed with half-decayed manure. They are put out in rows some 15 to 18 inches apart, and at least 12 to 14 inches apart in the rows. During the summer they are kept well watered and fed with mulchings of manure, also with dressings of chemical manure, being literally pampered and fattened as beasts are for exhibition, until during the season they become of inordinate dimensions. Some bulbs grown by Mr. Wilkins, of Inwood House, exceeded three pounds in weight, and were of good form. These were of the flatter form found in the variety Ailsa Craig. Other growers of huge bulbs on this system are Mr. Kneller, Malshanger; Mr. Bowerman, Hackwood Park; Mr. Pope, Highclere; Mr. Lye, Sydmonton Court; Mr. Waite, Glenhurst, and others, though, on the whole, none excel Mr. Wilkins in the dimensions of his bulbs. I saw the whole of this grower's bulbs in the autumn when stored—a truly wonderful lot—and I also saw the ground from which they had been taken, which resembled a mass of humus or a manure-bed, so thickly was it coated with that material. It may well be asked what gain attaches to this sort of Onion production. I have never yet heard of a market for these bulbs, other than prize competitions present. That is, however, a very fluctuating market, and it may collapse at any moment, because it has a very uncertain and meretricious basis. So long as the eye, sense, and knowledge of judges of Onions are set aside, that the scale alone may decide which is biggest, Onion-judging is far from being a desirable occupation. When, however, mere bigness, without corresponding qualities of usefulness, beauty, firmness, and keeping qualities, finds no favour, and the latter qualities are permitted to

have precedence, then Onion-judging may be found as desirable a duty as is that of judging Potatos or other vegetables. We have no means of comparing the weight of bulbs per acre that can be secured under the forcing method of culture and the ordinary form to which I have already referred, and after all that is a test that it is fair to apply. Especially also should be applied the test of firmness and keeping qualities. When I am informed that in a couple of weeks from the pulling giant Onions had lost by respiration no less than four or five ounces of water, it is very easy to realise how very largely, probably to the tune of 80 per cent., water enters into their composition. Can it be wondered at if such bulbs not only greatly waste, but also prove to be bad keepers? Certainly Onions should show their best keeping qualities this winter, for they have never had a better summer in which to mature. But it may be pleaded, and the plea merits full consideration, that it should be the aim of the cultivator to develop to the utmost the capacities of every vegetable he may grow. That may be so, just as it may be regarded as essential or useful that all human beings or animals should be fed or forced into obesity. We, however, fail to find comfort, health, or usefulness in obese animate beings; and I have yet to learn that in vegetable products any good has resulted from the practice of fattening or feeding until inordinate size is secured. After all, we find good averagedimensions, allied to health, firmness of flesh, endurance, and usefulness, in regard to everything animate, as being all round the best. Then especially it may be pleaded that, in relation to Onions, the huge bulbs are valuable for the production of seed stocks. That may be so when they can be induced to keep long enough to plant; but, after all, does not all experience show that very firm, medium-sized bulbs produce stouter stems and finer flower-heads than do the best of the huge samples? If we take from these monster bulbs the credit of winning prizes, what is left to them to render their production desirable? Remove the prizes, and the practice of growing such bulbs would soon die out. Of course it is easy to understand, if this sort of thing is specially encouraged in one direction, that other seed-houses must follow the lead; but, after all, it is doubtful whether it will ever pay anyone, and I at least fail to see that the production under this forcing method of bulbs of such inordinate dimensions is productive of any benefit to horticulture. If any present differ

from me, I hope they will have the courage of their opinions, and show what special benefit does result. Before leaving this aspect of Onion cultivation, I will quote a few words found in the preface to M. Vilmorin's book, from the pen of a vigorous and uncompromising opponent of mere size in products, Mr. W. Robinson. Referring specially to this point, he says: "All who have to do with gardeners and seedsmen should fight against the deterioration of our best vegetables through the mania for size. Although the flavour of vegetables may be more subtle than that of fruit, it is none the less their essential quality. A change in size, by adding to the watery tissue and fibrous framework of the plant, may entirely destroy the quality we enjoy in it." It is pleaded that these large Onions are milder for eating than are smaller bulbs, but that simply means they relatively contain more of water and less of flesh.

Onions, hardy as they are, have their enemies, and often, especially on light soils, these pests give much trouble. The chief one is entomological, and is found in the well-known Onion maggot, *Anthomyia ceparum*, the product of a small fly, which in the spring and early summer deposits its eggs in the sheath of the stems or leaves. These are shortly changed into tiny maggots or grubs, which at once begin to prey on the stems of the plants, boring their way up and down until the plants turn yellow, the leaves fall down, and then die. In some localities this maggot is terribly destructive, in others it is almost unknown; but generally it gives most trouble on light soils. The most efficacious remedy seems to be found either in sowing seed in pans or boxes early in the month of April, transplanting when strong and well-hardened at the end of May into rows on very firm but well-prepared soil. It very commonly happens that such plants escape the attacks of the maggot, chiefly, no doubt, because not accessible to the fly when depositing its eggs. This practice is a very old one, for it was recommended many years ago, but, except in relation to the production of prize or exhibition bulbs, is seldom adopted. That the larva, or chrysalis, hibernates in the soil during the winter there can be no doubt, as it is the rule to remove all Onion-plant refuse from the soil on which a crop has been raised in the preparation for successive crops. When the perfect insect is developed in the spring, it is obvious, because of its winged nature, that it can reach any part of the garden; hence the mere sowing of

a second season's crop on fresh ground does not enable the fly to be escaped from. When it does appear, about the best remedy seems to be to render the plants, if possible, very obnoxious by dressing them freely with a solution of quassia chips, petroleum, and soft soap, which may be followed by a dressing of soot; and if such combination will not keep the fly at bay, then nothing will. The laying of a thin dressing of fresh gas-lime between the rows has been often advised, because the fumes are so obnoxious, but it is rarely practised. It is very probable that the Onion maggot is to-day the most troublesome pest—even more so than is the Potato disease that afflicts vegetable growers—and a perfect remedy suitable in all cases is much needed. The sowing under glass and planting out merits all consideration. The Onion mildew also, in some cases, proves to be exceedingly troublesome. The best remedy for this seems to be found in the Bordeaux mixture, which, so far, has been found the most effective of anti-mildew compounds. That it may be needful to include in the ordinary combination of sulphate of copper and fresh lime a considerable mixture of molasses or soft-soap, to render it glutinous or adhesive for a time, there can be no doubt. In any case it is well worthy a trial on beds of young Onions, especially in districts where the mildew gives much trouble. It is not at all impossible but that a mixture of this kind, by reason of its poisonous nature, might also prove to be for the Onion maggot a powerful insecticide. Of necessity, in a paper that must be of moderate length, some matters that relate to Onions must be passed over. That is so with regard to the Onion as a pickling ingredient, with respect to which very much of interest may be said. Pickling Onions, however, are so small, and, of course, necessarily so, that they are not to be seen in competitive collections, and, indeed, no one offers prizes for them. No one, in the face of the rage for big Onions, seems to have courage to exhibit them. And yet they constitute the material of one important industry, and are held in high esteem in our domestic economy. But whilst, apart from this phase of Onion use, we like them in a young state, as constituting an excellent and savoury ingredient in salading, there are persons yet who can even partake with evident zest of perfectly ripe bulbs. The old estimate that a piece of bread and cheese, with an Onion for condiment, constituted for many a poor man a hot dinner,

has about it something that is both humorous and pathetic. More enjoyable is sliced Onion and Cucumber, to those who like such saladings, and in a paper on "Winter Vegetables," read at this table by Mr. W. Iggulden some time since, that able gardener had a good word to say in favour of sliced Onions fried, served with beefsteak. I agreed with him more fully, however, when he said that Onions well cooked and served constituted a tempting dish, and I may add a very wholesome and enjoyable one, especially when served up warm on a cold winter's day. But howsoever served, whether whole or as nearly whole as can be, the bulbs being of about half a pound weight, they give a nice relish, with bread and butter, to a cold, hungry man. But if you would seek for full instructions as to how properly to cook and serve Onions, let me refer you to that admirable little book, the "Art of preparing Vegetables for the Table," published by Messrs. Sutton & Sons, of Reading, who seem to have been imbued with the belief—one in which they are fully supported by Mr. Iggulden—that whilst we can grow the finest and best vegetables in the world, we are sadly deficient in the knowledge of how to cook them. Hence their little book is a most useful manual—one that should be not only in the hands of every housewife and cook, but also be used, and quite freely, by those pioneers of better things in domestic economy, the County Council cookery instructors. Thus we read that large Onions may be melted down for a most delicate dish by simply trimming them slightly, and putting them into a pot with a lump of butter, keeping them on the hot plate or half over the fire for about a couple of hours. By that time they will be melted (not stewed or boiled) and be ready for the table. Then, when baked in an oven, only the outer coats should be removed, leaving the secondary coats to preserve the flavour. Boil the bulbs in salt and water for half an hour, then drain them, wrap each in clean paper, twist it up tightly, and bake them in a brisk oven for an hour, testing them with a needle to see if soft and done. Served with butter and condiments, or with a little gravy or Worcester sauce, they are delicious. These are two methods, and for others obtain the book.

CHRYSANTHEMUMS.

By Mr. RICHARD PARKER, F.R.H.S.

[Read Nov. 14, 1893.]

ABOUT 1670 I saw for the first time a Chrysanthemum show. This was at Stoke Newington, and in those days it was considered the leading one. The flowers were a great surprise to me, especially the incurves, while the reflexed blooms resembled well-grown Asters. My visit to this exhibition not only did much to dispel the contempt for a plant I had previously known only as sprawling about in a dingy back garden, but I caught the fever at once, and, as a result, soon found myself installed in the Brunswick Nurseries, assisting Mr. Adam Forsyth, who at that time made Chrysanthemums a speciality, and had a grand collection. I suppose the plant then had been introduced into this country about eighty years. We have now lived to see its centenary; but what has been the outcome of the last twenty years? It has been little short of marvellous, and we must now recognise the Chrysanthemum as undoubtedly one of the glories of the floral world.

It would be impossible to include all matters connected with Chrysanthemum culture in a single paper, and he would be bold who attempted anything very original on a subject that is so well understood. I will, therefore, endeavour to select a few points, which I trust may prove interesting.

I. THE ADVANTAGE OF NEW VARIETIES OVER OLD ONES.

Anyone who can remember the Chrysanthemums of twenty years ago, and will compare the varieties of those days with the varieties of the present time, cannot help appreciating the labours of those who have worked so successfully to bring about so great a change and improvement. Such a transformation, I think, it would be impossible to find in any other one plant cultivated in this country. There were first-class growers in those days, and for many years previously, but they had not the selection of grand varieties to work upon that we have, and they were contented to grow the same year after year. It is not so with us, for the ruling passion for novelties urges us on each year to excel, if possible, the previous year's productions. The

future is hidden from us, but thoughts will arise: Is it possible that still greater improvement can be made? and, Will this flower continue to retain the hold it has taken upon all classes, especially on those who live in our large towns? I think most people will say "Yes" to both propositions.

In speaking of the general improvement of recent introductions, it is not alone in size and formation of blooms or in richness of colour we see it, but notably in much dwarfer plants, the great advantage of which cannot be too highly appreciated for all purposes. As an instance of this, we can take that good old variety Madame C. Audiguier. To obtain a good exhibition bloom of this it was not uncommon to have to run up growth ten feet high; whereas now either that grand acquisition Vivian Morel, or W. Tricker, can take its place on the exhibition board cut from plants often not more than three feet in height, their naturally dwarf habit being also more useful for all decorative purposes. The best white Japanese of a few years ago was Fair Maid of Guernsey, but this tall grower has had to make room for such grand dwarf varieties as Avalanche, Stanstead White, and others; while among the yellows, though Thunberg is still a lovely flower, yet for general usefulness, combined with exhibiting purposes, it cannot be compared with W. H. Lincoln, Sunflower, and many more. And so we find year by year the old giving place to the new. We may relinquish old favourites with reluctance, but each has to go in its turn, for fashions and tastes vary, and we are compelled to move with the times.

There is yet another advantage connected with these dwarfer varieties, and it is perhaps the greatest of all, viz. that it allows a greater number of growers—those with limited greenhouse accommodation—to include the best and leading varieties in their restricted collections, amateurs and small growers being able thereby to have as pleasing a display, if not so large, as those possessing unlimited greenhouses.

II. ADVICE TO SMALL GROWERS.

In the first place I would warn small growers against attempting too much, for this generally ends in disappointment and failure. It can hardly be expected that anyone possessing only a very small greenhouse and garden can produce the same magnificent blooms as are seen at our great exhibitions. Yet the plant

lends itself, so to speak, to the means of the amateur and cottager, who can cultivate it with success, pleasure, and profit.

Take first the propagation of the plant. This can be done at any season of the year. In large gardens plants are raised at different seasons for different requirements, viz. December and January for the production of large blooms; February and March for ordinary bush plants, for conservatory decoration and general cutting; and again in May and June for small table plants.

Growing large blooms for exhibition entails an enormous amount of time and labour, and daily close attention; it also necessitates plenty of room to accommodate the plants, and, unless all these requirements can be provided, far better not attempt their culture at all, but adopt a different style altogether, more suitable to the particular circumstances. In the first place I would advise a careful selection of varieties of naturally dwarf habit—the majority, of course, Japanese—with a view of having compact little plants, from one to two feet high, of both early and late varieties, so as to ensure a display for as long time as possible. Small plants carrying several dozen blooms have much more to recommend them than plants with one or two blossoms on tall leafless stems, and occupying large unsightly pots.

Then, again, the work connected with small summer-raised plants is light and interesting, and results are obtained in something like half the time required for the production of large blooms. We will suppose a grower with limited accommodation having a number of plants cut down after flowering. He is anxious to secure his cuttings and destroy the old plants to make room for other things. This he can do by selecting a plant or two of each variety. Turn these out of their pots and pack them closely in a cold frame, protecting them from severe frosts, yet exposing them on all favourable occasions to promote sturdy growth. They will require no more attention until March, when they should be planted out of doors to form stock for future propagation. After planting firmly a little mulching would be beneficial to protect from drying winds. In a short time strong young growths will be found pushing up from the base. These should be thinned to six or eight and encouraged to make clean, healthy growth, nothing more being needed until the end of May or beginning of June, when steps should be taken to prepare young plants for the winter. Propagation taking place at

this season instead of mid-winter, a saving of nearly six months is effected, which must be very valuable to most growers of plants for decoration. Striking the cuttings at the time mentioned is an easy matter. If a number of plants are required, the side-shoots from those planted out should be taken off first and inserted singly in thumb-pots, and placed in a shady frame or under a hand-light on the north side of a wall, where they will be well rooted in three weeks. They should be carefully hardened by gradual ventilation, and as soon as possible they should be placed in 3½-inch pots, and stood in the shade for a few days. They will soon get established, and in about a month will be ready for the flowering pots, which should be 6-inch ones. About ten days before the final potting they should be pinched back to three or four leaves to induce them to make bushy plants.

After once being established let them be exposed to all the light and sun possible until the time arrives for placing them in frames or greenhouses, which is generally about the beginning of October. Should still smaller plants be required, the tops of these when pinched as directed, or of those planted outside, may be inserted in the same way as late as August, and neat little plants will be produced.

This is a simple way of providing a display of Chysanthemums in the least possible time by persons who, though anxious to form a collection, have not the necessary means for the production of large flowers, and the following is a list of a dozen suitable varieties:—

Avalanche, white
 Edwin Beckett, yellow
 J. S. Dibben, bronzy yellow
 W. Tricker, delicate rose
 Mrs. Hawkins, golden yellow
 Mdlle. Thérèse Rey, white

Mdlle. Lacroix, white
 W. H. Lincoln, pure yellow
 Mdme. O. Mirbeau, light mauve
 Vivian Morel, blush mauve
 W. Seward, rich crimson
 J. Shrimpton, crimson-scarlet

It will be noticed that I have omitted incurves in this selection, beautiful as doubtless they are. I do not, however, consider them so useful for general decorative purposes as the Japanese; but should a few be desired, all the "Teck" and "Rundle" families, with others of a dwarf floriferous character, may be grown to form neat plants with perfect-shaped blooms.

Of other modes of culture, that of propagating in December and January, and growing the plants with three stems for large

blooms, is undoubtedly most general, and it is only by this means that the full beauty and true character of the flower can be brought to perfection.

Trained specimen plants, grand as they are, do not often repay the labour bestowed upon them, and to me there is always a stiffness in them not natural to the plant. A well-grown bush, each branch in itself a nosegay, I consider more beautiful, interesting, and certainly more useful in every way.

III. RESPECTING THE FORM OF CULTURE FOR LARGE BLOOMS, much could be written on details connected with it which cannot be included in this paper. Suffice it to say that the best results are obtained from generous treatment and watchful care, and though some persons may succeed better than others, it is not because there are any hidden secrets, but because they do the right thing at the proper time and leave the rest to nature. Some persons, in their anxiety to succeed, appear to think that the more they can force into a plant the greater will be the return, forgetting that a plant, like a human being, requires only a sufficient quantity of food of the right description to build up health and vigour, all over and above this sufficiency being excess, and consequently injurious. Either the wood becomes too gross to be fruitful, or the soil is made repulsive to the roots, collapse following sooner or later. If there is one thing more than another which tends to bring about those ills peculiar to *Chrysanthemums*, I think it is the haphazard way the plants are often gorged with rank manures. I have been often asked, when exhibiting in different parts of the country, what I feed my plants with, the inquirers evidently thinking that if that was known success would be easy and certain. This is quite a mistake. I have come to the conclusion long ago that it is not one manure that is more potent than all others, but much more important is the proper application of those that we know to be good, only using them with a view to assist nature, rather than forcing unnatural growth. When a plant is making satisfactory progress—viz. firm, short-jointed wood, with moderately green foliage—all is well. Why endeavour to obtain wood and foliage twice the size, and the latter more black than green? Years ago I used to look to such growth for my best blooms, especially in the Queen section, but in every instance I was dis-

appointed, the blooms either coming deformed, though often of an enormous size, or the petals pale in colour and soft in texture, being generally the first to damp off. The same natural laws observed and diligently followed by the successful fruit-grower are also indispensable to the Chrysanthemum grower, and I have often been struck how closely the two are connected in many cultural details. The fruit-grower endeavours to secure medium sized, short-jointed, well-ripened wood, to yield fruit of the highest order, and it is exactly similar qualities which produce the finest Chrysanthemums.

Fortunately the Chrysanthemum is not particular as to soil. I believe it would grow in any soil you could mention, but to see it at its best good turfy loam, inclined to be heavy, must form the staple, with leaf-mould, charcoal, and shell-gravel added to assist in keeping it open rather than to enrich it. Half-inch bones, either mixed in the soil or used as drainage, are, in my opinion, a mistake, and may be worse than wasted. The compost no doubt is improved by the addition of bones, but these should be used in strictly limited quantities and in a crushed state, so that what feeding properties they contain may be more equally distributed all through the soil, and so be more readily appropriated by the plant. If the plants had to occupy the same pots for a number of years together, there might be something to recommend the use of bones in their rough state, but it is not so.

Of the value of shell-gravel for most plants I cannot speak too highly. I have noticed repeatedly, when repotting Chrysanthemums and Pines, numbers of white feeding-roots wherever a little of this material has run together, showing clearly that it is a root-producer; while the lime and phosphate in the shell are well-known elements essential to the health of the plant. It thus serves a double purpose, insuring porosity and conveying food; and therefore, in my case, little sand is used. It is best to run the shell-gravel through a half-inch sieve, using the roughest part for the drainage, and one good barrowful of the fine to four or five of loam is in most cases sufficient.

Potting should be done with great care, and firmly, as this induces firm, short-jointed wood—loose potting, rich soil, and large pots having the opposite effect. In most cases 9-inch pots are large enough for the plants to flower in.

In August or early September, when the buds are being "taken," is a good time to assist the plants, as the pots should then be full of roots, and a top-dressing greatly assists in developing the buds. At the final potting sufficient room is left for this purpose, and pieces of turfy loam are generally packed level with, and sometimes above, the rim of the pot. I now find it better to do the top-dressing gradually, or at three different times. For this purpose I use the siftings of good, new loam of rather a heavy nature, adding to each barrowful half the quantity of sheep or deer manure, and thoroughly mixing some time before the compost is wanted for use. At the first dressing about one inch will be sufficient, gently pressed down and watered with a rose-can. It is surprising how greedily young roots take possession of this healthy feeding material.

Where time is precious and labour scarce, but where, nevertheless, a great demand exists for ordinary cut blooms, cuttings may be inserted in February, and when the plants are well established (about April), plant them outside in a sunny position, but not exposed to high winds. They should be planted firmly in not too rich soil. With the exception of pinching once or twice, little attention is needed. These plants may be lifted in the autumn and placed closely together on the Vine or Peach borders, working in a little soil to protect the roots. Hundreds of such plants can be put into a small compass, and barrowsful of blossoms can be gathered therefrom. I find Madame Desgrange (both white and yellow) grown in this way, and lifted about the middle of August, are most useful for general purposes, especially for supplying a great demand for harvest thanksgivings and other such-like occasions. There is much to recommend this rough-and-ready way of culture, as no pots are required, and little or no attention during the summer. The old plants can be destroyed as soon as the blossoms are taken, while the beauty of those grown in pots is not destroyed by being repeatedly cut from.

In conclusion I may give a few words of caution:—

Never "coddle" the plant at any season of its growth, as this induces weakness and insect pests.

Do not attempt to grow more plants than can be properly attended to.

Never allow the plants to become dry at any time,

especially during hot weather, or such a check may be given as no after-treatment can put right.

Syringe freely during dry weather, especially near towns.

Use good but not too rich soil.

Pot firmly.

Apply artificial manures very carefully.

If these plain instructions are properly carried out, and no fads and fancies indulged in, successful *Chrysanthemum* culture will not only be found easy, but will bring pleasure and brightness and joy to rich and poor alike, whether in town or in country, during the dullest season of the year, when the sight of beautiful flowers is always so cheering and hopeful.

LATE-KEEPING GRAPES.

By Mr. T. H. CRASP, F.R.H.S.

[Read November 28, 1893.]

THE importance of having a long and continuous supply of Grapes during the winter months is fully recognised by all gardeners, as well as by growers for market. As a matter of fact, some hundreds of tons of well-ripened, finely coloured, and good-flavoured Grapes are now grown for the chief markets in Britain; and in nearly every populous district will be found men who have gained something more than local fame by the enormous quantities of handsome late Grapes they produce every year.

To the manager of a private garden it has become of even greater importance to have a plentiful supply of late Grapes than to endeavour to obtain by hard forcing, with considerable expense and risk, a few extra early bunches, too often of indifferent quality. It is, therefore, evident that the subject of late Grapes is well worth our consideration.

There is a popular fallacy among some amateurs (and we have met gardeners who are not entirely free from it), to the effect that to obtain late Grapes it is only necessary to grow late varieties; that they do not require any special treatment—indeed, that rather less than ordinary care is quite sufficient to insure

the desired results. It is to this mistake that many failures with late Grapes must be attributed, and it accounts in some measure for the frequent inquiries in the gardening papers for explanations of why Grapes fail to colour and keep. Men who have had twenty years' experience of Grape-growing do not treat matters so lightly; they are only too conscious of the difficulties to be overcome, and they know that something more is necessary than merely filling a vinery with late varieties and then waiting for the Grapes, which may either entirely fail to come or pay a very short and disappointing visit. I am especially desirous to impress upon beginners, or those inexperienced in Grape-growing, that the system of preparation, the treatment and general management adopted, is of the first importance in the production of late Grapes that will either give satisfaction to an employer, secure awards at exhibitions, or bring the grower fair remuneration in the markets. Before discussing the merits of the respective varieties, I will, therefore, review what I have found to be essential points in the culture of vines to yield fruit for keeping during the winter.

Borders and Roots.—To make the story complete we must commence at the beginning, and the beginning of successful Grape-culture must be looked for in the borders and the management of the roots, just as we may often expect to find the cause of failure in the same direction, especially with regard to late Grapes. It is impossible to give too close attention or study to this matter, for so much depends upon starting in the right way. Do not suppose, however, that the preparation of costly and elaborate borders is advocated as absolutely essential to the production of good Grapes; there are abundant proofs to the contrary. The vine is up to a certain stage a most accommodating plant, and its strong vitality enables it to endure much ill-usage or neglect for a time, thus often misleading the careless cultivator into a belief that it is not necessary to give as much attention to the root department as experience proves to be necessary. There is no question that with good natural drainage and a soil containing what the vine really needs in the way of food, substantial crops of useful, profitable Grapes can be grown without any further border preparation than digging the soil a couple of spits deep; and some of the most successful growers for market can point to tons of handsome, well-coloured Grapes hanging on

vines that have been planted in borders, either inside or out, that have had no further preparation than this. Such vines, too, can be seen that have been in bearing for a sufficient number of years to prove that, provided certain other conditions be right, this is by no means as short-lived a method as might be imagined. Still, even this system cannot be practised in a haphazard fashion, and, of course, what is essential to the success of vines so planted is equally essential to those grown under a more elaborate method in private gardens, where it is necessary to guard against possible failure by even greater care.

The first highly important point to be studied is the selection of the site, for, however good the soil may be naturally, if a cold, low, damp, or water-logged position be chosen, where drainage is comparatively useless, failure may be expected as a certainty, whether early or late Grapes are attempted to be grown, but more particularly the latter, for the difficulties in keeping the fruit are increased tenfold. It might be said that any man's common sense would teach him to avoid such positions, but gardens of note in this country could be mentioned where deplorable mistakes have been made in this way in the past, and a succession of gardeners have struggled to combat unavoidable failures, and have been blamed for results for which they were in no way responsible. The vine naturally loves a well-drained, warm situation for its roots, and if this is provided a great stride is made in the direction of ultimate success. Positions that are not quite the best that could be selected may be improved by a thorough system of drainage, but in those of the character described the labour and expense are almost thrown away.

Soils and Manures.—The next point is to have a soil of a good substantial nature, such as will possess lasting properties, and yet it is equally essential not to err on the side of a too heavy soil, for this will lead to difficulties in another direction. A heavy, adhesive soil is always cold, and checks root-action, leading to ill-developed leaves and growth, resulting in all the evils to which Grapes are subject. The chief secret in securing Grapes that will keep plump and fresh for a reasonable time, either on the vines or cut and bottled, is to ensure free root-growth, with thorough maturation of well-developed leaves and wood. Everything, therefore, which tends to promote this ripening process should receive the closest attention. The orthodox recommendation in

obtaining soil for vine-borders is to take the top spit of an old pasture, and when this has been stacked it will in many cases be found an excellent soil for the purpose ; but it cannot always be obtained, and in some instances, where the pasture is on heavy land, it is by no means the most desirable, although it may be used if there is no other at hand. If the natural soil is unsuitable, and the expense of purchasing has to be faced, it is wiser to take some trouble in procuring a sound, fibrous, turfy loam than to endeavour to save a few shillings by using what can be had on the place. The roots of the vine require a free, porous, yet firm soil, one through which air and moisture can pass readily, conveying the needful nourishment and warmth, but not so loose that it becomes quickly and frequently dried or subject to sudden changes of temperature. One constituent is absolutely essential in a soil for vines, and that is lime in some form, and unless it is present in sufficient quantity success will be of short duration, even if it be attained at all. It is surprising how easily one may be mistaken in supposing that a soil must, from its position, contain lime, whereas it may be either absent or the proportion too small to be of any practical service. Instances will no doubt occur to many where unexpected troubles have had to be encountered in the stoning and swelling of Grapes after they have promised well, or even given good results for a season or two—and how puzzling this has been at the time ! I have myself had such difficulties to overcome, and without exception, when it has not been obvious that there has been a deficiency in some other direction, an application of lime has removed, or at least greatly reduced, the evil, and that much more quickly than many would suppose who had not tried it. Since Grapes imperfectly stoned cannot be expected to keep well, I regard the presence of lime, or its provision when deficient, as one of the most important essentials in the attainment of our object.

The days are long since past when it was deemed helpful to bury the carcasses of animals at the roots of vines, or to charge the borders with rank manures, under the impression that it was impossible to feed the vine too liberally. Cultivators now aim at something quite different, because it has been found that a sweet, wholesome, sound soil is far better for the vine, especially at the beginning of its career, than a coarse, stimulating diet, which only encourages a gross succulent growth that can seldom be

properly ripened, and is almost certain to result in failure. We are content now, if we add anything to the border when it is first made, to put a moderate quantity of crushed bones, and then, subsequently, when the demands become greater or there are appearances of the soil being partially exhausted, to give a top-dressing of old decayed manure or of Thompson's manure, which has done good service on many occasions. When the vines are carrying a heavy swelling crop, if the borders are watered alternately with well-diluted and warmed liquid manure, such as can be had from stable-tanks, it gives more immediate assistance and is preferable to overloading the soil with solid manurial substances that are apt to cause sourness or rank growth. Deep borders are not desirable, as inducing the roots to go down out of the reach of sun, heat, and air. Very shallow ones are also objectionable, because they have not sufficient body to support the vigorous growth of the vine. As a guide, we may take a depth of two feet as a minimum and three feet as a maximum, the "happy medium" being preferable in this as in most other cases.

Planting, &c.—It is not intended to give details of planting, but simply to suggest that whether the vines are home-raised or purchased, freely developed and thoroughly ripened canes should be selected, and stunted or starved, or excessively luxuriant but unripened plants avoided. The stem is both a channel and a storehouse for nourishment, and it performs its functions far more satisfactorily through the whole of the life of the plant if it is not cramped in its earlier stages. One matter which has special reference to our subject must not be overlooked, and that is the distance from the glass at which the training wires are placed. It is a very common mistake to train vines too near the glass; the young growths become crowded and the leaves forced up to the glass until they are almost useless, and it is not surprising they are scorched or injured in other ways. So far as may be without crowding, the more good leaves the vines carry the better are late Grapes likely to finish and keep. Roof-crowding is, therefore, an evil to be avoided as much as possible by fixing the wires two feet, or even farther, from the glass. The same remarks apply to the distance the vines are planted apart, but they are especially applicable to Muscat of Alexandria, which can scarcely have too much space allotted to it to ensure

the best results. Not only is plenty of foliage necessary, but abundance of softened light throughout the season is required to bring Muscats to that perfection of colour which is so much prized in this beautiful Grape. Crowding in every way must be strictly avoided with this variety. Cultivators must proportion the distance between the vines to the space at their disposal, but Muscats can be advantageously allowed at least double the distance given to any of the varieties of black Grapes with the exception of the very strong growers.

Resting and Starting.—Passing over the period during which the vines are growing into bearing condition, a few remarks are needed in reference to the resting and starting of late vines, for both are very important points in the annual life and prolonged existence of the plant. When Grapes are kept hanging in the vineries very late, several difficulties present themselves in the resting process, for though sufficient dryness, both of air and soil, can be easily provided, it frequently occurs that this is carried too far in studying the fruit, and the vines suffer in consequence; it is also inconvenient, whilst the fruit is hanging, to expose the canes to the maturing influence of air sufficiently to ensure a thorough resting. It, therefore, often happens that late vines are not “rested” as they should be, and this process is either unduly prolonged to bring about the required result, or they are restarted in an unfit state, and this leads to many evils difficult to counteract by after-treatment. It is most undesirable and dangerous to have borders continually saturated with water at the resting time, yet it is easy to err in the opposite direction, and with, perhaps, even worse consequences. Vine-roots continue active for a time after the leaves fall, and too great a deficiency of moisture checks the absorption before it is beneficial to do so, as the vine requires a considerable store to keep it in good condition and to provide for the demands of the young growth at starting time. With inside borders this can be regulated according to requirements, but it is especially unwise to have borders excessively dry when Grapes are still hanging and improving. It is better to risk the application of a good supply of water to the borders, as this is not half so dangerous to the keeping of the fruit as some suppose, if the ventilation be properly regulated, than to allow the soil to get into a dust-dry condition, to the detriment of the Grapes and the vines also. Of

course this is opposed to the rigid system expounded by the writers of former days, but most of the best growers now follow what is here recommended with better results than by adhering to the drying process to such an extreme.

Outside borders are greatly benefited by the heavy warm rains of early autumn, and all the protection needed is in the case of a long continuance of cold rains later on, or to prevent snow saturating the soil and reducing its temperature. With these exceptions, the less outside borders are covered the better, as it only prevents the aeration so necessary to the roots in most stages, or the complete rest needed at another. In this, as in all other gardening operations, judgment must be exercised in accordance with circumstances, rather than attempting to follow an absolute rule. If borders are both inside and out, it is desirable to provide for something like uniformity of temperature in the soil about the differently placed roots, and then outside protection is helpful.

The removal of the Grapes to a special room for preservation, which is now commonly adopted in private gardens, releases the cultivator from many restrictions; the pruning can be performed earlier, and we are enabled to get our vines into condition for starting in good time. Late Grapes require a long season of growth, and when they are started late it usually happens that the colouring and finishing are late also; the fire-heat is increased to forward the process, and growth is continued too long, at the expense both of the fruit and the vines—immature foliage, and wood with corresponding weakness, being the result. When Grapes are borne by vines having well-ripened leaves and stems they colour far better and keep plump much longer. This, at least, has been my experience, and it is confirmed by many other Grape-growers.

The pruning being completed—and it does not matter whether the extension or the spur system is adopted; in the one case we prune to the best ripened sound wood, and in the other to the best buds—the next consideration is to obtain as early a start as the vines will “break” naturally and strongly without *forcing* (as the word is ordinarily understood), and if the start is made in a fine March or early April, little aid by fire-heat is requisite to secure the temperature of 50° to 55° as a minimum. Useful and saleable late Grapes can be satisfactorily grown in unheated

houses by following the system advocated—namely, by utilising sun-heat to ensure an early start, for loss of time cannot be made up in autumn in these houses; indeed, in some degree it cannot be made up in heated vineries without disadvantage to both fruit and plants.

Disbudding and Stopping.—Prompt attention to disbudding and stopping is important, for it is a waste of the vine's strength to allow growth to be produced more freely than needed, and then to remove a quantity of it at a time after the mischief is done. A close watch should be kept to avoid this, as, though other points may be comparatively immaterial, attention or neglect in this means more or less of success or of failure. A moderate number of healthy, vigorous, well-developed leaves will do much more good work than a crowded mass of thin weakly leaves produced on attenuated and distorted shoots struggling for existence close against the glass; and the difference in the work done will show itself plainly when the time for colouring approaches. The removal of some shoots and the stopping of others requires much judgment and experience in dealing with the late varieties, for some of them need more and longer growth than others, especially where the foliage is thin. Another matter is that white Grapes, especially Muscats, need more exposure to light than black varieties, and this must be remembered in disbudding. The necessity for care in tying down the growths as they advance, and the importance of doing so gradually, or waiting until the brittle stage is passed, is familiar to all.

Flowering and Setting.—Most of the late varieties usually grown produce flowers and pollen freely and set satisfactorily; but with some, like the Muscat of Alexandria, Alnwick Seedling, and others, artificial help is necessary. With the Muscat and a few others all the aid required is to distribute their own pollen by shaking the vines when the flowers are fully expanded, or gently rubbing them with the hand or with a small soft brush, and if the flowers are in the right state this is usually sufficient. But with those of the Alnwick Seedling type pollen must be taken from other sorts which produce it freely, and transferred by means of a camel's-hair brush or feather to the stigma of the flowers it is wished to set. A small quantity is sufficient, but it must be done carefully and thoroughly, when the pollen is dry and powdery and the stigma moist, as imperfect setting not only

results in bad bunches, but also in irregular and deformed berries. The admission of plenty of dry warm air, a buoyant atmosphere in the vinery, and due regard to the maintenance of an even temperature, will assist greatly at this critical time.

Thinning.—Thinning late Grapes as soon as the setting is finished and the swelling commences, as soon as it can be seen which are secure and which are not, is also one of the very important matters connected with the subject, and one in which mistakes are frequently committed, and such as have serious after-results. Sufficient attention is seldom paid to the fact that several of the late black Grapes which are extensively grown set many more of their berries than do those grown for early crops. We have notable examples of this in Alicante and Lady Downe's, than which (other cultural conditions being correctly provided) few Grapes need more careful thinning, for nearly every flower "sets," and if the young berries are not promptly thinned the operation becomes more difficult, and the bunches are crowded from the first. While it is necessary to have a compact bunch, the specimens so frequently seen, with the berries jammed against each other until they lose their natural shape, must be strongly condemned. There are other evils attendant on insufficient thinning besides that just mentioned, for if moisture condenses upon, or finds its way into, such a crammed bunch, it is more likely to do damage than where its escape is not so prevented. The large size to which the berries of Gros Colmar attain renders liberal thinning of still more importance with this variety than any other, and only experience and close observation can teach the distance to ensure a firm but not crowded bunch. The removal of bunches where the crop is a heavy one, the vines weak, or the difficulties in the way of colouring numerous is a prudent course, for overcropping has a direct tendency to affect the prospect of good colouring in an unsatisfactory manner. This is not felt so much in the case of the vigorous young vines grown by the majority of cultivators for market, and it is quite astonishing what heavy weights per vine are safely obtained. But when older or weaker vines have to be dealt with, and in private gardens where replanting a vinery is regarded as a serious business to be seldom undertaken, and only in extreme necessity, the regulation of the crop by removing superfluous bunches demands the attention of all who desire success with late Grapes.

Temperature.—The essentials of the treatment of late Grapes from the setting until the colouring period may be summed up in a few brief paragraphs, but even this simple treatment cannot be provided without constant thought and close attention throughout the season. First, as to the temperature, it is scarcely necessary to observe in these days that the hard-and-fast rules formerly considered so important are now practically disregarded by the most successful cultivators, who direct their work in accordance with a more common-sense system rather than in strict compliance with certain rigid rules, without regard to the particular circumstances of the weather, the vines, and the houses, all of which need to be taken into consideration. We have already referred to temperature for starting, and still taking the minimum only, an increase of 5° up to the flowering, and a further advance of 5° from the setting onwards through the swelling, will afford a sufficiently general indication of what will be suitable; but the highest day temperature from sun-heat either early in the day with due ventilation, or in the afternoon with early closing, may reach 85° to 90° , or even a few degrees higher, with safety, and even advantage, for the majority of late Grapes.

Spacious span-roof houses running north and south are preferable for late Grapes in many ways, but chiefly because they enclose so large a body of air that sudden changes of temperature are most readily avoided. Three-quarter span houses are also suitable in the same way, but in northerly and cold districts "lean-tos" facing south are often necessary to bring Muscats and similar varieties to perfection. In bright, clear, warm seasons like that of 1893 the cultivator is wonderfully assisted, for artificial heat is but a poor substitute for sun-heat in insuring the development of the growth and the fruit.

Moisture.—Incidental reference has already been made to the necessity of supplying vine-borders with water liberally, but judiciously, from the starting until the colouring is perfected—*i.e.* for about six months in the case of late varieties—and an application of water at least every month during that period, at the rate of ten to fifteen gallons per square yard, will generally be sufficient. It is unwise, however, to give water to borders when its temperature is below that of the soil; it should be warmed by exposure or by the addition of a little hot water. I have a vivid recollection of an incident in earlier years when I

had to assist in drenching vine-borders with water and liquid manure collected in underground tanks deep in a solid bed of clay, which was applied without any exposure and in an almost icy-cold state. A severe check was speedily apparent in a fine house of Grapes, the lamentable effects of which were never recovered from during the whole season—effects undoubtedly due to the cold liquid lowering the temperature of the soil rapidly, stopping the root-action suddenly, and causing injury in the same way that a current of keen air will affect delicate foliage—namely, by the rapid withdrawal of heat from tender living tissue.

The thorough and frequent damping of paths, borders, walls, &c., is an important means of maintaining that fresh, sweet humidity in the atmosphere of a vinery which experienced men recognise the instant they enter a house. But even this must be regulated with judgment, for the indiscriminate distribution of water without regard to external conditions is certain to cause disaster sooner or later. Much the same may be said about syringing, which, however, requires still more caution, especially when the colouring commences. Until then, with the exception of the flowering period, syringing is needful to keep the foliage healthy, clean, and free from that greatest of vine pests, red-spider. It should be said that some successful growers discard the syringe entirely, and others, again, use it almost constantly, even at flowering time. Damping undoubtedly can be made to answer all the purposes if it is attended to with special care.

Ventilation.—Scarcely any part of the management during the different stages of the vine's advance needs more careful and constant attention than the ventilation, and it is one in which neglect will produce the worst possible results—absolutely incurable evils. By a proper system of ventilation we can to a great extent regulate both temperature and moisture as required; whereas, on the other hand, a little carelessness will nullify all the previous work. It has been pointed out times innumerable that most of the “scorching” and “scalding” which cause so much trouble are occasioned by not ventilating the vineries sufficiently early in the morning; yet it is necessary again to impress this forcibly upon young men, as it is one of the greatest difficulties the gardener in a large establishment has to contend with in leaving the work to others, because few seem to recognise

the importance of the matter, though they only too fully realise it in after-experience. In a house with a portion of the roof exposed to the morning sun, in the spring and early summer months the temperature rises rapidly if the ventilators are closed, and if this is not attended to for an hour or so the young man is alarmed upon entering the house, and commonly opens the ventilators widely at once to lower the temperature to the orthodox degree. Everyone knows that this has happened thousands of times, and it is then that the mischief is done in several ways. The inrush of a quantity of cold air is a severe check to the tender foliage and shoots, and even worse than this are the effects produced by the rapid evaporation from the surface of the berries themselves. A dozen years ago Mr. W. Taylor, of Longleat, drew prominent attention to this in the admirable articles he contributed to the horticultural press, when it came as a kind of revelation to many practical men who have since proved the accuracy of his statements. I had long held a similar opinion, and further experience and observation have served to confirm it, that this rapid drying and heat exhausting by sudden free ventilation in early morning is answerable for a large proportion of the so-called scalding of berries; and the adoption of a strictly observed system of early and moderate ventilation, gradually increased as the sun gains power (never allowing the temperature to rise high before applying the remedy), will reduce to a minimum the "scalding" to which some of our best late Grapes are so subject. By early ventilation is meant giving attention to the house before there has been a rise of more than a few degrees of temperature, and, if this be done, all night ventilation is rarely necessary in the early stages.

Ripening and Colouring.—We have now reached the most critical period in the career of our late vine—namely, the time when colouring and ripening commence and onwards until the Grapes are in their right condition for use—and the only consideration is the best means of preserving them as long as possible. It will not be expected that I should give a scientific explanation of Grape-colouring and Grape "bloom," but the subject is such an interesting one that many like myself would be glad to see it discussed by Dr. Masters or some other member of the Scientific Committee. All I can pretend to do is to give a few practical ideas on the subject derived from experience, showing

what influences principally bear upon this important point. Fortunately, the majority of late Grapes colour more readily than early ones (Gros Colmar being a conspicuous exception), but they take more time about it, as while an average of two months will "finish" Black Hamburgs from the time colouring begins, quite a month longer is needed for late varieties, and if it be not satisfactorily concluded by the end of September or early in October, it is seldom the weather will permit of any further advance. Very much will, however, depend upon the foliage, as the existence of healthy leaves, well developed and matured, and retained upon the vines as long as possible, will, in some cases, insure improvement in late Grapes up to the middle of November, or even later as regards Muscat of Alexandria. But it must be borne in mind that there is a considerable difference in the foliage of late varieties, both as to texture, size, quantity, and durability. What must be especially avoided is allowing late growth, and thus having young leaves when Grapes are "finishing," for I attribute premature shrivelling, as well as other defects, to this cause. Having plenty of good foliage, the next thing is to treat it well by providing sufficient moisture to keep it healthy (and a little will do this), with exposure to light and air to enable it to perform its functions as long as required. The judicious control of the ventilation has a great influence on the colouring and ripening, and though drier conditions are in some degree required, parched air or soil are opposed to success. For the colouring of late Grapes the temperature is also an urgent consideration, and no attempt should be made to reduce the minimum already given for the mid-season treatment, until the leaves are all down, when the weather must chiefly determine the temperature, as anything between 45° and 50° will suit, and in very severe seasons it is better to let it fall a few degrees than to increase the firing to keep it up to any fixed point.

Keeping Late Grapes.—It is possible to keep some varieties of late Grapes—as, for example, Lady Downe's and Alicante—hanging on the vines until March, and if well ripened the former variety in particular can be had as plump as could be desired. But the practice is not a good one, as pruning the vines is thereby too long delayed, and frequently vineries have to be utilised for other plants which would interfere with the Grapes. If, therefore, it can be avoided, Grapes should not be allowed to remain

on the vines after January, and from November until then the chief care must be directed to provide a regular temperature of about 45° , with moderate ventilation, the careful removal of all damaged or decaying berries, and the avoidance of stagnant moisture in the house. When the Grapes have to be cut from the vines for keeping, it is usual now where Grapes are largely grown, to have a special room or part of a fruit-room where they can be kept by inserting the stems in bottles of water suspended from the walls so that the bunches hang clear. This method has been long in use on the Continent, and was brought into general notice in this country some years ago by Mr. W. Robinson, and is now almost universally employed in preference to allowing the Grapes to hang so long on the vines. An even temperature of about 45° , the exclusion of direct sunlight, the maintenance of a rather dry atmosphere, and the frequent examination of the bunches, to remove decayed berries, are the principal requisites. The occasional emptying of the bottles and refilling with fresh water is needed, and a small slice cut off the ends of the stems when they have been some time in the bottles will help. Beyond this, the exclusion of cold damp air and frost, with careful watching to prevent the extension of decay or of mildew, little is required to ensure fully ripened Grapes, grown under the treatment advised, keeping fresh until new Grapes are obtainable.

Varieties.—Those who wish for full descriptions of late Grapes must refer to Dr. Hogg's excellent "Fruit Manual," or to Mr. A. F. Barron's able treatise on the Vine, for I can only attempt general notes on the varieties that have come under my own observation. Taking the black varieties first :—

Lady Downe's Seedling.—This grand variety has several excellent qualities. It is strong in growth, sets freely, assumes a fine colour, and keeps well very late in the season, and the flavour is extremely good if it has been well grown and thoroughly ripened. A liberal and long supply of heat is necessary to ensure its perfect finish. Scalded berries are common in this variety, and especial care must be given to the ventilation, as already advised, while very often the shady side of the house suits it best.

Gros Colmar.—Though so often unsatisfactorily tinted in colour, the great size of the berries renders this a useful market

Grape, and when exceptionally well ripened it is not to be despised in flavour as a late Grape. It must have a long season to develop, and should be ripened as early as possible in the autumn. It requires a good temperature throughout, with avoidance of overcropping, and preservation of the foliage.

Alicante.—A useful and easily grown variety where the temperature advised for late Grapes is well maintained. It grows, sets, and colours well, making handsome compact bunches, but is not usually of quite first-rate flavour, though decidedly superior to Gros Colmar.

Mrs. Pince.—Many prefer the flavour of this to any late black Grape grown, but it is not often seen in first-rate condition, the two defects in its culture that I have noticed being the not allowing sufficient foliage, which is produced rather sparsely as compared with other varieties, and the not giving it a sufficiently long time for maturing. The berries are apt to shrivel early, but the flavour is then even still richer than if it is not so far advanced.

Alnwick Seedling.—The chief trouble with this fine-looking Grape is its imperfect setting, necessitating artificial fertilisation with pollen from other varieties. The best results are obtained when it is allotted a house to itself, and special treatment at the setting stage and onwards. Then it colours beautifully, keeping to a late period, but the flavour is never remarkably good.

Gros Guillaume.—This is commonly but erroneously known as “Babarossa,” and is only noted here on account of the very large bunches it produces. It is not a Grape to be depended upon for a serviceable crop, though well-coloured bunches have a fine appearance.

West's St. Peter's.—A good keeping, pleasantly flavoured Grape that is worth more attention than it generally receives. Treated upon the system described in this paper, it grows and sets freely, its compact bunches keeping extremely well.

Black Maroc is rarely seen in good condition, and is not to be recommended for general cultivation, though sometimes it can be had in excellent form. It requires very close attention, as it is a most uncertain “setter,” and a long ripening season. It is interesting as one of the parents of the two very useful Grapes, Lady Downe's and Foster's Seedling.

Passing on to white varieties, *Muscat of Alexandria* is far

ahead of all late white Grapes, and is rightly prized highly, both for flavour and for appearance. The production of good Muscats is one of the triumphs of a successful gardener, and it is worth all the trouble required. I have already mentioned the chief points in its culture—viz. allowing plenty of space for the growth and abundant foliage, the provision of a good temperature over a longer period than for most other Grapes, and free exposure to sunlight. Beyond this the principal matter is the setting, which has been already noted. If this difficulty is overcome, and the culture recommended is carefully carried out, Muscats can be had in good condition throughout the winter; but for market purposes they are especially useful about Christmas, when plump, richly coloured, and highly flavoured samples command excellent prices.

White Tokay.—There is not another late white Grape to approach Muscat of Alexandria in any respect, but White Tokay may be noted as a more easily grown and more freely setting variety of fairly good flavour when thoroughly ripened.

Raisin de Calabre is a large-bunching variety that sets well and keeps late, but has little to recommend it in flavour.

Trebbiano also bears very large bunches and keeps fairly well, the flavour being rather better than the last-named, but, like the Syrian, it must not be closely restricted in growth.

GARDEN PHLOXES AT CHISWICK

P. PANICULATA (P. DECUSSATA) CLASS.

THE summer of 1893, with its ever to be remembered heat and drought, was a most unfortunate one for the Phloxes, which are by nature lovers of a fairly cool soil and plenty of moisture. The trial of these plants at Chiswick could not therefore be considered entirely satisfactory, but it is thought better to give such results as were arrived at, with a caution to the reader to remember that plants which were "dwarf" in 1893 might very conceivably prove "medium," or even "tall" growers in an ordinary English summer, and it may reasonably

be anticipated that any varieties which were good in 1893 will be extra good in any other year.

Large collections had been sent to the Gardens by Messrs. James Veitch & Sons, Chelsea; Messrs. Victor Lemoine, Nancy, France; Messrs. Paul & Son, Cheshunt; Mr. J. Forbes, Hawick, N.B.; Messrs. Dicksons, Chester; and Messrs. Dobbie, Rothesay, N.B.; and, out of a total collection of 569 varieties, the following were noted as worthy of $\times \times \times$, i.e. *Highly Commended*.

[In order to make the list more complete, the results obtained in 1892 are incorporated with those of 1893.]

Henri Murger:—White suffused with pink, crimson eye; flowers very large; medium height. *Lemoine, Dicksons*.

Le Soleil:—Rose, eye darker, mottled; dwarf. Award of Merit, August 23, 1892. *Paul & Son, Forbes*.

Epopée:—Rosy purple, crimson centre; medium height. *Dicksons*.

Panthéon:—Bright salmon-rose, lighter centre; flowers large; medium height. *Lemoine*.

Abondance:—Rosy purple, light eye; dwarf. *Lemoine*.

Eugène Schotte:—Rich pink, lighter centre; dwarf. *Paul & Son, Forbes*.

Perle:—White, shaded with rose; flowers large; medium height; very fine. *Paul & Son*.

Fille de l'Air:—White, deep pink eye; dwarf. *Paul & Son*.

Henri Regnault:—Dark rose, shaded with salmon; flowers very large; medium height. *Forbes*.

Mrs. Kinghorn:—Pale salmon, shaded with lilac, crimson eye; tall. *Forbes*.

Flambeau:—Fiery red-scarlet, crimson eye; flowers large; medium height. *Lemoine, Dicksons*.

Molière:—Rosy salmon-pink, shaded, darker eye; medium height. Award of Merit, Sept. 12, 1893. *Paul & Son, Lemoine*.

Alex. Matheson:—Light salmon-rose, crimson eye; medium height. *Dicksons*.

Eugène Danzanvilliers:—Shaded lilac, fine white eye; flowers very large; dwarf habit. *Forbes, Paul & Son*.

Amazon:—Pure white, lemon eye; flowers large; dwarf. *Forbes*.

Boule de Feu:—Deep salmon-red; medium height. *Paul & Son*.

Burnouf:—Very deep salmon-red, darker eye; medium height. *Lemoine, Dicksons.*

Croix de Sud:—White, edged lilac, carmine eye; dwarf. *Forbes.*

Countess of Mar:—White, shaded, dark eye; flowers small; medium height. *Forbes.*

Delicata:—White, pink eye; large spike; medium height. *Forbes.*

Etna:—Fiery orange-scarlet, darker centre; very fine flowers; tall. Award of Merit, August 8, 1893. *Paul & Son, Lemoine.*

Pluton:—Very deep red; dwarf. *Dicksons, Forbes.*

Paul Bert:—Lilac, suffused with blue; flowers large; medium height. *Forbes.*

Sam Ireland:—Rosy lilac, crimson eye; medium height. *Forbes.*

Wm. Robinson:—Rose, shaded purple, dark eye; tall. *Forbes.*

Michael Cervantes:—Blush, rose centre. Award of Merit, August 23, 1892. *Paul & Son.*

Panama:—Pure white, lemon eye. (Very like "Amazon.") *Forbes.*

Faust:—White, rose centre; flowers very large; very free; dwarf. *Lemoine.*

Avalanche:—Pure white, lemon eye; dwarf. *Lemoine, Forbes, Dicksons.*

Ornament:—Light rose, crimson centre; dwarf. *Forbes, Dicksons.*

Éclaircur:—Carmine, shaded rose; flowers very large; medium height. Award of Merit, August 23, 1892. *Paul & Son, Forbes.*

Enchantment:—Violet striped with white, white eye; medium height. *Forbes.*

Granville:—Creamy white, light pink centre; medium height. *Paul & Son, Forbes.*

Longchamps:—White, violet eye; medium height. *Forbes.*

Neptune:—Salmon, rose eye; dwarf. *Forbes.*

Nain Bébé:—Violet-rose; flowers large; medium height. *Forbes.*

Regalis:—Bright rosy carmine; dwarf. *Forbes.*

William Muir:—Rosy-purple, crimson eye; tall. *Forbes.*

John Forbes:—Bright rosy pink, crimson eye; flowers large; medium height. *Forbes*.

Thalie:—Pinkish purple, blotched with white, darker eye; flowers large; medium height. *Dicksons*.

Adonis:—Rosy salmon; very fine; medium height. *Lemoine*.

Le Vengeur:—Brilliant rosy-pink, crimson eye; flowers very large. *Lemoine*.

Aurore:—Very bright salmon-red, dark eye; fine flower; medium height. *Lemoine*.

Éclatante:—Bright orange-scarlet; large flowers. *Lemoine*.

Pont Biquet:—Deep crimson, shaded with magenta; medium height. *Lemoine*.

The following were noted as worthy of $\times \times$, i.e. *Commended*:—

Baccile:—Violet-mauve, rosy eye; flowers large; dwarf. *Paul & Son*.

Jenny Grieve:—White, crimson eye; flowers small; medium height. *Forbes*.

David Christie:—White, crimson eye; compact; medium height. *Forbes*.

Robur:—Purplish rose, streaked with white, rose-pink eye; tall. *Forbes*.

James McKay:—White; good flower; medium height. *Forbes*.

William Veitch:—White tinged with rose, crimson eye; tall. *Forbes*.

Alex. Shearer:—Deep orange-scarlet; good flower; medium height. *Forbes*.

Meteor:—Red-purple, blotched with white, darker eye; dwarf. *Veitch & Sons, Forbes*.

Flocon de Neige:—White, streaked with purple; medium height. *Lemoine*.

Aspasie:—Rosy lilac, white centre; dwarf. *Lemoine*.

Roi des Roses:—Rose, crimson eye; dwarf. *Forbes*.

Hirondelle:—Bright rosy-lilac, crimson eye; medium height. *Forbes*.

Pureté:—White; dwarf. *Forbes*.

Africain:—White, mottled rosy lilac; dwarf. *Dicksons*.

Bayard:—Violet-mauve; large flowers; dwarf. *Paul & Son, Forbes*.

Belvidere:—Bright rose, darker eye; free; dwarf. *Forbes, Paul & Son*.

Claudot :—Rosy pink, crimson eye ; tall. *Paul & Son*.

Félibre :—Fiery red ; dwarf. *Dicksons*.

Iris :—Violet, shaded blue, darker eye ; good spike ; dwarf.
Paul & Son, Dicksons, Forbes, Lemoine.

Panorama :—Rose-lilac, lighter centre ; dwarf. *Paul & Son, Forbes*.

Mrs. Laing :—Rosy lilac ; crimson eye : medium height.
Forbes.

Jeanne d'Arc :—White, lemon eye ; dwarf. *Paul & Son, Forbes*.

GARDEN VIOLAS AT CHISWICK.

THE hot, dry season of 1893 has been a very trying one for all the Pansy tribe in the southern parts of England, but out of a collection of 106 varieties sent by Messrs. Dobbie, of Rothessay, N.B., and Dr. Stuart, Churnside, N.B., the following were noted as worthy of $\times \times \times$, i.e. *Highly Commended* :—

Sylvia :—Flowers cream-coloured ; habit dwarf and compact. *Stuart*.

George Muirhead :—Canary-yellow ; compact. *Stuart*.

The Mearns :—Deep violet-purple, upper petals edged with white. *Dobbie*.

Champion :—Cream-coloured. *Dobbie*.

Lord Elcho :—Deep yellow ; large foliage. *Dobbie*.

Ardwel Gem :—Rich sulphur, deeper eye ; free bloomer.
Dobbie.

Victoria :—White, eye yellow ; deep green foliage. *Dobbie*.

Bridesmaid :—Soft primrose ; very free bloomer. *Dobbie*.

Trentham Purple :—Rich purple ; free bloomer. *Dobbie*.

Mr. Charles Turner :—Purple ; distinct. *Dobbie*.

William Neil :—Pale rose colour. *Dobbie*.

Blue Gown :—Bright blue, eye golden. *Stuart*.

Lillias :—Upper petals mauve, lower creamy white edged with mauve, with a deep yellow blotch. *Dobbie*.

Duchess of Sutherland :—Mauve, shaded with blue. *Dobbie*.

Duchess of Fife :—Primrose, edged with blue. *Dobbie*.

Queen of Scots :—Dark blue centre, light blue edges.
Dobbie.

HYBRID CANNAS AT CHISWICK.

OUT of a collection of 45 varieties sent by Messrs. Vilmorin, M. Lemoine, Messrs. Paul & Son, Messrs. J. Veitch & Sons, Mr. Allen, and some seedlings raised in the Society's Gardens, the following were noted as worthy of $\times \times \times$, i.e. *Highly Commended*, and those to which an Award of Merit has been granted have also been added to make the list more complete:—

Quasimodo:—Orange-scarlet, golden edges. Award of Merit, September 12, 1893. *Vilmorin*.

Gloire d'Empel:—Very rich crimson-scarlet; foliage bronzy-green. Award of Merit, August 8, 1893. *Vilmorin*.

Professor David:—Scarlet, golden edges. *Lemoine, Veitch*.

Alphonse Bouvier:—Rich deep crimson. Award of Merit, January 12, 1892. *Paul & Son, Lemoine*.

P. Marquant:—Brownish yellow, with darker streaks; beautiful bronze foliage. *Lemoine*.

Capucine:—Soft orange-scarlet. *Lemoine*.

François Crozy:—Orange, edged with canary; very free bloomer. *Lemoine*.

Duchesse de Montmartre:—Yellow, with brownish-red spots. *Lemoine*.

Jules Chrétien:—Crimson-scarlet; dwarf. Award of Merit, June 23, 1891. *Paul & Son, Veitch*.

T. W. Turner:—Rich canary, with brown streaks; a seedling from Duchesse de Montmartre. *R.H.S.*

Progression:—Soft yellow, with brown spots. Award of Merit, April 11, 1893. *Paul & Son*.

Sophie Buchner:—Bright crimson; large flowers. Award of Merit, May 9, 1893. *Paul & Son*.

Duchess of York:—Yellow, spotted and striped with red-brown. Award of Merit, August 8, 1893. *Kelway*.

Michelet:—Brilliant crimson; large. Award of Merit, August 8, 1893. *Sir Trevor Lawrence*.

Königin Charlotte:—Orange-scarlet, edged yellow; dwarf. Award of Merit, August 8, 1893. *Pfitzer*.

Lohengrin:—Orange-scarlet. Award of Merit, August 8, 1893. *Vilmorin*.

Capitaine de Suzzoni:—Clear yellow, brown spots. Award of Merit, August 8, 1893. *Lemoine*.

GARDEN IRISES AT CHISWICK

OF THE RHIZOMATOUS CLASSES COMMONLY CALLED "FLAG"
OR "GERMAN" IRISES.

THE hot, dry season of 1893 has suited this class of Iris to perfection; they seem to delight in baking sun, and especially to dislike alternating wet and dry. If any fail with this class of Iris it is probably from root disturbance, or from too copious supplies of water. Out of a collection of 117 varieties, the following were noted as worthy of $\times \times \times$, i.e. *Highly Commended*.

The plants were all sent by Messrs. Barr & Son, Covent Garden.

Aphylla M^{de}m. Chéreau:—Standards and falls white, with grey-blue edges and reticulations.

Aphylla Bridesmaid:—Standards white and lilac; falls white, with purple veins.

Amæna Comte de St. Clair:—Standards white; falls purple and white; stigma white.

Amæna reticulata alba:—Standards white; falls white, striped with violet.

Neglecta Cordelia:—Standards deep mauve; falls deep purple.

Neglecta Wagner:—Standards pale mauve; falls violet.

Pallida Walmer:—Standards lavender; falls purplish lilac.

Pallida Khedive:—Standards and falls satiny mauve.

Pallida M^{de}m. Pacquette:—Standards violet; falls deep purple.

Squalens Jacquinianna:—Standards pale bronzy crimson, spotted with yellow at the base; falls rich deep purple.

Squalens Arnolds:—Standards bronzy purple; falls rich purple.

Squalens Harrison Weir:—Standards bronzy yellow; falls purple.

Squalens M. Chérion:—Standards bronzy gold; falls rich blood-red, beautifully veined.

Variiegata Beaconsfield:—Standards primrose; falls rich purple.

Variiegata Chénédollé:—Standards deep yellow; falls purple.

Variiegata Hector:—Standards sulphur; falls amaranth and yellow.

Variiegata Honourable :—Standards deep yellow ; falls yellow, shaded with red.

Variiegata major :—Standards yellow ; falls brownish red.

Variiegata minor :—Standards clear yellow ; falls violet, edged with primrose.

Variiegata John Fraser :—Standards rich yellow ; falls purple, shaded with sulphur.

Variiegata Prince of Orange :—Standards bronzy yellow ; falls brown, suffused with yellow.

Flavescens :—Standards and falls pale lemon-yellow.

The following were noted as worthy of $\times \times$, i.e. *Com-
mended* :—

Neglecta Virginie :—Standards pale mauve, with red veins ; falls purple.

Squalens La Prestieuse :—Standards bronzy yellow ; falls dark purple.

Squalens Lady Seymour :—Standards pale mauve ; falls light purple. Dwarf habit.

Squalens Bronze Beauty :—Standards sulphur ; falls pale yellow, shaded with purple.

Squalens Herodotus :—Standards bronzy yellow ; falls striped purple.

Variiegata Apollon :—Standards sulphur ; falls soft purple, beautifully veined.

Variiegata Favourite :—Standards clear yellow ; falls light violet.

REPORT ON CELERY

GROWN FOR TRIAL IN THE SOCIETY'S GARDENS AT CHISWICK,
1893.

THE seeds for this trial were presented by Messrs. Vilmorin et Cie., Paris ; Messrs. Henderson & Co., New York ; Messrs. Sutton & Sons, Reading ; Messrs. J. Veitch & Sons, Chelsea ; Messrs. Dobbie & Co., Rothesay ; and Messrs. J. Carter & Co., High Holborn.

There were twenty-four reputed varieties, of which eleven were white and ten red, and three Celeriacs. The year 1893 proved rather dry for Celeries until late in the season, when they

began to grow in a very satisfactory manner, and most of the varieties attained a good size.

Celeries admit of division into three classes, viz. :—

Class I. White varieties.

„ II. Red varieties.

„ III. Celeriac.

CLASS I.—WHITE CELERIES.

1. White Plume (Messrs. Vilmorin et Cie.). Plants dwarf. Outer leaves pale green, the younger or heart leaves pale silvery white, as if blanched. Hearts small, not very firm, of inferior quality, but very ornamental, and suitable for garnishing. Plant somewhat tender.

2. White Plume (Messrs. P. Henderson & Co.). Same as No. 1, but a taller and stronger stock.

3. Paris Golden Yellow (Messrs. Vilmorin et Cie.). Plants dwarf, stalks thick and broad. Hearts large, firm, and solid. Leaves broad, pale golden. A very distinct variety, but somewhat tender.

4. Henderson's Golden Dwarf (Messrs. P. Henderson & Co.). Stock mixed. Inferior to No. 3.

5. Sandringham White (Messrs. J. Veitch & Sons). Plants dwarf. Hearts firm, solid, white.

6. Sutton's White Gem (Messrs. Sutton & Sons). A very dwarf stock of No. 5.

7. Henderson's Half-dwarf (Messrs. P. Henderson & Co.). Of taller and stronger growth than No. 5.

8. Dwarf Large-ribbed White (Messrs. Vilmorin et Cie.). A very broad-stalked variety, with solid hearts. A late variety.

9. White Solid Pascal (Messrs. Vilmorin et Cie.). Stock mixed and irregular.

10. Wright's Giant White (Messrs. J. Veitch & Sons). Plants of moderate height. Hearts large and solid.

11. Dobbie's Invincible White (Messrs. Dobbie & Co.). Plants tall. Hearts firm and solid, and of good quality.

CLASS II.—RED CELERIES.

12. New Dwarf Red (Messrs. J. Veitch & Sons). Plants dwarf and compact in growth. Hearts of moderate size, firm and solid.

13. Sutton's A1 (Messrs. Sutton & Sons). Similar to No. 12.

14. Improved Purple (Messrs. Vilmorin et Cie.). Plants dwarf. Hearts firm and solid. Stock somewhat mixed.

15. Carter's Standard Bearer (Messrs. Carter & Co.). Plants tall. Leaves broad, deep green. Hearts firm and solid, and very hardy.

16. Veitch's Early Rose (Messrs. J. Veitch & Sons). Tall growing. The stalks rounded, fine, crisp, and solid. Early.

17. Ivery's Nonesuch (Messrs. J. Veitch & Sons). Tall growing. Leaf-stalks broadly ribbed. Hearts pale, large and solid.

18. Carter's Solid Ivory (Messrs. J. Carter & Co.). Similar to No. 17.

19. Standard Bearer (Messrs. J. Veitch & Sons). Tall growth. Heads large, solid, deeply coloured.

20. Dobbie's Select Red (Messrs. Dobbie & Co.). Tall growth. Stalks broadly ribbed. Hearts large, very solid and good.

21. Major Clarke's Solid Red (Messrs. J. Veitch & Sons). Plants of compact, medium growth. Leaves deep green, deeply serrated. Hearts very firm and solid. Excellent for early use.

CLASS III.—CELERIAC OR TURNIP-ROOTED CELERY.

22. Hartshorn (Messrs. Vilmorin et Cie.). Dwarf. Leaves deeply toothed and lobed, shining green.

23. Large Smooth Prague (Messrs. Vilmorin et Cie.). Plants of tall growth. Bulbs large.

24. Variegated (Messrs. Vilmorin et Cie.). Plant small, the leaves prettily variegated with white. Bulb small.

REPORT ON ENDIVES

GROWN FOR TRIAL IN THE SOCIETY'S GARDENS AT CHISWICK,
1892-93.

THE Garden Endives are of two very distinct classes:—1. Curled; 2. Broad-leaved or Batavian.

Special attention is directed to the Batavian Endive, as being the finest autumn salad in cultivation, but comparatively

unknown. Seed sown in July will give a supply from September to Christmas. The varieties 16, 19, and 21 are the truest and best stocks.

CLASS I.—CURLED.

1. Court-à-Cloche (Messrs. J. Veitch & Sons). Leaves pale green. Hearts of medium size.

2. Ever-white Curled (Messrs. Vilmorin et Cie.). Leaves very pale green, of strong rather loose growth.

3. Fine Lacinated Louviers (Messrs. J. Veitch & Sons, and Messrs. Vilmorin et Cie.). Leaves glaucous green, and of compact growth; very slow to run to seed.

4. Green Curled (Messrs. J. Veitch & Sons). Leaves pale green, of very compact growth, and hearts well.

5. Green Fine Curled Winter (Messrs. Vilmorin et Cie.). Leaves deep green. Very similar to No. 9.

6. Green Very Fine Curled Summer (Messrs. Vilmorin et Cie.). Leaves bright green, much curled, of fine compact growth, and blanches freely.

7. Green Very Fine Parisienne Summer (Messrs. Vilmorin et Cie.). Same as No. 6.

8. Imperial Curled (Messrs. Vilmorin et Cie.). Leaves pale green, loose in the heart.

9. Large Curled Pancalier (Messrs. Vilmorin et Cie.). Leaves dark green, large coarse growth, and does not heart freely.

10. Moss Curled (Messrs. J. Veitch & Sons). Leaves short, finely curled, light green.

11. Moss Very Fine Curled (Messrs. J. Veitch & Sons). Leaves pale green, finely curled, of small compact growth, and hearts freely.

12. Picpus (Messrs. J. Veitch & Sons, and Messrs. Vilmorin et Cie.). Leaves bright green, of strong compact growth, and hearts freely.

13. Stagshorn (Messrs. J. Veitch & Sons, and Messrs. Vilmorin et Cie.). Leaves dark green, large lobed, of compact growth, and hearts freely.

14. Ruffec (Messrs. Vilmorin et Cie.). Leaves large, deep green, much curled; large.

15. White Curled (Messrs. J. Veitch & Sons). The same as No. 2.

CLASS II.—BROAD-LEAVED OR BATAVIAN.

16. Batavian or Broad-leaved (Messrs. Vilmorin et Cie.). Leaves large, light green; they incurve and hood over so that the hearts are naturally partially blanched; large and very fine.

17. Broad-leaved Large Limay (Messrs. Vilmorin et Cie.). Leaves large, deep green; large; blanches freely.

18. Broad-leaved Winter (Messrs. Vilmorin et Cie.). Leaves pale, broad, flat; does not form much heart.

19. Broad-leaved Green Batavian (Messrs. Barr & Son). Same as No. 16.

20. Broad-leaved White or Lettuce-leaved (Messrs. Vilmorin et Cie.). Leaves large, pale green, fleshy; hearts freely.

21. Improved Round-leaved (Messrs. J. Veitch & Sons). Same as No. 16.

22. Queen of the Winter (Messrs. Vilmorin et Cie.). Leaves large, much lobed and toothed. Plants large, with small hearts. Stands the winter well.

23. White Batavian (Messrs. J. Veitch & Sons). Same as No. 20.

 REPORT ON ONIONS

GROWN FOR TRIAL IN THE SOCIETY'S GARDENS AT
CHISWICK, 1893.

THE seeds for this trial were furnished by Mr. Allan, Gunton Park, Norwich; Messrs. Carter & Co., High Holborn; Messrs. Deverill & Co., Banbury; Messrs. Dobbie & Co., Rothesay; Messrs. P. Henderson & Son, New York; Messrs. Hurst & Son, Houndsditch; Messrs. Sutton & Sons, Reading; Messrs. Vilmorin et Cie., Paris; and Messrs. J. Veitch & Sons, Chelsea, and sown in the first week of March in drills 18 inches apart. The soil, a good loam, was well manured and deeply dug the previous autumn. No special treatment was given to any, the ordinary cultivation being followed. Although scarcely any rain fell from the time of sowing to the lifting of the crop, the Onions grew well and attained a fair size, so that the trial may be considered satisfactory.

The Committee inspected the trial twice during the season, and awarded $\times \times \times$, i.e. *Highly Commended*, to the following varieties as being good typical examples :—

Cocoanut, Deverill & Co. F.C.C., Oct. 10, 1893.

Southport Red Globe, Deverill & Co. and Messrs. P. Henderson & Son. F.C.C., Oct. 10, 1893.

Southport Yellow Globe, Messrs. P. Henderson & Son. F.C.C., Oct. 10, 1893.

Prizetaker, Messrs. P. Henderson & Son.

Globe Madeira, Messrs. Vilmorin et Cie. F.C.C., Oct. 10, 1893.

Italian Tripoli, Messrs. Vilmorin et Cie. F.C.C., Oct. 10, 1893.

Sutton's A1, Messrs. Sutton & Sons.

Altogether forty-eight examples were tested, which have been grouped into the following classes :—

1. Varieties adapted for sowing in spring for general supply.
2. Varieties adapted for sowing in autumn for use in summer.
3. Silver-skins or Pickling Onions.

CLASS I.—*Group 1.*

1. Allan's Reliable, Mr. Allan.
2. White Spanish, R.H.S.
3. Maincrop Spanish, Messrs. Deverill & Co.
4. Reading, Messrs. J. Veitch & Sons.
5. Sutton's A1, Messrs. Sutton & Sons.

Bulbs large, flattened; the base broad, frequently a little hollowed and uneven; somewhat globular towards the stalk in the best forms. Skin pale straw-white, at times a tinge of red. Flesh firm and solid. Keeps well.

Group 2.

6. The Royal Jubilee, Messrs. Deverill & Co.
7. Straw-coloured White Spanish, Messrs. Vilmorin et Cie.
8. Anglo-Spanish, Messrs. Deverill & Co.

Bulbs of medium size, flattened, similar to Group 1, of a pale straw colour.

Group 3.

9. Yellow Globe, Messrs. J. Veitch & Sons.
10. Excelsior, Messrs. Deverill & Co.

Bulbs of medium size ; shape somewhat globular or obovate, having a high crown. Skin pale straw.

Group 4.

11. Danvers Yellow, Messrs. Deverill & Co.
12. Yellow Globe Danvers, Messrs. P. Henderson & Son.
13. Danvers Yellow Globe, Messrs. Vilmorin et Cie.

Bulbs of medium size, very regular and even, roundish, globular, with a small neck. Skin of a dark straw colour. Flesh very firm and solid. Keeps remarkably well. No. 12 somewhat paler than the others.

Group 5.

14. Giant Zittau, Messrs. J. Veitch & Sons.
15. Zittau Yellow Giant, Messrs. Vilmorin et Cie.

Very similar to Danvers Yellow, but rather larger.

Group 6.

16. James's Keeping, Messrs. Vilmorin et Cie.
17. New Globe, Messrs. Hurst & Son.
18. Carter's Holborn, Messrs. Carter & Co.
19. Southport Yellow Globe, Messrs. Deverill & Co.
20. Bedfordshire Champion, Messrs. J. Veitch & Sons.

Bulbs of medium size, globular or obovate in shape, the better forms having a very characteristic sort of neck or shoulder. Skin pale brown. The flesh is very firm and solid. A remarkably fine keeping variety. No. 16 is a fine form No. 18 a very fine stock ; No. 20 somewhat mixed.

Group 7.

21. Prizetaker, Messrs. P. Henderson & Son. F.C.C., Oct. 10, 1893.

22. Ailsa Craig, Messrs. Deverill & Co.
23. Southport Yellow Globe, Messrs. P. Henderson & Son.
24. James's Keeping, Messrs. Deverill & Co.
25. The Sutton Globe, Messrs. Sutton & Sons.
26. The Lord Keeper, Messrs. Deverill & Co.
27. Improved Wroxton, Messrs. Deverill & Co.
28. Advancer, Messrs. Deverill & Co.
29. Cocoanut, Messrs. Deverill & Co.
30. Brown Globe, Messrs. J. Veitch & Sons.

Bulbs large, roundish or obovate, with a round, full base, and a high somewhat pointed crown; altogether a fine form. Skin pale straw. Flesh moderately firm and solid. Keeps well. No. 21, a very fine stock, pale brown; No. 24, a fine even stock; No. 28, a pale form; No. 30, a small form.

Group 8.

31. Southport Red Globe, Messrs. Henderson & Son.

32. Southport Red Globe, Messrs. Deverill & Co.

Bulbs large, globular or obovate, with a high crown. Skin deep red. Flesh very firm and solid. A handsome Onion, and keeps well.

Group 9.

33. Dobbie's Select Red, Messrs. Dobbie & Co.

34. Dark Red August, Messrs. Vilmorin et Cie.

Bulbs of medium size, round, and flattened at the crown. Skin dull red. Flesh very firm and solid. These two varieties are very similar.

Group 10.

35. Hard White Dutch, Messrs. Vilmorin et Cie.

Bulbs small, round. Skin greenish-white. Flesh very firm and solid. Keeps well.

CLASS II.—*Group 11.*

37. Trebons, Messrs. Deverill & Co.

38. Trebons, Messrs. J. Veitch & Sons.

39. Trebons Large Yellow, Messrs. Vilmorin et Cie.

Bulbs large, obovate; the base broad, flat, tapering to the crown. Skin pale straw colour; peels off readily. Flesh pale, rather soft, but mild and tender. A fine Onion for summer use. Succeeds best in warm seasons. Very handsome in appearance.

Group 12.

40. Italian Tripoli, Messrs. Vilmorin et Cie.

41. Large White Gorgonis, Messrs. J. Veitch & Sons.

Bulbs very large, flattened. Skin white. Flesh white, streaked with green where exposed; soft and useful, but will not keep long.

Group 13.

42. Globe Madeira, Messrs. Vilmorin et Cie.

Bulb large, globular or obovate. Skin dull brown, with a tinge of red. Flesh soft, a little coloured. Good for summer use; does not keep well.

Group 14.

43. Giant Rocca, Messrs. Deverill & Co.

44. Giant Rocca, Messrs. J. Veitch & Sons.

Bulb very large, globular, with a broad base. Skin of a dull straw colour, with a tinge of red. Flesh soft, pale straw. A good summer Onion.

Group 15.

45. White Globe, Messrs. Vilmorin et Cie.

46. New Silver Globe, Messrs. Carter & Co.

47. Southport White Globe, Messrs. Henderson & Son.

Bulbs of medium size, almost round, and very regular in form. Skin pure silvery white. Flesh very firm and solid; very strong flavour. A handsome Onion, but soon decays.

CLASS III.—*Group 16.*

48. Queen Onion, Messrs. J. Veitch & Sons.

49. New Queen, Messrs. Vilmorin et Cie.

Bulb very small if grown thickly, but will grow to a medium size if allowed space. Skin silvery white, with green veinings. Flesh white, firm and solid. This is a fine selection of the Silver-skins.

REPORT ON POTATOS

GROWN FOR TRIAL AT CHISWICK, 1893.

THE collection of Potatos consisted of sixty-three named varieties, and the season being favourable there was not much disease prevalent.

The Fruit and Vegetable Committee made two inspections of the crop whilst growing, the early varieties being tested on

August 17, and the later sorts on October 5. The following varieties, Major T. Neve, Duke of York, Renown, Crawley Prize-taker, Daniels' Special, Enoch Arden, Sutton's Triumph, King of the Earlies, Jeannie Deans, Sutton's Windsor Castle, Appleby's Nonesuch, Conference, New Seedling, Sutton's Superior, Princess May, White Russet, Radcliffe Kidney, The Amateur, Lillie Langtry, Holborn Reliance, Sutton's Perfection, Success, Fincham's Alpha, Early Regent, and Midland Rival having been selected by the Committee as being of good appearance and cropping qualities, were subjected to the test of cooking, and the following varieties then received $\times \times \times$, i.e. *Highly Com- mended* :—

Conference, from Mr. R. Dean, Ealing; *Early Regent*, from Messrs. J. Veitch & Sons, Chelsea; *Jeannie Deans*, from Messrs. Carter & Co., Holborn; *Major T. Neve*, from Mr. Fincham, Cranbrook; *Lillie Langtry*, from Mr. Fletcher, Annesley; *Rad- cliffe Kidney*, from Mr. Selby, Radcliffe, Notts; *Success*, from Mr. Aplin, Gloucester; *Sutton's Triumph*, from Messrs. Sutton & Sons, Reading; *Sutton's Windsor Castle*, from Messrs. Sutton & Sons, Reading.

The following is a brief description of the varieties tried, arranged in alphabetical order :—

Annie Lee (Mr. Fletcher, Annesley). White, large, half- round, regular. Good crop.

Appleby's Nonesuch (Mr. Appleby, Dorking). White, medium, oblong, rough skin.

Ashleaf Selected (Messrs. Barr & Son, Covent Garden, and Messrs. J. Veitch & Sons, Chelsea). True.

Black Prince (Mr. Ridgewell, Cambridge). Dark purple, medium, ovoid. Small crop.

Boskoop (Mr. Endtz, Boskoop). White, small, round, deep eyes. Very poor crop.

Boston Q. Q. (Messrs. Johnston, Boston, Lincoln). White, large, round, rough skin. Very large crop.

Cambridge Hero (Mr. Ridgewell). White, long, tapering to one end, irregular.

Conference (Mr. R. Dean, Ealing). White, with rosy-pink eyes, medium, ovoid, smooth skin. F.C.C. Oct. 10, 1893.

Cranbrookian (Mr. Fincham, Cranbrook). White, medium, rough, round. Moderate cropper.

Crawley Prizetaker (Messrs. J. Cheal & Sons, Crawley). White, half-round, rough skin, irregular. Good crop.

Daniels' Special (Messrs. Daniels Bros., Norwich). Large, oblong, regular, rough skin. Great crop.

Daniels' Table King (Messrs. Daniels Bros.). White, large, oblong, rough skin.

Duke of York (Messrs. Cooper, Taber & Co., Witham, and Messrs. Daniels Bros.). White, large, ovoid, rough skin, fine form.

Earl's Court Champion (Mr. Ridgewell). White, medium, round, regular. Moderate crop.

Earl Cranbrook (Mr. Fincham). Pale rose, large, oblong, deep eyes, early. Good crop.

Early Crimson Flourball (Messrs. Daniels Bros.). Red, round, small, rough skin.

Early Magnum or *Standard of Excellence* (Mr. P. Collins, Malvern). White, ovoid, medium, rough skin.

Early Short-top (Messrs. Laxton Bros., Bedford). White, oblong, medium, very early, and good crop.

Early Regent (Messrs. J. Veitch & Sons). Medium, round, rough skin, handsome. Good crop. F.C.C. Oct. 10, 1893.

Enoch Arden (Mr. Fletcher). Rose, large, regular, rough skin. Good crop.

Fincham's Alpha (Mr. Fincham). White, medium, round, flattened, regular. Heavy crop.

Fincham's Snowball (Mr. Fincham). White, round, rough skin. Fair crop.

Giant Nonpareil (Messrs. Vilmorin et Cie., Paris). Very large, deep eyes, irregular, coarse, late.

Holborn Reliance (Messrs. J. Carter & Co., High Holborn). White, large, long, tapering, smooth skin, coarse. Good crop.

Indian Prince (Messrs. Daniels Bros.). Purple, small, long kidney.

Jeannie Deans (Messrs. Carter & Co.). White, medium, half-round, rough skin. F.C.C. Oct. 10, 1893.

John Fincham (Mr. Fincham). White, small, round. Poor crop.

King of the Earlies (Mr. Ridgewell). White, long, tapering. Fair crop.

Leicester Gem (Mr. E. Miles, Leicester). White, small, ovoid, rough skin.

Lillie Langtry (Mr. Fletcher). White, with pink eyes, round, rough skin. Fair crop. F.C.C. Oct. 10, 1893.

London Purple (Mr. P. Collins). Long, purple.

Maincrop Kidney (R.H.S.). Magnum Bonum type. Great cropper.

Major T. Neve (Mr. Fincham). White, half-long, irregular shape, smooth skin. Great crop. F.C.C. Oct. 10, 1893.

Marvel (Mr. Fidler, Reading). White, medium, rough, round, irregular. Good crop.

Market Favourite (Mr. Ellington, Mildenhall, Suffolk). Flaked purple, large, round, irregular. Fair crop.

Mary Anderson (Mr. Fletcher). White, long, irregular. Great crop.

M. Eiffel (Messrs. Vilmorin et Cie.). White, medium, long kidney. Poor crop.

Midland Model (Mr. Miles). Ovoid, flattened, rather small, rough skin. Moderate crop.

New Forcing (Messrs. J. Carter & Co.). White, medium, round, rough skin. Small crop, early.

New International (Mr. Ridgewell). White, oblong, rough skin.

New Round Renown (Mr. Dean). Medium, rough skin, round. Fair crop.

New Seedling (Mr. B. Wright, Oakham). White, with pink eyes, large, round, rough skin.

Perfection (Messrs. Sutton & Sons). White, medium, round, very rough. Good crop.

Princess May (Messrs. Daniels Bros.). Pale rose, oblong, flattened, smooth. Fair crop.

Prodigious (Messrs. R. Veitch & Sons, Exeter). White, large, long, deep eyes, coarse, irregular. Great cropper.

Queen of the Plodders (Messrs. Vilmorin et Cie.). White, very long, tapering, irregular, smooth skin, large eyes, very coarse.

Radcliffe Kidney (Mr. Selby, Radcliffe, Notts). Half-long, rough skin, regular. Good crop. F.C.C. Oct. 10, 1893.

Reading Giant (Mr. Fidler). White, oblong, irregular, rough skin.

Reformer (Mr. Miles). Small, half-round.

Resistance (Mr. Miles). White, small, long, tapering.

Ringleader Kidney (Messrs. Sutton & Sons). White, long, smooth skin. Poor crop.

Schoolmaster (Messrs. R. Veitch & Sons). True.

Success (Mr. Aplin, Gloucester). White, large, half-long, rough skin, irregular. Good cropper.

Superb (Mr. Van Orman, Lewis, Iowa). White kidney, small, early.

Superior (Messrs. Sutton & Sons). Half-long, irregular, smooth skin. Moderate crop.

Triumph (Messrs. Sutton & Sons). White, medium, half-long, flattened, rough skin. Moderate crop.

Windsor Castle (Messrs. Sutton & Sons). Medium, half-long, rough skin. Moderate crop, early, promising.

The Amateur (Mr. Maher, Newbury). White, small, round, rough skin. Fair crop.

The Baten (Mr. P. Collins). White, small, ovoid.

The Canon (Mr. Dean). Oblong, smooth skin, large, flattened. Very handsome.

White Russet (Mr. Harris, Wavendon). White, medium, round, rough skin. Fair crop.

Wonderful (Mr. Fidler). White, half-long, rough skin, large. Good crop.

Woodlands Seedling (Mr. Newington, Ticehurst, Sussex). White, small, roundish, flattened, rough skin.

EXTRACTS FROM THE PROCEEDINGS

OF THE

ROYAL HORTICULTURAL SOCIETY.

GENERAL MEETING.

JANUARY 17, 1893.

G. PAUL, Esq., in the Chair.

Fellows elected (40).—J. C. L. Andrews, John Aste, L. Brown, J. Carvill, Professor Cheshire, W. B. Child, Robert Cross, C. Daniels, Mrs. de Tivioli, F. F. Freeman, George Fry, A. T. G. Gibson, R. Hannen, C. Herrin, E. L. Hillier, J. Joblin, J. J. Kidd, W. H. Lucas, H. J. W. Martin, W. E. Martin, Mrs. McLaren, W. Miller, J. M. V. Money-Kent, George J. Morris, H. W. Newman, C. W. Nieuwerf, Lady Osborne, Lady K. Pakenham, Miss B. Pearson, L. B. Pillin, F. Reader, F. Robinson, Mrs. Robson, H. Seeböhm, P. Simpson, P. C. Stewart, F. Thorne, H. Tite, Rev. J. Walker, S. Yates.

Societies affiliated.—Headley Horticultural Society; London Pansy and Violet Society.

ANNUAL GENERAL MEETING.

FEBRUARY 14, 1893.

Sir TREVOR LAWRENCE, Bart. (President of the Society), in the Chair, and over 100 Fellows present.

The minutes of the last Annual General Meeting, on February 9, 1892, were read and signed.

The following elections took place :—

Fellows (42).—Archibald Allen, Mrs. Barrand, A. E. Bellairs, William Birkett, John H. Bolton, G. H. Chaplin, Lady Clifford of Chudleigh, William Dipper, Whateley Eliot, M.I.C.E., J. Ellis, George Etheridge, Francis Fell, Col. Stephen Flower, W. F. Gates, Mrs. J. Keats, Hamilton Leigh, L. Linden, Frank Lloyd, Herbert Lloyd, F. J. Martell, Robert McIntosh, Henry Middlehurst, G. B. Milne-Redhead, George Morphett, Charles Morton, Alfred Outram, Edward Payne, James B. Riding, C. Richings, Arthur Rooke, W. North Row, Harold W. Sanderson,

Thomas Henry Scutt, Gilbert Spurling, G. S. Sutherland, M.D., Percy Vernon, J. H. Walker, Mrs. F. E. Walter, Herbert N. Wesson, H. J. Wheeler, J. H. White, Walter Wigram.

Societies affiliated (3).—Brixton, Streatham, &c., Horticultural Society; Caterham Horticultural Society; Mentmore Cottage Garden Society.

Messrs. Arthur Sutton and John Laing were appointed Scrutineers of the ballot.

Sir John Llewelyn, Bart., proposed, and Mr. H. Turner seconded, a hearty vote of thanks to the retiring members of the Council, viz.: Baron Schröder, N. N. Sherwood, Esq., and the Rev. W. Wilks, M.A.

The Chairman said the circumstances under which the Rev. W. Wilks retired from the Council were referred to in the Annual Report.

To fill the vacancies thus caused on the Council, the following gentlemen were proposed for election, viz.: The Hon. Walter de Rothschild, Sir John Llewelyn, Bart., and John T. Bennett-Poë, Esq.

The following gentlemen were proposed for re-election as officers, viz.: *President*, Sir Trevor Lawrence, Bart.; *Treasurer*, Philip Crowley, Esq., F.L.S.; *Secretary*, the Rev. W. Wilks, M.A.; *Auditors*, Messrs. Harry Turner, Henry Williams, and A. H. Pearson.

After a careful examination of the ballot papers, the Scrutineers reported the above-named gentlemen to be all duly elected.

The Chairman, in moving the adoption of the Annual Report, with the Financial Statement and Balance-sheet, reviewed with satisfaction the work accomplished by the Society during the year 1892. He called particular attention to the Temple Show, the result of which had been satisfactory. He also mentioned the fact that £386 had been spent in repairing the great vinery at Chiswick, in addition to the other expenses of the Gardens. The *Journal* of the Society appeared with regularity, and formed a great bond between the fountain-head and the Fellows all over the United Kingdom, on the Continent, and in the Colonies—especially in Australia. With regard to Examinations in Horticulture, the Chairman pointed out that three scholarships had been instituted in connection with them, the winners (if between the ages of 18 and 22) being required to spend at least

one year at Chiswick. In reference to the Life Fellows he wished to say that the Secretary, Treasurer, and himself had circulated a letter requesting them to become annual subscribers. The result was that many had done so, while others relieved the Society of the expense of sending them reports, &c.

Prof. Michael Foster rose to propose the following resolution: "That this meeting endorses the action of the Council in retaining the Rev. W. Wilks as paid Secretary of the Society."

Mr. J. Hudson seconded the resolution, which was carried *nem. con.*

The Secretary, in returning thanks for the unanimous adoption of the resolution, reviewed the history of the Society since it had vacated South Kensington and its "pleasure-garden" policy, and maintained that it had advanced in every way, and had returned to its original work of promoting horticultural knowledge.

The Report of the Council for the year 1892, as printed below, was then unanimously adopted.

REPORT OF THE COUNCIL FOR THE YEAR 1892-93.

The year 1892 has again been one of steady work and progress for our Society.

Two Conferences have been held at Chiswick, viz.: on Begonias and on Apricots and Plums. The attendance of Fellows and others at these Conferences, as also at the Fortnightly Lectures in the Drill Hall, has continued to be more encouraging than in previous years. Fellows would greatly assist the Council by making these Meetings and Lectures better known among the general public.

Twenty-two Fruit and Floral Meetings have been held in the Drill Hall, besides those held at Chiswick, and Lectures have been delivered at nineteen of them. The number of awards has been as follows:—On the recommendation of the Floral Committee, 62 First Class Certificates against 33 in 1891, 156 Awards of Merit against 183, and 2 Botanical Certificates. On the recommendation of the Orchid Committee, 48 First Class Certificates against 34 last year, 72 Awards of Merit against 38, 29 Botanical Certificates against 10. On the recommendation of the Fruit and Vegetable Committee, 27 First Class Certificates against 6, and 18 Awards of Merit against 7 last year.

The Society's Great Show, held (by the renewed kindness of the Treasurer and Benchers) in the Inner Temple Gardens, was as great a success as ever, alike in the number of visitors, the quantity and quality of the exhibits, and the propitiousness of

the elements. The best thanks of the Society are due to all who so kindly brought their plants for exhibition or otherwise contributed to the success of this Show.

The Society's general work of scientific experiment and investigation, and of the practical trials of various plants, has been going on steadily at Chiswick, under the superintendence of Mr. Barron. Trial has been made of 45 varieties of Tomatos, 12 of Turnips, 79 of Runner Beans, 66 of Beet, 79 of Vegetable Marrows, edible Gourds and Pumpkins, and 80 of Savoys and Cabbages. Eighty-nine new varieties of Potatos, and 104 new Peas have been tested. In the Floral Department 200 varieties of Carnations and Picotees, and 50 of Pinks, 200 Dahlias, 80 Violas, 44 of Sweet Peas, 26 Bedding Begonias, 324 Phloxes, 500 Pæonies, and 330 Asters (Michaelmas Daisies) have been tried. The Phloxes, Pæonies, and Asters have each had the special attention of a Committee of experts both in regard to their proper nomenclature and their value as hardy border flowers. The reports of these Committees will, it is hoped, be ready for publication during the present year.

Experiments have also been made with a Fruit Evaporator, kindly presented to the Gardens by Messrs. Mayfarth, and most satisfactory and encouraging results have been obtained in the drying both of Apples and Plums.

The *Journal* of the Society has been continued so as to enable Fellows at a distance to enter more fully into and reap the benefits of the study and work of those more actively engaged at headquarters. The first part of Vol. XV. was published early in the year, and the second and third parts (now ready for issue) were delayed owing to the pressure of work caused by the preparation of the Conifer Volume.

The Conifer Conference Report, forming Vol. XIV. of the *Journal*, is a work on the publication of which the Society may well be congratulated, and the thanks of all the Fellows are due to those who have so kindly contributed to it, and also especially to those on whom the heavy work of editing the volume has fallen.

The Council wish to repeat *verbatim* one paragraph of their last year's Report, which runs as follows:—

All these Conferences and Meetings, and especially the work and maintenance of the Chiswick Gardens and the publication of the *Journal*, have involved the Society in a very large outlay, and the Council take this opportunity of endeavouring to impress upon Fellows the absolute necessity there is for them all individually (as many as have the Society's welfare at heart) to endeavour to secure new Fellows to the Society, if its work is not only to be continued at its present standard, but still more so if the ever-opening and extended opportunities of usefulness are to be embraced and accepted. The adoption of £1. 1s. as one rate of subscription was, no doubt, a popular movement, but

the Council desire to remind the Fellows that such a low rate of Fellowship can only be self-supporting if it draws into the Society a *very large number* (far larger than at present exists) of additional Fellows. The Council, therefore, venture to express the hope that every Fellow of the Society will make an endeavour to obtain at least one new Fellow during the present year. A statement of the privileges of Fellows and of the aims and objects of the Society will be found in the Society's Arrangements for 1893, page 5.

The following table will show the Society's progress in regard to numerical strength during the past year:—

DEATHS IN 1892.				FELLOWS ELECTED 1892.			
		£	s. d.			£	s. d.
Life Fellows ...	27	0	0 0	4 Guineas	8	33	12 0
4 Guineas	2	8	8 0	2 „	75	157	10 0
2 „	18	37	16 0	1 „	291	305	11 0
1 „	25	26	5 0	Associates	4	2	2 0
				Affiliated Societies 13		15	15 0
	72	£72	9 0				
					391	£514	10 0
RESIGNATIONS.				Deduct loss			
		£	s. d.				
4 Guineas	2	8	8 0	Net increase in income	£278	5	0
2 „	37	77	14 0				
1 „	74	77	14 0	New Fellows, &c.	391		
	113	£163	16 0	Deduct resignations and deaths	185		
Total loss	185	£236	5 0	Numerical increase	206		

The most noticeable feature in last year's work, besides the Begonia Conference and the issue of the Conifer Volume, has been the promulgation of a scheme for the examination of students and others in the Principles and Practice of Horticulture, and a scheme is on foot for providing scholarships, whereby the most promising students may be enabled to pursue their studies in connection with the Society's Gardens at Chiswick or elsewhere. The first Examination was held in the early part of the year at the request of the Surrey County Council, when 72 candidates presented themselves, with the result that 12 passed to the satisfaction of the Examiners in the higher grade, and 17 in the lower grade. A second Examination will be held in May of this year, when it is proposed to extend it to candidates in all parts of England.

In round numbers, £1,700 has been expended at Chiswick this year on the general work, and repairs and keeping up of the Gardens. A further sum of about £386 has been laid out in special repairs, viz., in the thorough repainting and repair of the Great Vinery both inside and out, and in furnishing a new boiler, &c. The receipts from the Gardens by sale of surplus produce amount to £573, making the net cost of the Gardens £1,514.

In conjunction with the Lindley Library Trustees, the Society's Library has received considerable attention. All serial publications have been kept up to date, a large number of valuable volumes have been bound, and the following new books, amongst others, added to the Library, viz.: "Schweizerisches Pflanzen-Idiotikon," "Synopsis Muscorum europæorum," "Synopsis Filicum," "The Uses of Plants," "The Narcissus, its History and Culture," "The Silva of North America," "The British Moss Flora," "Stein's Orchideenbuch," "Indische Heil- und Nutzpflanzen," "La Taille des Arbres fruitiers," and many others.

The best thanks of the Society are due to all those who, either at home or abroad, have so kindly and liberally presented books to the Library, or plants or seeds to the Gardens. A list of the donors has been prepared, and will be found in the Society's *Journal*, Vol. XV., Parts 2 and 3, 1893. The Council also wish to express, in their own name and in that of all Fellows of the Society, their great indebtedness to all who have so kindly contributed, either by the exhibition of plants, fruits, flowers, or vegetables, or by the reading of papers, to the success of the Conferences and Fortnightly Meetings.

The papers read at these meetings, most of which have been already published in the *Journal*,* are as follows:—

- January 12. "Winter Vegetables," by Mr. W. Iggulden.
 March 8. "Plants for House Decoration," by Mr. John Wills.
 March 22. "The Cultivation of Melons," by Mr. C. Ross.
 April 12. "Daffodils," by the Rev. G. P. Haydon, M.A.
 April 19. "The English Florist's Tulip," by the Rev. F. D. Horner.
 May 3. "Bulbous Irises," by Prof. Michael Foster, F.R.S.
 May 17. "Hardy Climbers and Creepers," by Mr. W. C. Leach.
 June 7. "Summer Pruning and Training of Fruit Trees," by Mr. A. Young.
 June 21. "The Management of Trees in Parks and Gardens," by Mr. W. T. Thiselton Dyer, C.M.G., &c.
 July 12. "Orchids for a Cool House," by the Rev. F. Handley, M.A.
 July 26. "Insect-eating Plants," by Mr. A. J. Manda.
 August 9. "Fuchsias," by Mr. Geo. Fry.
 September 6. "Root Pruning," by Mr. Geo. Bunyard.
 September 20. "Variation of Some Hardy Plants under Cultivation," by the Rev. C. Wolley Dod, M.A.
 October 4. "Michaelmas Daisies," by Mr. D. Dewar.
 October 18. "Cycads," by Mr. W. Carruthers, F.R.S.
 November 1. "Fruit Trees in Pots," by the Rev. W. Wilks, M.A.
 November 15. "Zonal Pelargoniums for Winter Flowering," by Mr. C. Pearson.

* Several back numbers of the *Journal* can still be purchased at reduced prices. For List, see "Arrangements, 1893," p. 16.

The hearty thanks of the Society are due to the Chiswick Board and to all the members of the Standing Committees, viz. the Scientific, the Fruit and Vegetable, the Floral, the Orchid, and the Narcissus Committees, for the kind and patient attention which they have severally given to their departments; also to the exhibitors who have contributed to so great an extent to produce the valuable results of the various meetings.

The Council have the sad duty of recording the death of 72 Fellows during the year, and amongst them they regret to find the names of the Duke of Manchester, the Duke of Marlborough, Earl Denbigh, the Earl of Lichfield, the Marchioness of Waterford, Sir Henry Cotton, Captain Nelson, Mr. C. Sharman, &c.

A scheme for the affiliation of Local Societies was put forward in 1890, and forty-six Local Societies have availed themselves of it. The Council express the hope that Fellows will promote the affiliation of societies in their own immediate neighbourhood.

In the spring of the year, the Rev. W. Wilks—who has acted as Honorary Secretary of the Society since 1887, and the great value of whose services is well known to the Fellows—requested that he might be relieved of his office. Understanding that he took this step solely on account of his having received an offer of literary work, which he did not feel justified in refusing, the Council unanimously decided to take advantage of the power given in the Charter of making the Secretaryship a salaried office, as it is in the Royal Society, the Linnean, and most other similar bodies. They are glad to be able to say that, under the altered conditions, Mr. Wilks willingly consented to refuse, for the present at least, the lucrative offer that had been made him, and to continue to devote his services to the Society's welfare. A resolution to this effect will be submitted to the Annual Meeting. This alteration of the Secretary's position created under the Charter a vacancy in the Council.

Besides the Great Spring Show in the Temple Gardens, which will be held this year on May 25 and 26, the Council have decided to hold a Show at Chiswick on July 11th, at which prizes will be offered for local exhibits.

The Council have also entered into an agreement with the Directors of the Royal Agricultural Hall, Islington, to hold a Great Autumn Show at that Hall, from August 29 to Sept. 1, inclusive. A special schedule will be issued in March, and upwards of £400 in prizes, medals, &c., will be offered for Fruit, Flowers and Vegetables, and for Horticultural Appliances, machinery fittings and sundries. All articles shown in the latter group will have to be fitted up and in working order from August 24 to Sept. 1, so that the judges may put them to practical tests.

Mr. ANNUAL REVENUE AND EXPENDITURE ACCOUNT

To ESTABLISHMENT EXPENSES—

	£	s.	d.	£	s.	d.
Salaries and Wages	480	0	8			
Rent of Office	165	9	3			
Printing and Stationery	203	11	10			
Publications—Journal, &c.	550	7	8			
Repairs	16	9	0			
Postage	79	12	8			
Coal, Gas, and Water	5	19	4			
Miscellaneous	106	3	9			
	<hr/>				1,607	14 2

„ SHOWS, MEETINGS, and CONFERENCES—

Rent of Drill Hall and Cleaning	108	15	0			
Special Shows—Temple	516	3	3			
„ Begonia Conference	8	14	1			
Advertising	19	3	9			
Prizes and Medals	275	12	2			
Printing, &c.	46	8	9			
Labour	66	16	2			
Repairs to Tents	87	6	6			
Superintendent of Flower Shows	50	0	0			
	<hr/>				1,178	19 8

„ CHISWICK GARDENS—

Rent. Rates. Taxes. and Insurance	264	3	9			
Superintendent's Salary	225	0	0			
Labour	711	10	4			
Manure, Implements, &c.	175	16	0			
Coal and Coke	167	11	5			
Repairs	61	19	0			
Special Repairs	386	11	0			
Water and Gas... ..	15	8	9			
Miscellaneous	79	3	1			
	<hr/>				2,087	3 4
	<hr/>				£4,873	17 2
	<hr/>					

for the YEAR ending 31st DECEMBER, 1892.

Cr.

	£	s.	d.	£	s.	d.
By ANNUAL SUBSCRIPTIONS... .. .				3,087	17	1
„ SHOWS, TEMPLE—						
Tickets, Advertisements, Donations, &c.	663	18	0			
„ MEETINGS AND CONFERENCES	33	0	6	696	18	6
„ ADVERTISEMENTS				228	6	3
„ MISCELLANEOUS—						
Sale of Journal and Reports				60	15	7
„ DIVIDENDS—						
Davis Bequest and Parry's Legacy	56	18	4			
Consols, £500	10	1	0	66	19	4
Interest on Deposits				8	9	3
„ PRIZES AND MEDALS				72	4	6
„ FRUIT PAMPHLET				7	10	0
„ CHISWICK GARDENS—						
Produce Sold	551	12	3			
Admissions and Members' Tickets	4	2	6			
Miscellaneous	17	18	0	573	12	9
„ BALANCE TO GENERAL REVENUE ACCOUNT				71	3	11

£4,873 17 2

We have examined the above Accounts, and find the same correct.

(Signed)

HARRY TURNER, }
HENRY WILLIAMS, } *Auditors.*
HARPER BROS., *Chartered Accountants*

January 10, 1893.

	£	s.	d.	£	s.	d.
To SUNDRY CREDITORS	339	15	5			
" SUBSCRIPTIONS, 1893, paid in advance	80	16	11			
" GENERAL REVENUE ACCOUNT—						
Balance, 1st January, 1892 ...	1,985	11	6			
Donations transferred to this Account	315	0	0			
	<u>2,300</u>	<u>11</u>	<u>6</u>			
Less—						
Subscriptions for 1891, not paid, and Bad Debts	68	13	6			
	<u>2,261</u>	<u>18</u>	<u>0</u>			
Less—						
Balance for the year 1892, as per Revenue Account	71	3	11			
	<u>2,190</u>	<u>14</u>	<u>1</u>			
				<u>£2,611</u>	<u>6</u>	<u>5</u>
By SUNDRY DEBTORS—						
Annual Subscriptions outstanding, estimated at	20	0	0			
Garden Produce	34	8	1			
Advertisements in Schedules ...	124	17	3			
	<u>179</u>	<u>5</u>	<u>4</u>			
" INVESTMENTS—						
2 $\frac{3}{4}$ % Consols, £2,122. 8s. 9d. cost	1,892	11	3			
(£2,022. 8s. 9d. of this sum is held by the Society subject to the provisions of the will of the late J. Davis, Esq.)						
2 $\frac{3}{4}$ % Consols, £500 ... cost	479	8	0			
	<u>2,371</u>	<u>19</u>	<u>3</u>			
" CASH AT LONDON AND COUNTY BANK—						
On Current Account	55	12	9			
" CASH IN HAND	4	9	1			
	<u>60</u>	<u>1</u>	<u>10</u>			
				<u>£2,611</u>	<u>6</u>	<u>5</u>

We have examined the above Accounts, and find the same correct.

(Signed) HARRY TURNER, }
HENRY WILLIAMS, } Auditors.
HARPER BROS., Chartered Accountants.

January 10, 1893.

GENERAL MEETING.

MARCH 14, 1893.

J. T. BENNETT-POË, Esq., in the Chair.

Fellows elected (57).—St. J. Arabin, Godfrey E. P. Arkwright, E. Ashworth, P. Rudolph Barr, W. Beecroft Bottomley, C. J. Bowles, John R. Box, Col. W. Brown, Robert Burrell, Mrs. E. Byron, Francis J. Clark, Robert Cock, Miss Courtauld, Bernard Cowan, David A. Crichton, Baron de Blonay, John Drummond, H. R. Dugmore, W. H. B. Fletcher, Dr. E. O. Fountain, John Garner, Harry Geer, Joseph Godseff, H. J. Greenwood, Mrs. D. H. Halpin, Ben. Hurst, J.P., Edwyn R. Johnson, H. Killik, David Laird, Mrs. N. T. Lawrence, John Lees, J.P., James Leighton, Joseph Lytle, Sydney S. Marshall, Alex. McKenzie, Mrs. Myall, C. F. Nash, W. H. Payne, Mrs. E. Penton, Julian Phillips, J. W. Richins, Harry Roberts, Hon. Mark Rolle, Louis R. Russell, Rev. J. B. Shackle, W. Fawcett Smith, Jas. Stocken, Matthew Todd, Col. G. Topham, Arthur Turner, Mrs. Waddilove, James Wallis, J. B. Walmsley, Donald C. Warnes, Mrs. W. W. Welchman, Miss Willett, John C. Wootton.

Associate.—John Murison.

Societies affiliated (2).—Preston and Fulwood Horticultural Society; Mitford Grove, &c., Horticultural Society.

A lecture on "Some Effects of growing Plants under Glass of various Colours" was given by the Rev. G. Henslow, M.A. (See page 59).

GENERAL MEETING.

MARCH 28, 1893.

Dr. HOGG, F.L.S., in the Chair.

Fellows elected (30).—F. C. Arkwright, Ambrose Austin, Thos. Baker, Arthur Ed. Balleine, G. W. Bird, A. V. Bogaerde, J. B. Bromfield, C. Chalmers, H. J. Chapman, P. Coutanche, H. F. Crux, John Drew, Charles Eve, C. R. Fielder, A. G. Freer, Rev. R. W. Carew Hunt, F. W. Kell, John Margetson, G. May, W. B. Miller, E. Hay Murray, W. J. Newman, H. T. Pitt, Charles Pyke, A. B. Smith, William Terry, Captain A. Torrens, Francis Trickett, Robert A. Wilkin, J. C. Wing.

Societies affiliated (2).—Sutton and Cheam Horticultural Society; Huyton and Roby Horticultural Society.

A paper on "The Flowers of the Riviera," by Mons. Henry de Vilmorin, was read by the Secretary. (*See page 80.*)

GENERAL MEETING.

APRIL 11, 1893.

PHILIP CROWLEY, Esq., F.L.S., in the Chair.

Fellows elected (23).—W. D. Bellasis, C. Carrington, J. P. Clark, C. S. Eady, Paul French, Geo. E. Frere, Jas. Guyton, Dr. Hollingworth, Dr. G. J. Jones, Dr. E. Kirby, Joseph A. Last, Dowager Lady Loder, Rt. Hon. Earl of Lonsdale, Geo. Mount, E. A. Phillips, Alfred W. Read, Fred. Roberts, Sir C. H. Scotland, T. H. Slade, C. W. Smelt, Mrs. E. Spicer, Mrs. M. Veal, Lady Ethel Wickham.

A paper on "The Antiquity of the Citron Tree," by Dr. Bonavia, was read by the Secretary. (*See page 146.*)

GENERAL MEETING.

APRIL 25, 1893.

Sir JOHN T. D. LLEWELYN, Bart., in the Chair.

Fellows elected (21).—J. G. A. Baird, M.P., George Benington, Miss Adela Box, C. J. Coates, Thomas Colton, W. L. Evans, R. C. Fisher, John G. George, Sur.-Capt. J. P. S. Hayes, M. Hills, William Huddle, Henry J. Jalland, G. G. Kirchner, John C. H. Pierson, Mrs. Seaman, Rev. E. T. Sylvester, W. Thompson, G. Warren, H. Weetman, Robt. Wilkinson, Hon. Mrs. Yorke.

Associates.—Geo. Edom, W. Stevens.

A paper on "Alpine Plants," by Mons. H. Correvon, was read by the Secretary. (*See page 116.*)

The National Auricula and Primula Society held its annual exhibition in the Drill Hall this day. Owing to the hot, dry weather which had been prevailing, the plants were perhaps not quite up to their usual standard of excellence, and this fact was

noticeable in specimens from the North as well as from the South. Nevertheless the show was, on the whole, a good one, and there was keen competition among the members in several of the classes. The Royal Horticultural Society contributed £10 towards the prizes, and distributed 250 complimentary tickets among the members of the National Auricula and Primula Society, as in previous years.

GENERAL MEETING.

MAY 9, 1893.

GEO. PAUL, Esq., in the Chair.

Fellows elected (14).—H. R. Blackburn, A. J. Gear, Sir Walter Gilbey, Ernest Hartley, E. G. Jackman, Mrs. Low, A. J. Manning, W. W. Palmer, Chundra De Proboadh, Mrs. R. Rogers, T. C. Royle, Jas. Stocks, Miss Swete, Archibald Weir.

Professor Cheshire, F.L.S., gave a lecture on "Chemical Determinations concerning the Soil without the Aid of Chemistry." (See page 128.)

THE GREAT FLOWER SHOW

IN THE INNER TEMPLE GARDENS, LONDON, THURSDAY
AND FRIDAY, MAY 25 AND 26, 1893.

By the kind permission of the Treasurer and Masters of the Bench, the Society was enabled to hold its Sixth Great Annual Show of Flowers and Fruit in the gardens of the Inner Temple on the above days.

The exhibition was formally opened to Fellows on the first day at 12.30 P.M., an hour before the general public. The weather was very favourable, the heat and sunshine being, if anything, too intense. The four large tents containing the exhibits were thronged with visitors during the whole of each day, and it was estimated that the numbers were greatly in excess of previous years.

The Band of Her Majesty's Royal Horse Guards (Blue), under the conductorship of Mr. Chas. Godfrey, R.A.Mus., performed selections of music each day, to the enjoyment of the large and fashionable assembly on the lawn.

It would be impossible to do justice to the immense variety of plants and flowers which were brought together on this occasion. Suffice it to say that they were in every way excellent, and a great credit to the numerous exhibitors, to whom the thanks of the Council are heartily due for the efforts they made in rendering the exhibition a success. Owing to the dry weather, perhaps Roses did not have an opportunity of being seen at their best, but the Orchids, Begonias, Caladiums, Ferns, Gloxinias, &c., were quite up to their usual form, while hardy herbaceous flowers seemed to be more numerous than ever. There was a large and varied collection of fruit, as well as an interesting exhibit of Japanese woods, fibres, seeds, fruits, &c., the latter being contributed by Messrs. J. Veitch & Sons, of Chelsea.

The various awards made by the Council will be found under the reports of the Fruit, Floral, and Orchid Committees respectively, where the most noteworthy objects of the exhibition are mentioned.

GENERAL MEETING.

JUNE 6, 1893.

J. T. BENNETT-POË, Esq., in the Chair.

Fellows elected (35).—Rt. Hon. the Earl of Annesley, R. Ormston Backhouse, F. Baxter, Mrs. Brown, Captain St. P. Bunbury, J. Channing-Pearce, M.D., E. B. H. Chapman, James N. Flexman, E. T. Foakes, Claud H. Hamilton, Thomas Hart, Joseph Henderson, Frank Ernest Hills, Mrs. H. J. Jones, Charles Letts, Countess of Lonsdale, John Lowe, M.D., Mrs. C. J. Lucas, W. H. Lunsden, — Manghen, John F. Marchant, Beresford V. Melville, James McLeod, Mrs. Inez Miller, F. S. Philipson-Stow, John W. Potter, Charles Pritchard, W. G. Quilhampton, Sydney C. Scott, W. C. Slocock, David M. Smyth, J. R. Tranter, John Verrall Wall, Rev. W. J. Webster, J. Martin White.

Societies affiliated (3).—Hemel Hempstead Horticultural Society; Neasden Amateur Horticultural Society; Shepherdswell Horticultural Society.

A lecture on "Hardy Rhododendrons and Azaleas" was given by Sir John T. D. Llewelyn, Bart. (See page 133.)

The London Pansy and Violet Society held its first show in conjunction with the Society's meeting in the Drill Hall this day. The establishment of this new society was promoted with the intention of reviving an interest in the culture of Pansies and Violets. There was an interesting display of blooms, especially from Northern and Scottish growers, who had not been affected to the same extent with the drought as those living in the South. Judging from the fine blooms exhibited, there is every reason to hope that the new society will be doing good work in impressing the merits of Pansies and Violets upon the flower-loving public.

GENERAL MEETING.

JUNE 20, 1893.

Mr. JAMES DOUGLAS in the Chair.

Fellows elected (10).—T. D. Acland, Mrs. Blair, H. Le Blanc-Smith, Rev. Canon Blunt, Mrs. Callander, Mrs. Foley, Edward C. Goble, Bruce Morison, Ernest F. Whitehouse, J. C. Williams, M.P.

Societies affiliated (2).—Richmond Horticultural Society; Bromham and Chittoe Horticultural Society.

The National Rose Society held its first show of the year this day at the Drill Hall in conjunction with the Royal Horticultural Society. The exhibits of Tea and Noisette Roses were better than one would have expected, considering the serious effects of the drought on plants in general. There was a fairly keen competition, however, for the prizes, towards which the Royal Horticultural Society, as in previous years, contributed £10, as well as allowing 550 complimentary tickets to members of the National Rose Society.

SCIENTIFIC COMMITTEE.

FEBRUARY 14, 1893.

Prof. M. FOSTER, Sec. R.S., in the Chair, and nine members present.

Soil with Mites, &c.—Mr. Michael reported upon a sample of earth sent from Jura Forest, and found that it contained wireworms, some Thysanuridæ, and mites (Gamasidæ). The mites were in this case not injurious to plant life, but rather “friends,” as they were predatory on other animals. In another sample sent there were Thysanuridæ and wireworms, but no mites. The soil being in a bad condition, should be treated with gas-lime, or other usual remedies for wireworm. Mr. McLachlan observed on the importance of such investigations as the present, as they revealed what creatures were “friends” to the cultivator, such being very often regarded unwittingly as “foes.”

Parsnip devoured by a Vole.—Dr. Masters exhibited a specimen from Bagshot, in which the whole of the interior had been consumed, nothing but a thin shell of cortex being left. He also showed a drawing of a monstrous Turnip which had grown not unlike a Mandrake in form.

Burr Knot on Apple Roots.—Dr. Masters also showed a specimen from a “Burr Knot” Apple-tree, a feature characteristic of certain varieties of Apples, such being used for propagating purposes. It was referred to Prof. Farmer for examination.

Fog Report.—Prof. Oliver presented the second report on his investigations upon “The Effects of Urban Fog on Cultivated Plants,” which was ordered to be printed for discussion at the next meeting. The following is a brief abstract: “The report deals especially with the physiological aspect of the question, matters of more purely local interest being reserved for a forthcoming communication. The observed action of fog upon plants is described in detail, and the share taken in this action by the reduction of light on the one hand, and by atmospheric impurities on the other, is critically discussed in the light of the writer’s experimental results. The position taken up by the author is that ‘fog’ is, physiologically speaking, a much more complex affair than has been suspected. In presenting his

report, Prof. Oliver explained that the present contribution could only be regarded as a very imperfect statement of the subject, and that he was busily employed in following up some of the more novel lines which he has indicated." Prof. M. Foster moved, and Mr. McLachlan seconded the motion, that the report should be presented to the Council.

Arum with Two Spathes.—Dr. Masters exhibited a specimen of this common phenomenon, and remarked that no florist had made any attempt to fix it. The question was raised whether it was desirable to do so, as some thought that two spathes were no improvement to the flower.

African Produce.—Messrs. J. Wrench & Sons forwarded samples of leguminous and other seeds raised in South Africa from English origin. As a general result they had remained constant in character. The Committee expressed their thanks to the exhibitors.

SCIENTIFIC COMMITTEE, MARCH 14, 1893.

Dr. MAXWELL T. MASTERS, F.R.S., in the Chair, and
ten members present.

Sargasso Weed.—Mr. Blandford exhibited a specimen collected off the Azores. He also remarked upon a perfectly successful experiment of bringing fresh green Cocoa-nuts from Jamaica in the refrigerator of a vessel.

Tipulæ in Soil.—Dr. Müller exhibited some grubs which were pronounced to be a species of this insect allied to the common *T. oleracea*, or Daddy Long-legs.

Blue Primulas.—Mr. Wilson exhibited about fifty varieties of different shades of blue, plum-blue, and bluish-violet Primroses, all being seedlings from the original "Scott Wilson," and grown at Weybridge and Wisley.

Knotted Oak Branch.—Dr. Masters exhibited a specimen of this well-known peculiarity, the stems being sometimes used for walking-sticks. He had referred it to a fungologist, who had detected the presence of the fungus *Dichæna discina*. It was a question, however, to be solved whether this fungus was the cause of the knob-like protrusions or not. It was referred to Prof. H. Marshall Ward for further examination and report.

Cecidomya Taxi.—Prof. Farmer exhibited specimens of

Yew sprays affected by this well-known parasite, which causes an arrest of the axis and the leaves to form a rosette. The question was raised as to whether the shoot subsequently elongated or not. In Mr. Henslow's garden both male and female Yews are always affected by it, the tufts of leaves and shoots attacked dying every year.

Injuries to Plants by certain Substances present in Coal Smoke.—Prof. Oliver exhibited several results of his experiments in testing the effects of the ingredients of fog and their allied substances upon plants. A frond of *Phegopteris trichoides*, subjected to the vapour of phenol under a bell-glass, was blackened. White Lilac became of a chocolate-brown colour; white Cyclamens, however, being unaffected, though killed. It was remarkable that the alcoholic extract of chlorophyll made from the blackened frond was identically like that of the uninjured green leaf, showing that the chlorophyll was “masked,” but not altered in character by the phenol. The effects of pyridine were not so marked, as the Lilac and Cyclamen were only slightly tinted with a pale brown colour. Prof. Oliver had tested these and other plants for tannin, but the distribution of this substance in organs which change colour with or resist phenol and other coal-tar products was found to be such that no positive conclusions could be drawn.

Prof. Oliver also showed the effects of sulphurous acid gas, so prevalent in urban fogs. The above-mentioned white flowers were killed by its action. The spectrum of chlorophyll of leaves subjected to its action showed the usual modifications due to the presence of an acid. It is to be noted that the effects produced were only on living protoplasm, no such results occurring if the protoplasm had been previously killed.

Dr. Scott said that he hoped Prof. Oliver would be able to throw some more light on the falling of almost uninjured leaves, which was perhaps the most remarkable of the effects of fog. In these cases the leaves, when they fall, are alive, and show scarcely any symptoms of poisoning. He thought it possible that the investigation of this phenomenon might help to explain the immediate cause of the normal fall of leaves in autumn, as to which we at present know little more than the anatomical conditions.

Prof. H. Marshall Ward, in commenting upon Prof. Oliver's

elaborate report, observed that the author had evidently attacked the problem quite in the right way, by experimenting on plants with the separate ingredients of urban fogs; and that, as the report showed, the investigation had raised a number of interesting and very important questions in vegetable physiology. It was, indeed, a matter of surprise to see how much information Prof. Oliver had extracted from his investigations in the short time at his disposal. He trusted that the author would persevere with his experiments, as he would have the hearty sympathy of everyone interested in the subject. Prof. Ward alluded to some old experiments of his own in which he found that in fine, dry, bright, and sunshiny weather plants resisted the effects of sulphurous acid better than in dull seasons, thus correlating in an interesting manner the results of Prof. Oliver, in that in foggy weather sulphurous acid gas was most effective in injuring plants. The result of this action was a plasmolysis and diffusion giving the appearance of "sweating" in the cells. The sulphurous acid in the gaseous condition penetrated the intercellular spaces of the tissues, and entered the cells in solution.

Dr. Müller called attention to the statement in the report that, according to Dr. Bailey, the organic matter which forms a large proportion of the greasy deposit left by fog, and which proved so injurious to plants, consisted mainly of some form of pyridine. Now, considering that pyridine is a rather volatile liquid substance, this is a somewhat surprising fact, and the question arises how the pyridine and other similar volatile constituents of smoke become thus fixed and precipitated. He suggested that this probably is brought about by the agency of the particles of solid hydrocarbon and tarry ingredients of the fog, which possess great affinity for these volatile substances and absorb them. It is now well understood that these solid constituents of the smoke, along with the mineral dust suspended in the atmosphere, form the primary cause of the formation of fog.

Dr. Masters exhibited sprays of Holly, *Skimmia*, and *Aucuba* covered with sooty deposit of fog, but yet the foliage was apparently healthy. He attributed their capability of resisting the deleterious influences to the great thickness of the cuticle possessed by these plants. He observed that evergreens often possessed in addition two or three rows of palisade cells, instead

of only one, and were thus enabled by their structure to offer a greater degree of resistance to injurious vapours than plants less well equipped. Dr. Masters also observed that plants with an aqueous hypodermal layer, such as was present in certain Orchids, might on that account be better able to resist the injurious effects of fogs. Mr. Henslow added that *E. I. Rhododendrons* have much tannin, a moderately thick cuticle, and aqueous layers on both sides of their leaves, and as they withstood the fogs well these features might corroborate Dr. Masters's suggestion. Dr. Masters also remarked on the observation of Prof. Oliver that Monocotyledons appeared to be less liable to injury than Dicotyledons. He threw out the suggestion that as so many of the former class have a more or less erect phyllodinous foliage, the fog deposit would be less likely to accumulate upon it than on the more usually horizontal blades of dicotyledonous plants. In addition to this morphological feature was the anatomical structure—viz. there being two palisade layers and the presence of stomata on both sides, &c. Such and other histological differences, though apparently not borne out in the case of Ferns, might account for some of the differences mentioned.

The thanks of the Committee were unanimously tendered to Prof. Oliver for his interesting and valuable report. (*See page 1.*)

SCIENTIFIC COMMITTEE, MARCH 28, 1893.

Dr. HUGO MÜLLER in the Chair, and five members present.

The Antiquity of the Citron in Egypt.—A communication was received from Dr. Bonavia, in which he referred to M. V. Loret's paper on this subject, entitled "Le Cédration dans l'Antiquité" (Paris, 1891). The author mentions several writers from 2 B.C. to 360 A.D., and states that it was cultivated in the fourth century A.D. in Upper Egypt (Coptic, "Ghitré"), while a Citron is said to have been found in a tomb of the 12th century B.C. It is also figured on the temple of Thothmes III. at Karnak, 15th century B.C. From a drawing it would seem that even the "fingered Citron" might have been known. Dr. Bonavia discusses the probable source of the Citron in Egypt as being brought by traders through the Persian Gulf and Red Sea,

for he thinks that all varieties originated in South China and spread westwards. The value of the Citron was supposed to be purely medicinal by the ancients, and M. Loret alludes to one use, viz., for affections of the spleen, the true value of which Dr. Bonavia corroborates.

Peridermium Strobi.—Mr. Plowright sent specimens of this fungus with the following observations: "Last July I found in the garden of Mr. C. E. Boyes, at Oakwood House, Tottenham, that the Currant-bushes were affected with *Cronartium ribicola*, specimens of which were sent to the Scientific Committee, as this fungus had not previously been recorded in Great Britain. In the same garden were some young trees of *Pinus Strobus*, which were roughly trimmed so as to form a screen or hedge. On these trees must have occurred the æcidiospores of the *Cronartium* at some season of the year, Prof. Klebalm, of Bremen, having shown that these form the life cycle of this fungus. On March 19th of this year I visited Oakwood House, and was pleased to find the *Peridermium* in perfection. It will be noticed on the specimens sent that the mycelium of *Peridermium* is perennial, causing a certain amount of hypertrophy in the affected branches, forming generally a fusiform enlargement of the twig. The peripheral extremity of the branch suffers somewhat at first, and eventually dies. The mycelium of the *Cronartium* is annual. With the heterœcious *Uredineæ* sometimes the æcidiospores have permanent mycelia as is the case there; at other times the mycelium of the teleutospores is thus endowed as with the gymnosporangia."

Ustilago on Psamma arenaria.—"The so-called *U. hypodites* which occurs on this grass is doubtless a distinct species. It is not common in Great Britain, and appears only to have been found upon the east coast. The specimens sent herewith are interesting as having been produced by a root which was transplanted from the sea-coast three years ago into a town garden, and which still produces diseased stems. One of the specimens shows a curious distortion, consisting of a twisting of the stem within the sheath. This may be due to the fungus, although in the majority of cases this condition does not occur."

Polyanthus Blue Primrose.—Mr. Wilson exhibited a seedling from Oakwood Blue Primrose, with a very large flower, a Marianne North (pale blue), and a plum-blue *Polyanthus*, it

being the first occasion of this strain assuming the umbellate form.

Cucumber Roots diseased.—Mr. Hurnard, of Hingham, sent a specimen which appeared to be attacked by the common “eel-worm.” It was referred to Mr. McLachlan for further examination.

Fasciated Cotoneaster.—A specimen of this common malformation was sent by Mrs. A. Stuart, of Edinburgh. Mr. Henslow had observed a bush in a garden at Penmaenmawr, on which nearly every branch was fasciated.

Tuberculated Stem of Ailanthus glandulosus.—Mr. Wilson brought a specimen having a tuberculated structure, 6 inches broad and 3 inches deep, issuing from around the junction of stem and root. The knob-like tubercles consisted of “embryo buds” agglomerated together. What the original cause might have been which produced the hypertrophied condition, with arrest of axial growth of the buds, it was impossible to say.

Dimorphic Aralias.—Mr. Tidmarsh, Curator of the Botanic Gardens, Grahamstown, sent some foliage of two species of *Aralia*, which, he observes, would certainly be regarded as four species had he not known the plants from cuttings upwards. The leaves of *A. Veitchii* when growing in a poor soil are about 4 inches long and one-fifth of an inch wide. Those sent were grown in a poor soil under glass. The leaves of the same species planted out in a mass of fresh compost in a hothouse, with a moist atmosphere, and at a temperature of 60° to 90° F., were 5 inches long and 1 $\frac{3}{4}$ broad. Hence, while the former are linear, the latter are broadly lanceolate and tapering at the base. He also sent leaves of *A. reticulata*, which were upwards of 2 feet in length and 6 inches in breadth. The plant was 10 feet high, planted in the open on the banks of a stream, but too far above the water to be benefited much by it. It was under Willows, which to some extent protected the foliage from the frosts of several degrees experienced at Grahamstown. Mr. Tidmarsh added that he had no inside plants of this last species with the narrow-leaved foliage. He remarks: “We can propagate from cuttings of the narrow-leaved form, but fail to do so with the large-leaved form. This plant behaves in a similar manner to *Araucaria excelsa*, the young growth of which, while still possessing the narrow Juniper-like leaf, will strike from cuttings, but

we cannot succeed with small side-shoots from an old trunk, these latter shoots being furnished with a thick bark and stout foliage of the mature tree." Mr. Tidmarsh raises the question whether the larger leaves of these Aralias may not be the naturally mature form, and the smaller foliage characteristic of the young stage, as with the Eucalyptus. An examination of the epidermides of the leaves sent shows that the number of cells in the same area of the broad-leaved form is to that of the narrow-leaved as fifty-five to thirty-eight (upper), and as forty-four to thirty-six (lower), so that this element does not support Mr. Tidmarsh's view, inasmuch as the cells, being smaller on the larger leaf, would *per se* suggest its being the younger.

SCIENTIFIC COMMITTEE, APRIL 11, 1893.

Dr. MAXWELL T. MASTERS, F.R.S., &c., in the Chair, and eight members present.

Californian Oranges.—Dr. Bonavia showed samples of this newly imported fruit. They are peculiar in having the rind open above, with a small Orange protruding from the apex. It appears to be an established variety of "carpellary multiplication," though incapable of propagation by seed, as these Oranges are seedless. It is of common occurrence in the variety called "Mellarose"—("Teratology," by Dr. M. T. Masters, p. 134).

Gentiana acaulis.—Mr. Wilson exhibited about a dozen flowers of this plant, showing variations in the colours, from lavender to the deepest blue. Mr. Michael remarked that he had noticed very many about 2,000 feet above Innsbruck of the pale blue variety, the pink-coloured variety being rare. Mr. Wilson's were specimens cultivated at Weybridge and Wisley.

Oxlip var.—Dr. Masters exhibited an umbel of the true Bardfield yellow Oxlip, *P. elatior*, which is rare in Britain; and a red-flowered variety, from a clump originally introduced into his garden together with the former, which has hitherto borne only yellow flowers.

Grammatophyllum with Spinescent Roots.—He also showed a specimen of the roots of this Orchid, remarkable for their much-branching character, the longer roots being covered with

short spinescent branches, half an inch in length. The thicker roots penetrated into decayed vegetable matter, developing absorbent root hairs, confirming the suggestion of Professor Oliver that the peculiar development was an adaptation to a saprophytism. The Secretary suggests that the short spiny lateral roots may be arrested conditions, in consequence of their not having been buried in any nourishing material.

Eucalyptus Galls.—Remarkable specimens were received from Baron von Müller, from Australia. They were referred to Mr. Blandford for examination.

Richardia, Monstrous.—Mr. Sheppard, of the Toddington Orchard Company, sent a specimen, one leaf of which was white, like a true spathe. In another case there was a small supplementary spathe and spadix springing from the axil of a second spathe. Dr. Masters observed that if this could be perpetuated there might be a succession of bloom from the same stalk.

SCIENTIFIC COMMITTEE, APRIL 25, 1893.

R. McLACHLAN, Esq., F.R.S., in the Chair, and seven members present.

Eucalyptus Galls.—Mr. Blandford reported upon his examination of the large woody galls (wrongly referred to Acacia), sent to the last meeting by Baron von Müller from Australia. They appeared to be formed at the base of the leaves. The gall was occupied by a large solitary coccid, the head being turned away from the orifice by which the larva escaped. Mr. McLachlan observed that coccids usually live externally on plants; but for some time a group has been known, including several species, which form galls on Eucalyptus in Australia, the coccids being sometimes upwards of an inch in length.

Bardfield Oxlips changing Colour.—Rev. C. W. Dod sent a clump bearing several umbels of yellow and one of red flowers, with the following communication. Referring to the specimens brought to the last meeting by Dr. Masters, he writes: "I have during the last few years investigated many of these cases in which I used to believe, but I have come to the conclusion that if a plant growing in the same soil and position, and not having

been drugged, seems to have changed the colour of its flowers, *aliquis latet error*. In the particular case of the Bardfield Oxlip, which I grow in many spare corners of my garden, I find the duration of life of the plants to be about four years. Seedlings take the place of those that die, and are often amalgamated with them flowering all together; so that it seems that one with dull red flowers (always the first departure from the typical colour in the *Primula veris*, *L.*, class) appears to be part of the same plant which is bearing yellow flowers. By the next year the yellow-flowering plant is probably dead, and the red-flowering one has quite superseded it." On carefully washing the mould away from the "clump" sent by Mr. Dod, it was readily resolved into seven perfectly distinct plants, six bearing yellow flowers and one being dull red flowered, thus entirely corroborating Mr. Dod's account of the origin of a change of colour being by seed only.

Erythronium grandiflorum, *Giant form*, &c.—Mr. Wilson exhibited a flowering spike of this plant, 16 inches in height, with leaves proportionally large. It appeared first in 1892 among some seedlings, and is considerably larger in the present year. He also showed a specimen of *Narcissus triandrus*, remarkable for its strong growth, bearing four instead of the usually two flowers; also an umbel of a *Primula*, with the flowers dissociated along the peduncle.

Myosotis, *Proliferous and Many-petalled*.—Dr. Bonavia exhibited sprays of this variety, which is now in the market. The petals are often as many as nine or ten in number, though no flower appears to be "double." Two or three flowers are sometimes fused together as in Tomatos. An examination of this variety made by the Secretary showed that instead of the separate flowers along a common peduncle, as in the ordinary Forget-me-not, each flower is represented by a raceme, a proliferous condition sometimes seen in Solomon's Seal, Bluebells, &c. The individual flowers were characterised by "symmetrical increase," the sepals, petals, and stamens being multiplied uniformly. The pistil was malformed, consisting of a conical structure, the styler tube being open above, with a rudimentary stigmatic border. About eight ovules were arranged in a circle at the base of the ovary, the placentation being thus free central. The terminal flower on the main axis was very remarkable, recalling somewhat similar malformations often seen in Foxgloves, Larkspurs, &c. It con-

sisted of a whorl of many sepals, within which were five clusters, consisting of oval scale-like carpels, surrounded by a cellular disc; then followed in succession within the scales a mass of petals and stamens. Five similar carpellary scales then were seen around the axis, within which all round appeared to be numerous abortive ovules; in another case there were stamens and no ovules. The central axis consisted of a flower turned inside outwards, the members of which being in a reversed order—viz. stamens on the outside of the tube of the corolla, the corona being thus on the exterior surface, the petal lobes overarching them outwards while the centre was occupied by a tuft of erect sepals in a reversed position. Information as to the origin of this remarkable variety and the name of the raiser is greatly to be desired.

Peach Leaves malformed.—Rev. E. C. Dillon sent leaves which were curled, and with a blistered appearance, the lower epidermis peeling off. It was thought to be due to a chill by east winds, and not to the presence of fungus or insects. They were referred to Prof. Green for further examination.

SCIENTIFIC COMMITTEE, MAY 9, 1893.

R. McLACHLAN, Esq., F.R.S., in the Chair, and five members present.

Myosotis alpestris, Multipetalous var.—The plants brought to the last meeting by Dr. Bonavia proved to be the same as that described and figured in the *Gardeners' Chronicle* (August 8, 1891, p. 159), where it is stated that "According to M. Ernst Benary, of Erfurt, who sent it out in 1886, it was raised in Germany, and is 'presumed to have sprung' from *M. alpestris*, robusta, grandiflora (Eliza Fouribert). It was fully described in M. Benary's list of novelties in 1886. He adds, 'It comes quite true from seed.'" Mr. Appleton, of Sipson, near Slough, writes that he has grown some acres of it for five or six years, and always from seed, about 80 per cent. coming true. The name by which it is generally known is "Victoria," but Messrs. Carter are issuing seed for 1893 under the name of "The Jewel." It appears to be quite hardy, withstanding severe winters without any protection. A botanical description is

given in the *Gardeners' Chronicle*, where it is called the "Hen and Chickens" Forget-me-not, as the flowers on the central axis terminate in a synanthic condition, while numerous scorpioid racemes radiate from below it. The stems are often strongly fasciated. With regard to the separate multipetalous flowers, Dr. Bonavia contributed the following additional observations: "I have no doubt whatever that this monstrous form does seed, and for the following reasons: (a) The pistil is conical, like the neck of a bottle in the middle of a circle of nucules; and the stigma is well formed, consisting of six or seven lobes, often covered with pollen. (b) When the corolla has fallen off for some time the stigma is shrivelled, and *several* of the nucules are much larger than their companions, indicating that their contents had been fertilised. I have two forms before me—one of a turquoise blue with all the flowers elongated, and with an oval centre; the other is much paler, and with all its flowers circular, the centre being also circular. Both varieties have eight, nine, or ten petals and stamens." A further examination of the pistils made by Mr. Henslow reveals that either another pistil or a cluster of stamens may be found within the ovary. In the last report a number of free central ovules was described; but as this observation has not been confirmed, they were probably rudimentary papillæ of undeterminable character. On removing an ovule from a nucule it is found to be oval, with a remarkably long "beak" turned towards the funicle. Many consisted of a hollow bag-like structure, being presumably the primine only. Those which had become larger possessed pro-embryos, while the fully formed nucules, with black polished surfaces of the "seeds" issued by Messrs. Carter, had large, perfect, oily embryos. The thanks of the Committee were given to Dr. Bonavia and Mr. Henslow for their investigations into the structure of this remarkable variety.

Sugar-cane Moth.—Mr. Blandford exhibited specimens received from Mr. Morris of moths, the caterpillars of which attack the Sugar-canes in Teneriffe. It appeared to be a variety of or perhaps a different species from *Diatræa saccharalis*, which bores into the Maize stems, from which it is said to have spread to the Sugar-canes. It was first figured by Rev. L. Guilding in the "Trans. Soc. for the Encouragement of Arts" 1828, vol. xlv. p. 149 (*D. sacchari*, *Guild.*). It is also figured and described as

the "Larger Cornstalk-borer" by Mr. L. O. Howard, "Insect Life," p. 95 (*D. saccharalis*, *F.*), Washington 1891.

Scale-insect on Retama (Cytisus jucundus).—Mr. McLachlan exhibited specimens from Mr. Morris, the plants growing from 7,000 to 8,000 feet on the Peak of Teneriffe. It proved to be *Mytilaspis pomorum*, the Apple-tree scale insect. It was first described as occurring in North America. It has also been found in Guernsey on the Broom, which is closely allied to *Retama*.

Euonymus attacked by Caterpillars.—Specimens of the common Spindle-tree, infested with the web-forming *Hyponomeuta evonymella*, were sent from Battersea Park, where they are described as doing great damage both to the deciduous and evergreen (Japanese) species of *Euonymus*. Another species is also attacking the Hawthorns. The best remedy is spraying the trees with some insecticide, as, *e.g.* 6 oz. of Paris-green dissolved in 100 gallons of water.

Aquilegia var.—Mr. E. J. Lowe, of Shirenewton, Chepstow, sent examples of the dark crimson Columbine "Royal Marriage" without the usual spurs; a not uncommon variety, exhibiting a reversion to the presumed ancestral form.

SCIENTIFIC COMMITTEE, JUNE 6, 1893.

Dr. M. T. MASTERS, F.R.S., in the Chair, and four members present.

Clematis, Double and Single.—Flowers were received of the variety "Proteus," which is remarkable for bearing double flowers on the old wood of the previous year, which are the first to appear; while the present year's wood subsequently bears single blossoms in the autumn.

Cereus grandiflorus, Photograph of.—Dr. Masters exhibited a photograph, taken by magnesium light, of a blossom of the night-flowering *Cereus* growing at Loughborough.

Abies balsamea.—He also showed drawings of this species, exhibiting great variations in the characters of the bracts, scales, colour, &c.

Cupressus guadaloupeensis and C. macrocarpa.—Dr. Masters showed dried specimens of these two forms. The former grows

on the island of Guadaloup, off South California, and the latter on the mainland on a very limited area. They appear to be only varieties of one another, the island form being more glaucous, a common feature of maritime plants. Dr. Masters also observed that a variety of *Pinus insignis* with two "needles" instead of three, the usual number in this species, together with a Fan Palm, *Erythea edulis*, grew on the same island.

Calochortus vars.—Mr. Wilson exhibited blossoms showing great variety of colouring in *C. venustus citrinus* and *C. v. oculatus*. They were grown in open borders at Weybridge and Wisley.

Aquilegia and Clematis Hybrids (?).—A communication was received from Mr. E. J. Lowe, of Shirenewton, Chepstow, describing some supposed hybrids, accompanied by specimens of *Clematis montana*, and a drawing of the "hybrid" *Aquilegia* exhibited at the last meeting. It was the opinion of the Committee that the evidence of its being a true hybrid was not satisfactorily established.

SCIENTIFIC COMMITTEE, JUNE 20, 1893.

Dr. M. T. MASTERS, F.R.S., in the Chair, and six members present.

Scale on "Retama."—Mr. Morris observed with reference to this subject, brought before the last meeting, that the name of the *Retama* is *Cytisus nubigenus*. It is the only ligneous plant growing on a platform at an elevation of 8,000 feet on the Peak of Teneriffe. The whole of the plants were covered with the scale. Dr. Perez had noticed no instance of this scale insect appearing until Australian trees had been introduced into Teneriffe. Mr. Morris added that it has now appeared at Kew on the English Broom.

Honeydew on Limes.—Mr. Morris remarked that this had been so abundant on the Limes at Kew that the cement pavement below them had become quite slippery from the drip from the trees. Mr. Henslow added that he remembered a similar occurrence from an Ash-tree in a garden in Regent's Park Road about the year 1878.

Oranges in Devon.—Mr. Morris exhibited photographs of

Orange-trees growing and fruiting successfully in arched recesses at Coombe Royal, near Kingsbridge, Devon. They were protected in front during the winter.

Cochineal in Teneriffe.—Mr. McLachlan raised the question of the cultivation of this insect in Teneriffe, as the industry appears to have decayed in consequence of the introduction of aniline dyes. Mr. Morris observed that it was somewhat reviving, as there was a certain demand for colouring fruit, preserves, &c. Dr. Müller added that it would be always required as a source of carmine, as this colour cannot be replaced by any other known product.

Thereva nobilitata in Celery.—Dr. Müller exhibited grubs resembling wireworms, which were found in decayed Celery plants. They proved to be those of a brown fly. This usually lives in rotten wood, but whether the grubs destroyed the Celery or were feeding on the decayed roots, &c., was not clear. It was suggested that possibly they were carnivorous, as other grubs had disappeared from the soil.

Calochortus and Lily, Monstrous.—Dr. Bonavia exhibited flowers, each consisting of two flowers united on one floral receptacle. An examination of the fibro-vascular cords showed that these had arisen by chorisis from a normal stem. *A propos* of this, Mr. Henslow said that he had examined the cords in a germinating Cockscomb, and found that the multiplication of the bracts and flower-buds arose in a similar way. The zone of cords being circular in section below, the cords rapidly increased in number by bifurcation above, one branch entering each bract and a small cluster each flower-bud. Hence fasciation would be better described as the effect of cauline chorisis, and not as a fusion of a number of independent buds, as the term seems to imply.

Azolla pinnata Fruiting.—Mr. Greenwood Pim sent specimens in fruit. He writes: "The plants had been growing in the open air for two years in co. Wicklow, and had increased to a large extent. Two or three months ago a quantity was placed in a shallow peaty pool, which is now almost dry, having only a few inches of water. In this the plant is producing fruit on almost every fully developed individual."

Linaria repens × *vulgaris.*—Mr. Henslow showed specimens of this hybrid which has occurred spontaneously near the station

at Oxford, with the following remarks received: "L. repens was not known prior to 1889, when ballast was brought from Didecot. It appeared in 1890 side by side with L. vulgaris. In 1892 a complete chain of hybrids was found from L. repens, with a little yellow on the lip, to L. vulgaris, with the faintest striæ on the flower."

FRUIT COMMITTEE.

JANUARY 17, 1893.

P. CROWLEY, Esq., F.L.S., in the Chair, and twenty-one members present.

Awards Recommended:—

Silver Gilt Knightian Medal.

To Messrs. G. Bunyard & Co., Maidstone, for a magnificent collection of 150 varieties of Apples and Pears, all in good condition, the most noteworthy being Bismarck, Peasgood's None-such, Lord Derby, &c.

Bronze Banksian Medal.

To Messrs. Cheal & Sons, Crawley, for a choice collection of new and little-known Apples.

Award of Merit.

To Apple Blue Pearmain (votes, unanimous), an American variety from the Society's Gardens. Fruit large, oblong, green streaked with red, and covered with a dense blue bloom. Flesh tender and pleasant.

Cultural Commendation.

To H. Balderson, Esq., Corner Hall, Hemel Hempstead, for a small bunch of Asparagus grown in the open ground under litter.

Other Exhibits.

Mr. J. Butler, Broke Hall, Nacton, sent a seedling Apple.

Mr. H. Becker, 13 Beresford Street, Jersey, exhibited 11 sorts of seedling Apples, which were not considered superior to others already in cultivation.

A. Waterhouse, Esq., Yattendon Court, Slough (gr. Mr. R. Maher), sent examples of Apple Stamford Pippin, and another supposed to be a seedling.

J. Hargreaves, Esq., Maiden Erlegh, Reading (gr. Mr. Turton), sent some fine specimens of Apple Annie Elizabeth.

Mr. A. Dean, Kingston, S.W., exhibited some Jaffa Oranges received from Palestine. Jaffa Oranges are among the best in commerce.

FRUIT COMMITTEE, FEBRUARY 14, 1893.

P. CROWLEY, Esq., F.L.S., in the Chair, and twenty-three members present.

Awards Recommended:—

Silver Gilt Knightian Medal.

To Messrs. Rivers & Son, Sawbridgeworth, for an extremely interesting collection of Apples and Oranges. Amongst the Apples were some fine examples of Cox's Orange Pippin, Nancy Jackson, Bismarck, King of Tomkins County, Wadhurst Pippin, &c., and Jacquin, a new pale yellow variety of splendid texture, which the Committee desired to see again. Of the Oranges 13 varieties were shown, viz. St. Michael's, Seville, White, Long, Bitten-court, Maltese Blood, Maltese Oval, Variegated, Sustain, Pernambuco, Dom Louise, Egg, and Silver Orange. The fruits being large, clear-skinned, and of excellent quality, and having the green foliage attached, were very attractive.

To A. H. Smee, Esq., The Grange, Wallington (gr. Mr. G. W. Cummins), for a group of 60 varieties of Apples, noteworthy being Gloria Mundi, Schoolmaster, and Wadhurst Pippin.

To Messrs. Cheal & Sons, Crawley, for a collection of 106 varieties of Apples and Pears, including several of the newer varieties, Armored, Atalanta, &c., with Frogmore Prolific, Hoary Morning, Bess Pool, New Hawthornden, Dumelow's Seedling, &c.

Bronze Banksian Medal.

To Lord Foley, Ruxley Lodge, Esher (gr. Mr. J. Miller), for a collection of Apples, Grapes, &c.

Award of Merit.

To Apple Standard Bearer (votes 10 for, 6 against), from Mr. H. Bannister, Cote House, Westbury-on-Trym. Fruit of good size, flesh tender and of good quality.

Cultural Commendation.

To Mr. W. Roupell, Harvey Lodge, Roupell Park, for six varieties of Apples grown within the London five-mile radius, noticeable being Smart's Prince Arthur, Newton Wonder, and Beauty of Kent.

To Mr. S. Hardy, Ash House, Parsons Green, for some extremely fine Mushrooms.

Other Exhibits.

Mr. T. Laxton, Bedford, sent Broccoli Chou de Bedford, which the Committee asked to be grown at Chiswick.

A. H. Smee, Esq., The Grange, Wallington, exhibited an Apple called Buckley's Seedling.

P. A. Molteno, Esq., Fenchurch Street, London, sent a box of Peaches received from the Cape. The fruits had a good appearance, but were not considered up to the standard of quality of home-grown kinds.

A. Waterhouse, Esq., Yattendon Court, sent some unnamed Apples, also some Apple-jelly.

Mr. J. Clarke, The Ross, Saffron Walden, sent a seedling Apple.

Messrs. T. & R. White, Camberwell, showed some fine examples of Mushrooms.

From the Society's Gardens, Chiswick, came examples of Witloef Chicory, which is much relished as a salad.

 FRUIT COMMITTEE, MARCH 14, 1893.

PHILIP CROWLEY, Esq., F.L.S., in the Chair, and twenty-three members present.

Awards Recommended:—*Bronze Knightian Medal.*

To Mr. S. Hardy, Ash House, Parsons Green, for a large exhibit of very fine Mushrooms, packed as for market.

Cultural Commendation.

To Mr. Smythe, The Gardens, Basing Park, Hants, for examples of late Grapes—Alicante, Mrs. Pince, and Gros Colmar. The Alicante proved to be the freshest, and Mrs. Pince the sweetest.

Other Exhibits.

From the Royal Gardens, Windsor, Mr. Thomas sent good examples of new Black Hambro' Grapes.

Lord Foley, Ruxley Lodge, Esher (gr. Mr. Miller), sent some La Grosse Sucrée Strawberries.

W. Winthorpe, Esq., Barton Court, Kintbury, sent a seedling Apple.

Messrs. T. Rivers & Son sent examples of their new late Apple Jacquin, which it was requested might be submitted to the meeting on April 11.

Col. Archer Houblon, Welford Park, Newbury (gr. Mr. Ross), exhibited examples of Apple Mottled Beauty.

The Duke of Northumberland, Albury Park, Guildford (gr. Mr. W. C. Leach), sent examples of Tomato Ladybird.

Mr. E. Beckett, The Gardens, Aldenham, sent examples of a new forcing Lettuce named Harbinger.

P. A. Molteno, Esq., sent examples of several sorts of fruit imported from the Cape, namely:—(1) Red and White Chasselas Grapes, which were received in bad condition, being greatly decayed, of poor flavour, and little value; (2) Williams's Bonchrétien Pears, finely grown fruit, but all overripe; (3) three varieties of Melons, all overripe, the green variety considered the best as a market fruit.

FRUIT COMMITTEE, MARCH 28, 1893.

P. CROWLEY, Esq., F.L.S., in the Chair, and eighteen members present.

Awards Recommended:—

Cultural Commendation.

To Mr. S. Hardy, Ash House, Parsons Green, for a large collection of Mushrooms in very fine condition, packed in baskets as they are sent to Covent Garden Market.

To Mr. T. Lockie, Oakley Court, Windsor, for a brace of finely grown Lockie's Perfection Cucumber, which had been grown from seed sown January 9, 1893.

To the Duke of Northumberland (gr. Mr. Geo. Wythes), for

Strawberry Vicomtesse Héricart de Thury, and Fig St. John's Day, a very early good forcing variety.

Other Exhibits.

Mr. T. Osman, The Elms, Ottershaw Park, Chertsey, sent Strawberry Loxford Hall.

W. H. Evans, Esq., Forde Abbey, Chard (gr. Mr. J. Crook), sent nine dishes of Apples.

Mr. W. Bannister, Cote House Gardens, Westbury-on-Trym, again submitted examples of Apple Standard Bearer, a variety which had received an Award of Merit at a previous meeting. The fruits were in good condition, and the award was confirmed.

FRUIT COMMITTEE, APRIL 11, 1893.

P. CROWLEY, Esq., F.L.S., in the Chair, and fifteen members present.

Awards Recommended:—

Silver Banksian Medal.

To His Grace the Duke of Northumberland, Syon House (gr. Mr. Geo. Wythes), for a collection of excellent vegetables, comprising Seakale, Kidney Beans, Asparagus, Potatos, &c., with some excellent Strawberries, Black Hambro' Grapes from pot plants, St. John's Day Figs, &c.

First Class Certificate.

To Apple Jacquin, from Messrs. T. Rivers & Son, Sawbridge-worth. Fruits of medium size, conical, clear lemon colour; flesh tender, sweet, and pleasant. A valuable late dessert variety.

To Lettuce Veitch's Golden Queen, from C. J. Ingram, Esq., Elstead House, Godalming (gr. Mr. T. W. Bond), as a forcing variety. Hearts firm and solid.

Cultural Commendation.

To Mr. Thomas Laxton, Bedford, for Royal Sovereign Strawberries in pots, a variety certificated by the Committee in 1892.

Other Exhibits.

From the Society's Garden, Chiswick, were submitted examples of several varieties of Apples which had been grown

in pots under glass, and were still fresh and excellent. The specimens were very pale and waxlike.

Major Warde, Barham Court, Maidstone (gr. Mr. G. Woodward), sent examples of an Apple named Roi d'Angleterre, a dull green medium-sized fruit, somewhat past its season.

Messrs. H. Lane & Son, Berkhamstead, sent some fine examples of Lane's Prince Albert Apple and St. John's Seedling.

Wm. Moore, Esq., Wierton House, Maidstone (gr. Mr. W. Divers), sent 15 sorts of Apples.

The Duke of Northumberland, Albury Park, Guildford (gr. Mr. Leach), sent four Vegetable Marrows.

FRUIT COMMITTEE, APRIL 25, 1893.

P. CROWLEY, Esq., F.L.S., in the Chair, and nineteen members present.

Awards Recommended:—

Award of Merit.

To Potato Sharpe's Victor, as a forcing variety, from the Duke of Northumberland, Syon House (gr. Mr. Wythes). The fine examples shown were grown in nine weeks.

To Peach Amsden June, as an early variety, from the Duke of Northumberland, Syon House.

Other Exhibits.

Mr. Wythes also exhibited two bunches of Conover's Colossal Asparagus.

Lord Foley, Ruxley Lodge, Esher (gr. Mr. Miller), sent a dish of Strawberries, Bicton Pine and Keen's Seedling mixed.

W. A. Wykeman-Musgrave, Esq., Thame Park (gr. Mr. C. E. Munday), sent a dish of Walker's Early Prolific Strawberry.

Mr. Thomas, the Royal Gardens, Windsor, sent a fine dish of Strawberry La Grosse Sucrée; six seedling Melons, crosses between Countess and Royal Ascot; also Tomato Brown's Invincible, which greatly resembled the old red Italian.

W. R. Inglis, Esq., Craigendowie, Reigate Hill, exhibited a seedling Melon named Hamilton's Defiance.

Mr. J. G. Dean, Titsey Gardens, Limpsfield, Surrey, sent 20 dishes of Apples to show their late keeping qualities.

Messrs. J. Veitch & Sons, Chelsea, sent fine dishes of Mr. Allan's new Strawberries Gunton Park, Lord Suffield, and Empress of India.

FRUIT COMMITTEE, MAY 9, 1893.

P. CROWLEY, Esq., F.L.S., in the Chair, and twenty-one members present.

Awards Recommended:—

Award of Merit.

To Melon Ingestre Hybrid (votes 11 for, 6 against), from the Earl of Shrewsbury, Ingestre Hall, Stafford (gr. Mr. E. Gilman). A hybrid between Hero of Lockinge and Countess.

Cultural Commendation.

To the Duke of Northumberland, Syon House, Brentford (gr. Mr. G. Wythes), for Brown Turkey Figs. Very fine.

To H. H. Gibbs, Esq., Aldenham Park, Elstree (gr. Mr. E. Beckett), for Strawberry British Queen.

To H. H. Gibbs, Esq., for Tomato Reading Perfection.

To H. H. Gibbs, Esq., for Potato Snowdrop.

Other Exhibits.

Dr. Frankland, F.R.S., The Yews, Reigate Hill, sent a green-fleshed Melon of considerable promise, but not quite ripe.

The Earl of Cork, Marston, Frome (gr. Mr. W. Iggulden), sent a dish of Strawberry Noble which had been gathered from the open ground, the plants having been protected with mats whilst in flower. These were stated to be one month earlier than in previous years.

The Duke of Northumberland, Syon House, Brentford, sent the Old Red Tomato.

The Duke of Northumberland, Albury Park (gr. Mr. W. C. Leach), sent examples of several varieties of Lettuce Chelsea Gem, Peas, and a Runner Bean named Delicious, greatly resembling Tender and True.

C. Ingram, Esq., Elstead House, Godalming (gr. Mr. T. W. Bond), sent examples of Veitch's Earliest of All Cabbage.

FRUIT COMMITTEE, MAY 25, 1893.

INNER TEMPLE GARDENS.

P. CROWLEY, Esq., F.L.S., in the Chair, and twenty-eight members present.

Special Awards made by the Council :—*Silver Cup.*

To Messrs. T. Rivers & Son, Sawbridgeworth, for a group of Early Rivers Nectarine in pots. Fruits large, finely coloured, and very handsome, resembling in appearance Lord Napier, but ripening earlier.

Silver Gilt Knightian Medal.

To Mr. George Featherby, The Vineries, Gillingham, Kent, for very fine examples of Black Hambro' and Muscat of Alexandria Grapes, Peaches, Nectarines, and Cucumbers.

To Mr. S. Mortimer, Swiss Nursery, Farnham, for Melon Duke of York, a seedling from Empress; and two new Cucumbers, one named Princess May, the other Prince George, crosses from Improved Telegraph, of remarkably fine form.

Silver Banksian Medal.

To the Duke of Northumberland, Syon House, Brentford (gr. Mr. G. Wythes), for good Brown Turkey Figs and Nectarines.

To E. Dresden, Esq., Livermere Park, Bury St. Edmunds (gr. Mr. J. C. Tallach), for several dishes of very fine Brown Turkey Figs.

To Lord Foley, Ruxley Lodge, Esher (gr. Mr. J. Miller), for a collection of fruit.

Other Exhibits.

Dr. Frankland, F.R.S., The Yews, Reigate (gr. Mr. C. Richings), sent three varieties of Melons.

The Earl of Jersey, Middleton Park, Bicester (gr. Mr. Hope), exhibited a "twin" Cucumber, the two fruits cohering lengthwise.

C. A. Hanbury, Esq., Belmont House, East Barnet (gr. Mr. J. McKinley), sent 12 handsome Melons.

Messrs. Dicksons, Chester, sent several Melons named Whitfield Seedling, which proved overripe.

Sir J. W. Pease, Bart., Hutton Hall, Guisboro', Yorks (gr. Mr. J. McIndoe), sent three dishes of good Peaches, one of Nectarines, and four Melons.

Mr. C. Osman, South Metropolitan District Schools, Sutton, sent 12 sticks of Stott's Monarch Rhubarb, a very broad, deep green variety.

Mr. N. Molyneux, Rookesbury Park, Wickham, sent a seedling Melon, a cross between Hero of Lockinge and Scarlet Gem.

Messrs. J. Veitch & Sons, Chelsea, sent a collection of well-kept Apples.

Mr. J. Walker, Thame, Oxon, sent some fine Cucumbers and Potatos.

FRUIT COMMITTEE, JUNE 6, 1893.

P. CROWLEY, Esq., F.L.S., in the Chair, and fifteen members present.

Awards Recommended:—

Award of Merit.

To Melon Frogmore Seedling (votes, 8 for, 6 against), a white-fleshed variety, having a bright yellow skin, from Mr. O. Thomas, the Royal Gardens, Windsor.

To Pea Duke of York (votes, 8 for, 1 against), from Messrs. Cooper, Taber & Co., Witham. An early selection from Duke of Albany. Highly Commended (× × ×) at Chiswick 1892.

Cultural Commendation.

To the Duke of Northumberland, Syon House, Brentford (gr. Mr. Wythes), for Duke of Albany Peas.

To the Viscountess Portman, Hogg House, Buxted Park, Sussex (gr. Mr. C. Prinsep), for 12 dishes of Peas.

To Messrs. de Rothschild, Gunnersbury House, Acton (gr. Mr. J. Hudson), for Nectarine Lord Napier, remarkably fine examples.

Other Exhibits.

Mr. J. Kent, The Gardens, Ashted Park, sent Melons. Three fruits of Ashted Park Seedling being considered promising, the Committee desired to see them again.

Col. Archer Houblon, Welford Park (gr. Mr. C. Ross), sent

Melon Marmion, which was also considered promising and requested to be seen again.

Dr. Frankland, The Yews, Reigate, sent Melon Reigate Ruby.

W. O. Foster, Esq., Apley Hall, Bridgenorth, Salop (gr. Mr. Parr), sent Melon Apley Beauty, a cross between Benham Beauty and Scarlet Premier.

Lord Cowper, Panshanger Park, Herts (gr. Mr. J. Fitt), sent Melon Salmon Queen.

Mr. G. A. Bishop, Netherton House, Wolverhampton, sent an unnamed seedling Melon.

Mr. S. Eley, Joyce Grove Gardens, Henley-on-Thames, sent Melon Oxonian.

Robert Burrell, Esq., Westley Hall, Bury St. Edmunds (gr. Mr. A. Bishop), sent two varieties of Melons.

Mr. W. J. Myatt, Hextable, exhibited six large handsome Melons named The Conqueror, a variety largely grown for market.

Mr. J. Collis, Acton, sent fruits of a new Strawberry named May Queen, which ripened in the open ground on May 20, in advance of Noble. This was recommended to be tried in the Society's Gardens.

Mr. O. Thomas sent from the Royal Gardens, Windsor, some fine examples of Strawberries La Grosse Sucrée, Noble, Sir J. Paxton, and Sharpless from the open ground.

Mr. Tudway, Lower Berkeley Street, sent Strawberry Auguste Nicaise, some of the fruits weighing $2\frac{1}{2}$ oz.

Mr. Whitehouse, Pelham Lodge, Chester Road, Kidderminster, sent fruits of a large Strawberry named Whitehouse Seedling.

Mr. T. Wilkins, The Gardens, Inwood House, Henstridge, Devon, sent a ripe fruit of *Carica Papaya*.

The Duke of Northumberland, Syon House, Brentford (gr. Mr. G. Wythes), sent seven sorts of Cherries grown on walls; also three sorts of Potatos and several Cabbages.

Messrs. McHattie & Co., Northgate Street, Chester, sent examples of their new Giant Winter Lettuce.

FRUIT COMMITTEE, JUNE 20, 1893.

P. CROWLEY, Esq., F.L.S., in the Chair, and ten members present.

Awards Recommended :—*Silver Banksian Medal.*

To J. Corbett, Esq., Impney Hall, Droitwich (gr. Mr. R. Parker), for six particularly fine well-grown Queen Pineapples.

To H. H. Gibbs, Esq., Aldenham, Elstree (gr. Mr. E. Beckett), for six very fine Queen Pineapples.

To Her Majesty the Queen, Windsor (gr. Mr. O. Thomas), for 14 dishes of Cherries, 14 dishes of Strawberries, and several Melons.

Cultural Commendation.

To Messrs. J. Veitch & Sons, Chelsea, for examples of 12 varieties of Cherries from small pyramids in the open ground.

To J. Watson, Esq., Berwick House, Shrewsbury (gr. Mr. A. Gant), for six large and fine fruits of *Musa Cavendishi*.

Other Exhibits.

Mrs. Whitbourn, Great Gearies, Ilford (gr. Mr. J. Douglas), sent a seedling Grape, a cross between Hambro' and Muscadine. In the flesh and general character it greatly resembled Buckland Sweetwater.

Lord Suffield, Gunton Park, Norwich (gr. Mr. W. Allan), sent good examples of Strawberries Gunton Park, Empress of India, and Lord Suffield.

P. Crowley, Esq., F.L.S., Waddon House, Croydon, exhibited some Asparagus which had been dried; also examples of the same cooked.

Dr. Kirby, Beckenham (gr. Mr. Webster), sent some clusters of a large and good Tomato.

James Watts, Esq., Abney Hall, Cheadle, Cheshire (gr. Mr. R. Mackellar), sent some fine fruits of Strawberry President and the Myrtle-leaved Orange.

Messrs. T. Rivers & Son, Sawbridgeworth, sent fine examples of Peaches Amsden June, Waterloo, and Alexander, which had been grown in an unheated house.

Messrs. H. Cannell & Sons, Swanley, sent a new Strawberry named George, a seedling from British Queen, which seemed promising.

R. Burrell, Esq., Westley Hall, Bury St. Edmunds (gr. Mr. A. Bishop), sent an unnamed seedling Melon.

Lord Howard, Glossop Hall, Derby (gr. Mr. B. Ashton), sent two varieties of Melons.

Mr. H. S. Easty, Great Cornard, Sudbury, sent two varieties of Melons.

H. A. Simmonds, Esq., Red Rice, Andover (gr. Mr. C. Brooks), sent Melon Supreme.

FLORAL COMMITTEE.

JANUARY 17, 1893.

W. MARSHALL, Esq., in the Chair, and twenty-three members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Hugh Low & Co., Clapton, for a fine group of Cyclamen, numbering upwards of 150 plants, splendidly grown and flowering profusely.

Silver Banksian Medal.

To Leopold de Rothschild, Esq., Ascott, Leighton Buzzard (gr. Mr. J. Jennings), for a large group of remarkably well-grown plants of Begonia Gloire de Sceaux. An extremely handsome stove-plant for winter decoration. Plants compact, leaves large, of a rich bronze colour. Flowers in large trusses of a pale rosy-pink colour. Mr. Jennings also showed plants of Tree Carnation Sir Henry Calcraft. Flowers large, deep scarlet.

To the Duke of Northumberland, Albury Park, Guildford (gr. Mr. W. C. Leach), for a nicely arranged group of cut Chrysanthemums, Euphorbias (Poinsettias), &c.

Bronze Banksian Medal.

To Messrs. W. Cutbush & Sons, Highgate, for a group of *Dracæna Massangeana* and *D. Lindenii*, grown in small pots.

First Class Certificate.

To Begonia Gloire de Sceaux (votes, unanimous), from Leopold de Rothschild, Esq., Ascott.

Award of Merit.

To *Pteris serrulata gigantea* (votes, 6 for, 2 against), from Mr. H. B. May, Upper Edmonton. Plant of vigorous growth, compact habit.

To *Chrysanthemum New Year's Gift* (votes, unanimous), from Mr. R. Owen, Maidenhead. A fine massive reflexed Japanese late-flowering variety. Flowers large, white suffused with sulphur-yellow.

To *Chrysanthemum Mrs. E. D. Adams* (Jap.) (votes, 15 for), from Mr. R. Owen, Maidenhead. Florets wavy, pale pink.

Other Exhibits.

Mr. R. Owen, Maidenhead, sent, besides the above, cut blooms of *Chrysanthemums Mrs. Marian Bourne* (Jap.) and *Mrs. L. C. Madeira* (Inc.), a rich yellow variety, which the Committee desired to see again.

Messrs. J. Veitch & Sons, Chelsea, sent *Primula floribunda*.

Messrs. Cannell & Sons, Swanley, exhibited a group of Chinese *Primulas* of various colours.

Mr. H. B. May, Upper Edmonton, sent *Carnation Winter Cheer*. Flowers deep red, very fine. Also *Pteris Reginae*, a Fern of graceful habit.

Messrs. B. S. Williams & Son, Upper Holloway, showed plants of *Nidularium fulgens* and *Pandanus concidens*.

Messrs. E. D. Shuttleworth & Co., Fleet, exhibited 13 varieties of single *Narcissi* in small pots.

T. B. Rogers Tillstone, Esq., Mousle Coombe Place, Brighton (gr. Mr. W. E. Anderson), sent six pots of double *Narcissi*.

Mr. J. Brooks, Brixton Terrace, Exmouth, sent a sample of iron stakes for plants.

Messrs. R. Lee & Co., Southwell, sent samples of their wooden labels.

FLORAL COMMITTEE, FEBRUARY 14, 1893.

W. MARSHALL, Esq., in the Chair, and twenty-five members present.

Awards Recommended :—*Silver Gilt Flora Medal.*

To Lord Foley, Ruxley Lodge, Esher (gr. Mr. J. Miller), for a group of mixed plants composed of well-flowered pieces of

Cœlogyne cristata, *Cypripedium insigne*, *Calanthes*, *Lily-of-the-Valley*, *Thyrsacanthus rutilans*, &c.

Silver Flora Medal.

To Messrs. Paul & Son, Cheshunt, for a group of *Cœlogyne*s in variety, *Lachenalia luteola*, and forced Lilacs, including Mme. Abel Chatenay, a double variety, and Marie Legrange, one of the best for forcing.

Silver Banksian Medal.

To Messrs. H. Low & Co., Clapton, for a fine group of New Holland plants, *Acacia Drummondii*, *Diosma capitata*, *Erica melanthera*, *Chorizema Lowii* (a pretty free-flowering variety), *Boronia megastigma*, &c.

Bronze Flora Medal.

To Messrs. E. D. Shuttleworth & Co., Peckham Rye, and Fleet, Hants, for a tastefully arranged group of flowering and foliage plants grown in small pots, comprising *Codiaeums* (*Crotons*) in variety, *Dracæna Lindenii*, *Cocos Weddelliana*, *Azalea mollis*, *Lilly-of-the-Valley*, &c. Also a nice collection of cut *Narcissi* *Sir Watkin*, *Emperor*, &c.

To Mr. C. Turner, Slough, for a group of *Cyclamen*, of good strain.

To the Hon. P. C. Glyn, Rook's Nest, Godstone, Surrey, for a collection of cut *Camellias*, arranged with *Maidenhair Fern*; also shoots of *Acacia dealbata* laden with bloom.

Award of Merit.

To *Hippeastrum* The Hon. W. F. D. Smith (votes, 9 for, 3 against), from Viscountess Hambledon, Greenlands, Henley-on-Thames (gr. Mr. H. Perkins). A variety of great promise. Flowers large, of a dark crimson colour.

To *Chrysanthemum* *Beauty of Castle Hill* (Jap.) (votes, 11 for, 2 against), from Mr. R. Owen, Maidenhead. A good late-flowering sort. Flowers bronzy yellow, petals narrow, very distinct, good form.

Other Exhibits.

Lord Suffield, Gunton Park, Norwich (gr. Mr. W. Allan), exhibited cut blooms of *Lachenalia Nelsonii*.

Viscountess Hambledon, Henley-on-Thames, showed eight seedling Hippeastrums, one of which received an Award of Merit as above.

F. W. Moore, Esq., Botanic Garden, Glasnevin, sent *Freesia odorata lilacina* and *Crinum pulchellum*.

Mr. S. Mortimer, Farnham, exhibited a splendid group of cut *Chrysanthemum Golden Gem*, showing its suitability as a late-flowering kind.

Messrs. Cutbush & Son, Highgate, exhibited a well-flowered group of *Erica Wilmoreana*, and 17 narrow-leaved *Dracenas*, the most prominent being Mrs. Freake, *Bella*, *Superba*, &c.

Mr. H. B. May, Upper Edmonton, sent a basket of *Carnation Miss Jolliffe*.

Messrs. J. Veitch & Sons, Chelsea, exhibited *Pandanus Baptistii*.

Messrs. J. Laing & Sons, Forest Hill, sent *Clivia Exquisite*.

Messrs. R. Veitch & Son, Exeter, sent *Asparagus retrofractus arboreus*, *Arum Palestinum*, and a variegated form of *A. compactum*, which was referred to the Scientific Committee.

Messrs. Garaway & Co., Durdham Down, Bristol, showed *Primula sinensis*, *Garaway's White Perfection*.

The following resolution was unanimously agreed to:—
 "That this Committee beg to express to Mrs. George Phippen their sincere condolence and sympathy on the great loss that she has sustained, and to assure her that the services which her late husband rendered to the Committee were always greatly appreciated."

FLORAL COMMITTEE, MARCH 14, 1893.

W. MARSHALL, Esq., in the Chair, and twenty-eight members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. W. Paul & Son, Waltham Cross, for a grand display of cut *Camellias* arranged in boxes, comprising some of the best varieties grown, such as *Fimbriata*, *Mathotiana*, *Princess Charlotte*, *Largoni*, &c.

To Mr. T. S. Ware, Tottenham, for an extensive collection of

hardy flowers, the following Narcissi being very noticeable : Sir Watkin, Emperor, maximus, Johnstoni, and princeps ; also *Fritillaria aurea*, *Chionodoxa Luciliæ*, *Scillas*, &c.

To Messrs. Hugh Low & Co., Clapton, for a group of hard-wooded plants, conspicuous amongst them being *Acacia rotundifolia*, *A. cordata*, *Chorizema Lowii*, *Epacris Eclipse*, *Boronia megastigma*, *Genista Everestiana*, &c.

To Messrs. Cutbush & Son, Highgate, for a group of flowering and foliage plants, which included small but well-flowered specimens of *Erica Wilmoreana*, *E. Cavendishiana* ; Azaleas, *Boronias*, *Begonia Gloire de Sceaux*, *Pernettyas* with berries, and Oranges in fruit.

To Messrs. J. Laing & Sons, Forest Hill, for a miscellaneous group of plants, comprising *Dendrobium crassinode giganteum*, *Cattleya Trianae*, Palms, *Dracenas*, *Crotons*, *Clivias*, Ferns, and *Acacia Drummondii* laden with bloom.

To Mr. John Odell, Gould's Green, Hillingdon, for a group of well-grown *Cyclamen*.

Silver Banksian Medal.

To J. C. Tasker, Esq., Middleton Hall, Brentwood (gr. Mr. P. Perry), for a group of pot Roses, small plants, well flowered, noteworthy being Catherine Mermet, White Perle, and Mme. V. Verdier.

To Mr. W. Newport, Hillingdon Heath, Uxbridge, for a group of *Primula White Model*.

To Mr. C. Holden, 61 Warwick Road, Ealing, for a small group of Azaleas in flower, Ferns, *Aspidistras*, &c.

To Messrs. J. James & Son, Farnham Royal, Slough, for a well-flowered group of *Cinerarias*.

To Messrs. E. D. Shuttleworth & Co., Peckham Rye, for a miscellaneous group of plants, consisting of Palms, *Dracena Nelseriana*, *D. Lindeni*, *Crotons*, *Anthuriums*, &c.

To Messrs. Paul & Son, Cheshunt, for a group of spring flowers, embracing *Saxifraga (Megasea) Stracheyi*, *Anemone pulsatilla*, *Scopolia carniolica Fladnichiana*, *Saxifraga Burseri-ana*, *Hepaticas*, and some seedling *Hippeastrums*.

To S. G. Lutwyche, Esq., South Eden Park, Beckenham, for a small group of well-flowered *Clivias* and *Hippeastrums*.

Bronze Banksian Medal.

To Sir Trevor Lawrence, Bart., for a group of Winter-

flowering Begonias, noticeable being *Triomphe de Lemoine*, *odorata*, &c.

To Messrs. Barr & Son, Covent Garden, for a group of herbaceous plants, conspicuous amongst them being *Chionodoxa sardensis*, *Scilla bifolia*, *Hellebores*, and *Narcissus*.

To Messrs. E. D. Shuttleworth & Co., Fleet, Hants, for a collection of hardy flowers, including *Iris persica*, *I. purpurea*, *Anemone pulsatilla*, and *Narcissus Sir Watkin*.

First Class Certificate.

To *Caraguata cardinalis* (votes, 16 for), from Messrs. B. S. Williams & Son, Upper Holloway. The plant has bright green leaves and bracts of a rich scarlet colour.

To *Corylopsis pauciflora* (votes, unanimous), from Messrs. J. Veitch & Sons, Chelsea. A deciduous Japanese shrub. Flowers bright yellow, produced freely.

Award of Merit.

To *Begonia Triomphe de Lemoine* (votes, 13 for), from Sir Trevor Lawrence, Bart., Dorking. Plant of good habit, producing heavy trusses of small pink blooms.

To *Clivia Scarlet Gem* (votes, 12 for), from Messrs. B. S. Williams & Son, Upper Holloway. Flowers of a bright orange-scarlet colour.

To *Fritillaria aurea* (votes, 20 for), from Mr. T. S. Ware, Tottenham. Flowers soft yellow with dark spots.

To *Hippeastrum Corinna* (votes, 18 for, 2 against), from Messrs. J. Veitch & Sons, Chelsea. Flowers rich scarlet.

To *Hippeastrum Nimrod* (votes, 15 for, 2 against), from Messrs. J. Veitch & Sons, Chelsea. Flowers large, of good form; colour crimson.

To *Hippeastrum Excellent* (votes, 14 for), from Messrs. J. Veitch & Sons, Chelsea. Flowers bright scarlet.

To *Hippeastrum Eldorado* (votes, unanimous), from Messrs. J. Veitch & Sons, Chelsea. Flowers of good form, very distinct; colour crimson.

To *Hippeastrum Socrates* (votes, unanimous), from Messrs. J. Veitch & Sons, Chelsea. Flowers large; colour deep scarlet.

To *Hippeastrum Salvator Rosa* (votes, 12 for), from Messrs. Paul & Son, Cheshunt. Flowers bright red, streaked with white.

To *Chrysanthemum frutescens Alma Bruggemann* (votes

23 for), from Mr. C. Bruggemann, Villefranche-sur-Mer, France. Flowers sulphur-yellow, varying to white.



FIG. 19.—*SCOPOLIA CARNIOLICA FLADNICHIANA*. (*Journal of Horticulture*.)

To *Scopolia carniolica Fladnichiana* (votes 12 for, 6 against), from Messrs. Paul & Son, Cheshunt. Flowers bell-shaped; colour greenish yellow (fig. 19).

Commended.

Cyclamen Queen Victoria, Snowflake, Giant White, and Rosetta, exhibited by Mr. J. Odell.

Other Exhibits.

The Director, Royal Gardens, Kew, sent a collection of early-flowering hardy shrubs, *Rhododendron fulgens*, *Amygdalus persicoides*, *Dirca palustris*, *Parrottia persica*, *Daphnes*, *Forsythias*, &c.

The Duke of Northumberland, Albury Park (gr. Mr. Leach), sent cut blooms of *Deutzia candidissima flore pleno*.

Lord Foley, Ruxley Lodge, Esher (gr. Mr. J. Miller), exhibited a basket of Neapolitan Violets.

Viscountess Hambledon, Henley-on-Thames, exhibited *Hippeastrum Greenlands Gem*.

Mr. Douglas, Great Gearies, Ilford, sent a basket of *Cineraria* blooms.

Mr. J. Odell, Hillingdon Heath, exhibited *Cyclamen Peculiarity*.

Messrs. B. S. Williams & Son, Holloway, exhibited *Pandanus coincidens*, *Dracæna congesta robusta*, &c.

Messrs. J. Laing & Sons, Forest Hill, sent *Clivias Stanstead Beauty*, *Colonel Davidson*, and *Purity*.

Mr. H. Geer, 83 Preston Road, Brighton, exhibited an unnamed Violet.

Messrs. Paul & Son, Cheshunt, sent *Hippeastrum Sirius*.

Messrs. J. Veitch & Sons, Chelsea, sent *Hippeastrum Dorothea*.

FLORAL COMMITTEE, MARCH 28, 1893.

W. MARSHALL, Esq., in the Chair, and twenty-three members present.

Awards Recommended:—*Silver Flora Medal.*

To Messrs. Paul & Son, Cheshunt, for a group of Roses, *Hippeastrums*, Lilacs, &c., and a basket of early-flowering plants, including *Primula altaica*, *Hepatica rubra* and *alba*, *Anemone pulsatilla*, and Lilac Alphonse Lavallée.

To Messrs. Hugh Low & Co., Clapton, for a collection of

New Holland and other plants, noticeable being *Acacia undulata* laden with rich yellow flowers, *Boronia elatior*, *Tremandra ericifolia hirsuta*, *Ericas*, *Azaleas*, *Hibbertia Reedii*, *Correa cardinalis*, and *Pimeleas*.

To Messrs. J. Laing & Sons, Forest Hill, for a group of plants consisting of Orchids, Palms, Ferns, Crotons (finely coloured), *Erica Cavendishiana* (heavily flowered), *Leea amabilis*, *Bertolonias*, *Saxifraga sarmentosa tricolor superba*, *Caladiums*, &c.

To the St. George's Nursery Co., Hanwell, for an extensive group of vigorous and well-flowered *Cyclamen*.

Silver Banksian Medal.

To W. M. Bullivant, Esq., Homewood Park, Beckenham (gr. Mr. Cresswell), for a group of *Cinerarias*.

To Messrs. E. D. Shuttleworth & Co., Peckham Rye, for a group of plants comprising *Azalea Deutsche Pearl* (with fine large flowers), *Dracænas*, *Anthuriums*, and *Rhapis humilis*.

To Mr. H. B. May, Upper Edmonton, for a group of Ferns, the most noteworthy being *Davallia Mariesii*, *Pteris cretica nobilis* (a plant of good habit), *Pteris serrulata densa*, *Adiantum Wiegandii*, *versailleense*, *Ficus elastica variegata*, and *Dieffenbachias*.

To Messrs. J. James & Son, Farnham Royal, Slough, for *Cinerarias* grown in small pots and well-flowered.

To Messrs. Barr & Son, Covent Garden, for a collection of hardy flowers, including a great variety of *Narcissus*—*Horsfieldii*, *obvallaris*, *Countess of Annesley*, *cernuus*, *Mrs. H. J. Elwes*, *Golden Spur*, &c.; *Saxifraga Cymbalaria*, *Chionodoxa gigantea* (flowers pale blue), and *Scillas*.

To Messrs. J. Peed & Sons, Norwood Road, London, for a group of foliage and flowering plants, such as *Dracæna Goldiana*, *Marie Meige*, *superba*; *Aralia Veitchii*, *Dendrobiums*, *Crotons*, &c.

To Messrs. W. Cutbush & Son, Highgate, for a group of plants—*Azalea Graf von Meran* (flowers light pink), *Azalea mollis*, *Staphyllea colchica*, Palms, *Hippeastrums*, *Epacris*, &c.

Bronze Banksian Medal.

To Messrs. E. D. Shuttleworth & Co., Fleet, Hants, for a group of cut flowers and early-flowering plants.

First Class Certificate.

To *Schizocodon soldanelloides* (votes, unanimous), from Captain Torrens, Baston Manor, Hayes, Kent. Said to be the first living plant introduced into England, from Myanoshta, Japan, in 1891. It grows only a few inches high. Flowers of a rosy-pink colour borne on upright spikes (fig. 20).

To *Brownea ariza* (votes, unanimous), from F. W. Moore, Esq., Botanic Gardens, Glasnevin. Flowers rich scarlet.



FIG. 20.—SCHIZOCODON SOLDANELLOIDES. (*Journal of Horticulture.*)

To *Aucuba japonica fructu albo* (votes, 18 for, 1 against), from Messrs. Paul & Son, Cheshunt. Berries of a creamy-white colour, produced freely.

Award of Merit.

To *Clivia Beechdale* (votes, 18 for), from J. C. Geiselbrecht,

Lee, Kent (gr. Mr. G. Judge). Flowers numerous, of a reddish-orange colour.

To *Olearia stellulata* (votes, 12 for, 3 against), from Messrs. R. Veitch & Sons, Exeter. Flowers star-shaped, pure white, very free; small green leaves.

To *Scilla sibirica vera alba* (votes, 15 for), from Messrs. De Graaff Brothers, Leyden. Flowers pure white.

To *Hippeastrum Ophelia* (votes, 16 for), from Messrs. B. S. Williams & Son, Upper Holloway. Flowers large, deep red in the centre, lighter towards the edges, with a red margin.

To *Hippeastrum Syren* (votes, 9 for), from Messrs. J. Veitch & Sons, Chelsea. Flowers deep rich pink.

To *Hippeastrum Lightning* (votes, unanimous), from Messrs. Paul & Son, Cheshunt. Flowers rich scarlet; distinct.

To *Rhododendron Yellow Gem* (votes, unanimous), from Messrs. J. Veitch & Sons, Chelsea. Flowers rich yellow, of good size and substance—indo-javanicum section.

To *Magnolia stellata* (pink var.) (votes, 9 for, 5 against), from Messrs. J. Veitch & Sons, Chelsea. Flowers pale pink.

To *Lilac Alphonse Lavallée* (votes, 15 for), from Messrs. Paul & Son, Cheshunt. Flowers semi-double, colour pale lilac.

To *Cereus Hoveyi* (votes, 11 for), from Mr. F. Ross, Merstham. Flowers large, scarlet.

To strain of *Cyclamen* (votes, unanimous), exhibited by the St. George's Nursery Co., Hanwell.

Cultural Commendation.

To Lord Hylton, Merstham, Surrey (gr. Mr. C. Wood), for a well-grown plant of *Ranunculus cortusæfolius*.

To Messrs. J. Veitch & Sons, Chelsea, for well-forced plants of *Chionanthus virginica*.

Other Exhibits.

F. W. Moore, Esq., Botanic Garden, Glasnevin, sent *Hoya cinnamomifolia* and *Brownea grandiceps*.

Lord Hylton, Merstham, exhibited *Psoralea pinnata*.

Mr. Fitt, Panshanger, Hertford, exhibited cut flowers of *Veltheimia viridifolia*. The Committee wished to see the plant.

W. H. Underhill, Esq., Kirkconnell, Ealing, sent a new seedling *Auricula*, *Nina Underhill*.

Mr. Newport, Hillingdon Heath, Uxbridge, sent a group of white Stocks grown in pots.

Messrs. J. Peed & Sons, Norwood Road, London, exhibited *Anthurium* John Peed, also *Caladium* Comtesse de Brosse, which the Committee desired to see again.

Messrs. R. Veitch & Son, Exeter, sent *Rhododendron* *gloxiniæ-flora*. Flowers pure white, with brownish spots.

Messrs. J. Laing & Sons, Forest Hill, sent *Clivia* Lord Wolverton, *Rhopaloblaste* *hexandra*; also *Caladium* Rose Laing and *Calamus* *melanochætes* *microcarpus*, which the Committee asked to see again.

Messrs. Paul & Son, Cheshunt, sent *Hippeastrum* Orpheus.

Messrs. B. S. Williams & Son, Holloway, exhibited several *Hippeastrums*.

Messrs. J. Veitch & Sons, Chelsea, sent *Hippeastrum* Duke of York, Zara, &c.

FLORAL COMMITTEE, APRIL 11, 1893.

W. MARSHALL, Esq., in the Chair, and twenty-one members present.

Awards Recommended :—

Silver Gilt Flora Medal.

To Messrs. J. Laing & Sons, Forest Hill, for a group of flowering and foliage plants—*Clivias*, Azaleas, Ferns, Palms, Lilacs, *Leschenaultia* *biloba* *major*, &c.

To Messrs. Hugh Low & Co., Clapton, for an extensive group of plants, among which were *Grevillea* *Preisii*, *Leptospermum* *bullatum*, *Aphlexis* *Bruseii*, small plants of *Cytisus* *scoparius* *Andreanus*, Azalea Flambeau, *Gardenia* *intermedia*, and standards of *Cytisus* *fragrans*.

Silver Flora Medal.

To J. C. Tasker, Esq., Middleton Hall, Brentwood (gr. Mr. Perry), for a group of pot Roses, *Spiræas*, Azaleas, &c.

To Messrs. B. S. Williams & Son, Upper Holloway, for a group of flowering plants—*Hippeastrums* in variety, *Staphylea* *colchica*, a large plant of *Rhododendron* *McNabiana*, &c.

To the Guildford Hardy Plant Nursery, Guildford, for three

baskets of Alpines, including *Gentiana excisa*, *G. acaulis*, *Saxifraga Stanfieldi*, *Eritrichium nanum*, Alpine *Primulas*, &c.

To Messrs. Paul & Son, Cheshunt, for a group of *Genistas*, Alpine plants, *Prunus triloba*, *P. planeriflora alba plena*, *Doronicums*, &c. The *Genistas*, worked on Laburnum stocks 4 feet high, had a very graceful appearance.

To Mr. F. Cant, Colchester, for two boxes of cut *Roses*, which were exceptionally good at this season of the year, noteworthy being *The Bride*, *Ethel Brownlow*, *Her Majesty*, *Crown Prince*, *Baroness Rothschild*, &c.

To Messrs. Cutbush & Son, Highgate, for a group of greenhouse and hardy plants, which included well-flowered specimens of *Erica ventricosa magnifica*, *E. Spenceriana*, *E. Cavendishiana*, *Leschenaultia biloba major*, *Tree-Pæony Professor Moiren*, &c.

Silver Banksian Medal.

To Messrs. H. Lane & Son, Berkhamstead, for four baskets of *Polyantha Roses*, remarkably well grown, carrying an abundance of flowers—*Perle d'Or*, *Gloire des Polyanthes*, *Paquerette*, &c.

To Mr. G. May, King's Road, Upper Teddington, for a group of *Clove Carnation Uriah Pike*.

To Messrs. J. Veitch & Sons, Chelsea, for a group of hardy flowering shrubs—*Andromeda speciosa*, *A. cassinifolia*, *Cydonia japonica atropurpurea*, *Cerasus Waterii*, *Olearia Gunnii*, &c.

Bronze Banksian Medal.

To Messrs. E. D. Shuttleworth & Co., Peckham Rye, for a group of *Cycads*.

To Messrs. Barr & Son, Covent Garden, for a group of early *Tulips* (*La Riante*, *King of the Yellows*, *Cottage Maid*, &c.), *Ornithogalum nutans*, &c.

To Messrs. J. Peed & Sons, Norwood Road, London, for a miscellaneous group of *Palms*, *Anthuriums*, *Erica Cavendishiana*, *Ficus elastica variegata*, *Aralias*, &c.

First Class Certificate.

To *Bougainvillæa spectabilis* (votes, 13 for), from Captain Oldfield, Winchfield, Hants. Bracts of a rich magenta colour.

To *Sarracenia Mandaiana* (votes, unanimous), from Messrs. Pitcher & Manda, Hextable. Pitchers large, of a greenish colour.

To *Azalea Anthony Koster* (votes, unanimous), from Messrs.

H. Lane & Son, Great Berkhamstead. Flowers produced in large trusses : colour deep orange-yellow.



FIG. 21.—IRIS SARI NAZARENSIS. (*Journal of Horticulture.*)

Award of Merit.

To Carnation Souvenir de la Malmaison Princess May (votes unanimous), from M. R. Smith, Esq., Hayes Common, Beckenham (gr. Mr. C. Blick). Flowers large; colour dark red.

To Clove Carnation Uriah Pike (votes, unanimous), from Mr. G. May, King's Road, Upper Teddington. Flowers large; colour deep crimson.

To Eucharis Lowii (votes, 9 for), from Messrs. H. Low & Co., Clapton. Flowers pure white.

To Iris Sari nazarensis (votes, 15 for), from Mr. T. S. Ware, Tottenham. Flowers white, spotted brown, purple centre (fig. 21).

To Canna Progression (votes, unanimous), from Messrs. Paul & Son, Cheshunt. Flowers soft yellow, with brownish spots.

To Cydonia japonica cardinalis (votes, unanimous), from Mr. A. Waterer, Knap Hill, Woking. Flowers large, deep red, freely produced.

Botanical Certificate.

To Anthurium Dickii (votes, 9 for), from Messrs. B. S. Williams & Son, Holloway.

Other Exhibits.

Sir Trevor Lawrence, Bart., Dorking, exhibited Anthurium Rothschildianum maximum.

J. T. Bennett-Poë, Esq., 29 Ashley Place, S.W., exhibited Richardia aurata, Deleuil (R. albo-maculata × R. hastata). Flowers light sulphur-yellow.

J. Todman, Esq., 11 Dafforne Road, Tooting, sent Azalea Duchess of Fife and Princess Victoria.

M. R. Smith, Esq., Beckenham, sent a seedling Carnation, Lord Wolseley.

Mr. R. Dean, Ealing, sent a new Alpine Auricula, Princess May.

The Duke of Northumberland, Albury Park, Guildford (gr. Mr. W. C. Leach), sent Salvia gesneræflora and Philadelphus inodorus grandiflorus.

Mrs. Whitbourn, Great Gearies, Ilford (gr. Mr. J. Douglas), exhibited a grey-edged Auricula, Marmion.

Mr. T. S. Ware, Tottenham, sent Iris Helena.

Mr. E. Morse, Epsom, sent a group of new Giant Lily-of-the-Valley (Fortin's variety).

Messrs. H. Cannell & Sons, Swanley, sent a group of Wall-flowers and a basket of Primrose Harbinger.

FLORAL COMMITTEE, APRIL 25, 1893.

G. PAUL, Esq., in the Chair, and sixteen members present, with
Mons. H. Correvon.

Awards Recommended :—

Silver Gilt Flora Medal.

To Messrs. W. Paul & Son, Waltham Cross, for an extensive and beautiful group of pot Roses, noticeable being La France, Duke of Teck, Jeannie Dickson, Violette Bouyer, and Zenobia.

Silver Flora Medal.

To Mr. W. Rumsey, Joynings Nursery, Waltham Cross, for a group of Roses (dwarfs and standards) in pots—Baroness Rothschild, Souvenir d'un Ami, Earl of Dufferin, &c. Also two boxes of very fine cut blooms of Niphetos and other Roses.

Silver Banksian Medal.

To J. C. Tasker, Esq., Brentwood, (gr. Mr. Perry), for a well-grown collection of pot Roses.

To Messrs. E. D. Shuttleworth & Co., Peckham Rye, for a tastefully arranged group of flowering and foliage plants including Caladiums, Palms, Orchids, Azaleas, &c.

To Mr. J. Walker, 7 and 8 High Street, Thame, Oxon, for Maréchal Niel Roses, cut Zonal Pelargoniums, and the beautiful *Fabiana imbricata*.

To Messrs. Paul & Son, Cheshunt, for a large group of pot Roses, Alpines, &c., the most noteworthy Roses being Marie Van Houtte, Madame Falcot, and Cheshunt Hybrid. Of the Alpine plants *Anemone sylvestris*, *Myosotis rupicola*, *Trillium grandiflorum*, *Adonis vernalis*, and *Phlox amœna* were chiefly noticeable.

To Messrs. J. James & Son, Farnham Royal, Slough, for a group of large and brilliant-flowered *Calceolarias*.

To Messrs. Barr & Son, Covent Garden, for an extensive group of hardy spring flowers, including many Narcissi, Tulips, Spiræas, Pæonies, &c.

To Messrs. B. S. Williams & Son, Upper Holloway, for a group of flowering and foliage plants, including Rhododendron Aucklandii, Hippeastrums, Ferns, Azaleas, &c.

To the Guildford Hardy Plant Nursery Co., Millmead, Guildford, for Alpines, including good examples of Dracocephalum grandiflorum, Trollius nepalensis, Gentiana acaulis, Ramondia pyrenaica, Cypripedium pubescens, &c.

To Mr. F. Cant, Colchester, for a collection of very fine cut Roses, the most noticeable being Puritan, Madame Hoste, and Madame Cusin.

Bronze Banksian Medal.

To J. C. Tasker, Esq., Brentwood (gr. Mr. Perry), for a group of Cannas, conspicuous being Progression, Madame Croizy, and Victor Hugo.

To Messrs. J. Peed & Sons, Norwood Road, London, for a fine group of Gloxinias, arranged with Adiantums.

To Messrs. E. D. Shuttleworth & Co., Fleet, Hants, for a group of Narcissi and other hardy spring-flowering plants, including Onosma alba rosea, Lithospermum prostratum, Saxifraga granulata, &c.

To Mr. T. S. Ware, Tottenham, for a group of varieties of Primula Sieboldii.

To Messrs. Pearson & Sons, Chilwell, for a rich collection of cut Narcissi, including many rare varieties.

First Class Certificate.

To Strobilanthes Dyerianus (votes, 8 for), from Messrs. J. Veitch & Sons, Chelsea. A pretty plant with opposite, acuminate leaves of a rich magenta colour, in which the veins are very noticeable.

Award of Merit.

To Abutilon Souvenir de Bonn (votes, 8 for, 1 against), from Messrs. B. S. Williams & Son, Upper Holloway. Leaves green with a deep irregular silver bordering on the edges.

To Azalea mollis Hilda (votes, 8 for, 2 against), from Messrs. Lane & Son, Great Berkhamstead. Flowers of a rich orange colour.

To Ghent Azalea Raphael de Smet (votes, 11 for), from Messrs. Lane & Son, Berkhamstead. Flowers semi-double ; colour rosy pink.

Other Exhibits.

C. E. Smith, Esq., Cobham (gr. Mr. J. Quarterman), sent cut specimens of *Deutzia crenata* fl. pl.

Dr. George Walker, Wimbledon, exhibited a flower-stand.

Mr. J. O'Brien, Harrow-on-the-Hill, exhibited cut flowers of *Cyrtanthus carneus*, the colour being of a soft scarlet. The Committee desired to see the plant.

Mr. A. Smith, Downley, High Wycombe, sent cut Roses and Violas.

Messrs. Lane & Sons, Berkhamstead, sent three baskets of hardy Azaleas well flowered.

Messrs. Cutbush & Son, Highgate, sent examples of *Leschenaultia biloba major*, *Daphne cneorum*, *Calla Little Gem*, &c.

Mr. A. Knowles, Horsell Nursery, Woking, exhibited two boxes of *Daphne cneorum majus*.

Mr. H. Eckford, Wem, Salop, sent cut blooms of *Cinerarias*.

Messrs. J. Veitch & Sons, Chelsea, exhibited *Anemone aldboroughensis*.

Mr. F. Bullen, Hither Green, Lewisham, sent several varieties of Callas, including *Little Gem* and a beautiful yellow variety.

Mr. W. Talley, 16 Brenda Road, Upper Tooting, exhibited specimens of flower-pots.

FLORAL COMMITTEE, MAY 9, 1893.

W. MARSHALL, Esq., in the Chair, and twenty-five members present.

Awards Recommended:—

Silver Gilt Flora Medal.

To Messrs. W. Paul & Son, Waltham Cross, for a fine group of Roses in pots, noteworthy being *Clio*, *Spenser*, *Danmark*, and *Crimson Queen*. Also cut Roses, in which were fine examples of *Prince Camille de Rohan* (a very dark crimson),

Belle Lyonnaise, White Lady, Alfred Colomb, and Garden Favourite.

To Messrs. J. Veitch & Sons, Chelsea, for an exceedingly handsome display of hardy flowering shrubs, &c., noteworthy being *Spiræa Thunbergi*, *Rhododendron Rosalie Seidel* (a very free-flowering variety), standard *Cytisus scoparius grandiflorus*, *Pæonia Elizabeth*, Azaleas, Japanese Maples in variety, *Prunus Pissardii* with rich red foliage, Liliiums, &c.

Silver Flora Medal.

To Messrs. Barr & Son, Covent Garden, for an extensive group of hardy herbaceous and bulbous plants, among them being *Anemone palmata alba*, *Hemerocallis Middendorfi*, *Gladiolus Colvillei albus*, *Heuchera sanguinea*, *Pæonies*, *Narcissi*, *Pyrethrums*, *Centaureas*, &c.

To Messrs. Barr & Son, Covent Garden, for a large collection of English Florists' Tulips, conspicuous being Lord Derby, Annie McGregor, Sir Joseph Paxton, Adonis, and Lady Sefton.

To Messrs. Cutbush & Son, Highgate, for an extensive group of plants, amongst which were some well-flowered plants of *Leschenaultia biloba major*, *Erica Cavendishiana*; also good specimens of *Dracæna Doucetti*, Palms, *Abutilon Souvenir de Bonn*, and *Eurya japonica variegata*.

Silver Banksian Medal.

To J. C. Tasker, Esq., Middleton Hall, Brentwood (gr. Mr. Perry), for a beautiful group of Cannas, arranged with *Spiræa japonica* and *Adiantum cuneatum*.

To Messrs. E. D. Shuttleworth & Co., Peckham Rye, for a group of plants, including *Lælia purpurata*, *Cypripedium barbatum*, *Aralia elegantissima*, *Caladium argyrites*, *Rhapis humilis*, *Dracænas*, Liliiums, &c.

To Messrs. Paul & Son, Cheshunt, for a very fine display of cut flowers of Azaleas and *Rhododendrons*.

Bronze Banksian Medal.

To Messrs. E. D. Shuttleworth & Co., Fleet, for a collection of Alpines and hardy plants. The most prominent were *Dodecatheon splendidum*, *Polemonium humile*, *Pyrethrum Princess of Wales* (single), and *P. Mrs. Barrell* (double).

To Mr. F. Cant, Colchester, for cut Roses, noticeable being *Madame de Watteville*, *Waban*, *Ernest Metz*, and *Cleopatra*.

To Mr. G. Mount, Canterbury, for cut Roses, in which were good examples of Catherine Mermet, La France, Maréchal Niel, Jean Ducher, and Ulrich Brunner.

First Class Certificate.

To *Ulmus Wreedi aurea* (votes, unanimous), from the Duke of Northumberland, Albury Park (gr. Mr. W. C. Leach). This Elm is a free grower, keeping its colour and being of a brighter hue than the Golden Alder.

To *Calochortus* (*Cyclobothra*) *amœnus* (votes, 12 for), from H. J. Elwes, Esq., Colesborne, Andoversford, R.S.O. A very free-flowering plant, with flowers of a rich pink colour, and having numerous hairs on the inner side of the petals.

To *Rhododendron Hélène Schiffner* (votes, unanimous), from Mr. T. J. Seidel, Steisen bei Dresden. Flowers pure white, borne in dense trusses.

To *Tillandsia* (*Vriesia*) *leodiensis* (votes, 8 for, 2 against), from Messrs. J. Veitch & Sons, Chelsea. A fine Bromeliad with dull green leaves; flowers brilliant crimson and gold, carried on a long spike.

To *Magnolia hypoleuca* (*M. Watsoni*) (votes 13 for), from Messrs. J. Veitch & Sons, Chelsea. Flowers white, sweetly scented.

To *Viburnum plicatum*, type (votes, unanimous), from Messrs. J. Veitch & Sons, Chelsea. Foliage dark green; flowers produced in clusters, very pretty.

To *Bilbergia sanguinea* (votes, 5 for, 3 against), from Messrs. Charlesworth, Shuttleworth & Co., Heaton, Bradford.

To *Dracæna Sanderiana* (votes, unanimous), from Messrs. F. Sander & Co., St. Albans, and Mons. Lucien Linden, L'Horticulture Internationale, Brussels (who exhibited it as *Dracæna thalioides foliis variegatis*.) Leaves about seven inches long, light green in centre, with a silver bordering (fig. 22).

Award of Merit.

To *Begonia* R. B. Parsons (votes, 17 for, 1 against), from Messrs. H. Cannell & Sons, Swanley. Flowers double; colour salmon-pink.

To *Begonia Hector* (votes, unanimous), from Messrs. H. Cannell & Sons, Swanley. A fine double variety; flowers deep blood-red.



FIG. 22.—DRACÆNA SANDERIANA. (Reduced.) (*Journal of Horticulture.*)

To Canna Sophie Buchner (votes, 14 for), from Messrs. Paul & Son, Cheshunt. Flowers large, bright crimson.

To Phyllocactus Plato (votes, 13 for), from Messrs. J. Veitch & Sons, Chelsea. Flowers crimson.

Cultural Commendation.

To F. W. Moore, Esq., Botanic Garden, Glasnevin, for *Pæonia Emodi*. Flowers single, white.

To Messrs. F. Sander & Co., St. Albans, for a group of *Dracæna Sanderiana*.

Other Exhibits.

Lord Foley, Ruxley Lodge, Esher (gr. Mr. J. Miller), sent *Hippeastrum solandræflorum*. Flower white, with a long tube, on a scape about three feet high.

Dr. Kirby, Kelsey Park, Beckenham (gr. Mr. Mark Webster), exhibited a small group of *Myosotis* in pots.

The Hon. E. H. Ellis, Rosenau, Datchet, Bucks, sent two plants of *Kæmpferia rotunda*.

E. J. Lowe, Esq., F.R.S., Shirenewton Hall, Chepstow, exhibited *Centaurea montana* "Monstrosity" (being a cross (?) between *C. montana* and *C. rosea*); also *Aquilegia* "Royal Marriage," a cross (?) between *Clematis montana* and *Aquilegia glandulosa* var., which was referred to the Scientific Committee. (See page 29.)

W. Marshall, Esq., Auchinraith, Bexley, exhibited *Selaginella cæsia*, struck from a plant that stood out of doors during the winter without protection.

Mr. C. J. Van Tubergen, Zwanenburg, Haarlem, sent six varieties of *Fritillarias*.

F. W. Moore, Esq., Botanic Gardens, Glasnevin, sent *Crinum latifolium* which had been grown in the open air without protection, planted against the wall of a stove.

Mr. Smythe, The Gardens, Basing Park, Alton, sent cut blooms of Tree Carnation Annie Smythe and Florence Smythe.

Mr. C. Turner, Slough, exhibited the new *Polyantha* Rose Turner's Crimson Rambler. Flowers borne freely in dense clusters; colour bright red.

Mr. T. S. Ware, Tottenham, exhibited Border Carnation Pride of Great Britain. Flowers large; colour pale yellow.

Messrs. H. Cannell & Son, Swanley, exhibited two single-

flowered Begonias, Mrs. John Thorp and Fantastic; also a small box of cut single blooms.

Mr. A. Pollard, Fisherton, Salisbury, exhibited two seedling Zonal Pelargoniums.

Messrs. Paul & Son, Cheshunt, exhibited a hybrid sweet-scented Rhododendron, High Beech Hybrid—a cross between R. Fortunei and R. Mrs. C. Butler. The Committee asked to see the plant.

Mr. A. Gilbert, 1 Albert Terrace, Bishop's Waltham, sent a hybrid Pelargonium, Beauty of Waltham—a cross from Zonal Pelargonium "Improved Queen of Whites" and a Decorative Pelargonium; also Aquilegia Perle Blanche, a good white variety.

FLORAL COMMITTEE, MAY 25, 1893, IN THE
TEMPLE GARDENS.

W. MARSHALL, Esq., in the Chair, and nineteen members present.

Awards Recommended :—

First Class Certificate.

To *Primula Reidii* (votes, 13 for), from G. F. Wilson, Esq., Weybridge Heath. A rare, dwarf Himalayan species. Flowers borne on a spike about 6 inches high; bell-shaped, pure white (fig. 23).

To *Asplenium marginatum* (votes, unanimous), from Mr. H. B. May, Upper Edmonton. Strong-growing variety, with large light green fronds.

To *Alocasia Sanderiana nobilis* (votes, unanimous), from Messrs. F. Sander & Co., St. Albans. Leaves handsome, of a rich dark green colour; veins very prominent.

To *Anthurium crystallinum foliis variegatis* (votes, 9 for), from Messrs. Pitcher & Manda, Hextable, Swanley. Leaves large, one half being creamy white, the other dark bronzy green with white markings.

Award of Merit.

To *Anthurium Parisiente* (votes, 7 for), from Sir Trevor Lawrence, Bart., Dorking (gr. Mr. Bain). Spathes of a soft pink colour.

To Carnation Mrs. Seymour Bouverie (votes, unanimous),

from Martin R. Smith, Esq., Hayes (gr. Mr. C. Blick). Flowers large, light orange, pink towards the edges.

To Carnation The Churchwarden (votes, 10 for), from M. R. Smith, Esq., Hayes. Flowers large; colour scarlet.

To Hemerocallis Apricot (votes, unanimous), from G. Yeld, Esq., Clifton Cottage, York. Flowers of a rich orange-yellow; very large.

To Gloxinia Netted Queen (votes, unanimous), from Messrs. Sutton & Sons, Reading. Flowers pink, netted with white.



FIG. 23.—PRIMULA REIDII. (*Journal of Horticulture*.)

To Asplenium (Athyrum) f. f. setigerum grandiceps (votes, 8 for, 1 against), from Messrs. W. & J. Birkenhead, Sale, Manchester. Fronds crested, of a light green colour.

To Davallia fijiensis elegans (votes, 7 for), from Messrs. W. & J. Birkenhead. A plant with graceful habit.

To Nothochlæna mollis (votes, 10 for), from Messrs. W. & J. Birkenhead. Plants of dwarf habit; fronds bright green.

To Rhododendron Ariel (votes, unanimous), from Messrs. J. Veitch & Sons, Chelsea. Flowers of a clear yellow colour, borne in terminal trusses. Indo-Javanicum type.

To *Polyanthus* Queen Victoria (votes, 5 for, 3 against), from Messrs. J. Cocker & Sons, Aberdeen. Flowers semi-double, red, gold laced.

To *Vallota purpurea delicata* (votes, unanimous), from Messrs. R. Veitch & Son, Exeter. Flowers soft salmon-pink.

To *Dracæna* Lord Wolseley (votes, 9 for), from Messrs. B. S. Williams & Son, Upper Holloway. Leaves about 18 inches long, green in centre, with red border.

To *Hippeastrum* Lord Roberts (votes, 6 for, 2 against), from Messrs. B. S. Williams & Son. Flowers funnel-shaped, white, netted with rich rose.

To Sweet Brier Amy Robsart (votes, 11 for), from Messrs. Keynes, Williams & Co., Salisbury. Flowers rich rosy pink.

To single Rose Carmine Pillar (votes, 13 for), from Messrs. Paul & Son, Cheshunt. Flowers large; colour crimson.

To *Delphinium* John Thorpe (votes, unanimous), from Messrs. Kelway & Son, Langport. Flowers rich blue with white centres.

To *Begonia* Lord Llangattock (votes, 12 for), from Messrs. H. Cannell & Sons, Swanley. Flowers large, of a rich scarlet colour.

To *Begonia* Bexley Gem (votes, 8 for), from Mr. T. S. Ware (Francis Fell), Tottenham. Flowers bright pink.

To *Begonia elegans* (votes, 9 for), from Mr. T. S. Ware (Francis Fell). Flowers fringed; colour soft pink.

To *Begonia* Lady Brooke (votes, 10 for), from Messrs. J. Laing & Sons, Forest Hill. Flowers double; colour deep pink.

To *Begonia* Baron Schröder (votes, 8 for), from Messrs. J. Laing & Sons. Flowers large, of a deep orange-red colour.

To *Begonia* Mrs. Regnart (votes, 11 for), from Messrs. J. Laing & Sons. Flowers deep rich yellow.

To *Begonia* Lord Brooke (votes, 7 for, 6 against), from Messrs. J. Laing & Sons. Flowers crimson.

To *Caladium* Ibis Rouge (votes, 8 for), from Messrs. J. Laing & Sons. Leaves sagittate, light ground with red veins.

To *Caladium* Mrs. Harry Veitch (votes, 14 for), from Messrs. J. Laing & Sons. Leaves very large, reddish coloured, with bright red veins.

To *Codiaeum* (Croton) Thomsoni (votes, 13 for), from Messrs. J. Laing & Sons. Leaves richly coloured yellow and green.

To *Cineraria maritima aurea variegata* (votes, unanimous), from Mr. H. B. May, Edmonton, and Messrs. F. Sander & Co., St. Albans. Leaves much divided, green in centre, with a yellow margin.

Cultural Commendation.

To Messrs. W. Balchin & Sons, Brighton, for *Leschenaultia biloba major* and *Pyrethrum Jubilee*.

Special Awards made by the Council.

Silver Cup.

To Philip Crowley, Esq., Waddon House, Croydon, for a group of foliage plants.

To J. Warren, Esq., Handcross Park, Crawley, for a group of foliage plants.

To Messrs. J. Laing & Sons for *Caladiums* and *Begonias*.

To Messrs. H. Cannell & Sons for *Begonias*, &c.

To Messrs. W. & J. Birkenhead for a group of *Ferns*.

To Messrs. J. Backhouse & Son for a group of *Alpine plants*.

To Messrs. Barr & Son for a group of *hardy flowers*, *Tulips*, &c.

To Messrs. J. Veitch & Sons for *hardy shrubs*, *Gloxinias*, and *Streptocarpuses*.

To Messrs. G. Paul & Son, Cheshunt, for a group of *Roses*.

To Messrs. Pitcher & Manda for *Orchids* and *miscellaneous plants*.

To Mr. H. B. May for a group of *Ferns*.

Silver Gilt Flora Medal.

To Lord Penzance, Godalming, for a collection of *Sweet Briers* and *cut Roses*.

To Messrs. J. Laing & Sons, Forest Hill, for a group of *plants* and *hardy flowers*.

To Messrs. Harkness & Son, Bedale, for a group of *hardy cut flowers*.

To Messrs. Paul & Son, Cheshunt, for a group of *hardy plants* and *cut flowers*.

To Mr. Prichard, Christchurch, for a group of *hardy cut flowers*.

To Mr. T. S. Ware (Francis Fell), Tottenham, for a group of *hardy plants*, *Begonias*, &c.

To Messrs. Kelway & Son, Langport, for a group of Pæonies Pyrethrums, &c.

To Messrs. Dobbie & Co., Rothesay, for a group of Violas and Pansies.

To Messrs. Sutton & Sons, Reading, for a group of Gloxinias.

To Messrs. Carter & Co., High Holborn, for a group of Gloxinias, Calceolarias, Mimulus, &c.

To Messrs. Hugh Low & Co., Clapton, for a group of Ericas, &c.

To Mr. C. Turner, Slough, for a group of Carnations and new Roses.

To Messrs. J. Peed & Sons, Norwood Road, for a group of Gloxinias and miscellaneous plants.

To Messrs. E. D. Shuttleworth & Co., Peckham Rye, for a group of foliage and hardy plants.

To Mr. W. Rumsey, Joynings Nurseries, Waltham Cross, for a group of Roses.

To Messrs. B. S. Williams & Son, Holloway, for a group of Orchids and greenhouse plants.

To Messrs. Cutbush & Sons, Highgate, for a group of plants and cut flowers.

To Messrs. Perkins & Sons, Coventry, for bouquets, cut flowers, &c.

To the Guildford Hardy Plant Nursery, Guildford, for a group of Alpines, &c.

Silver Flora Medal.

To G. A. Farini, Esq., Perry Vale, Forest Hill, for a group of Begonias.

To Mr. F. Cant, Colchester, for a group of cut Roses.

To Mr. H. J. Jones, Lewisham, for a group of Pelargoniums.

To Messrs. E. D. Shuttleworth & Co., Fleet, for a collection of hardy cut flowers, &c.

To Mr. C. G. Van Tubergen, Haarlem, for cut blooms of Irises, Calochortus, &c.

To Mr. G. Mount, Canterbury, for a group of cut Roses.

To Messrs. Cooling & Sons, Bath, for a group of old-fashioned Garden Roses.

To Messrs. Cutbush & Son, Highgate, for a group of hardy flowers.

Silver Gilt Banksian Medal.

To Mrs. Thewles, New Street Station, Birmingham, for bouquets, &c.

To Mr. T. S. Ware (Francis Fell), Tottenham, for a group of Begonias.

To Mr. John Walker, Thame, Oxon, for a group of Pelargoniums.

Silver Banksian Medal.

To J. C. Tasker, Esq., Brentwood (gr. Mr. Perry), for a group of Cannas and Roses.

To J. W. Bentley, Esq., Castleton, Manchester, for a collection of English Tulips.

To Messrs. Keynes, Williams & Co., Salisbury, for a group of Roses.

To Messrs. Reid & Bornemann, Sydenham, for a group of plants.

To Messrs. Collins Bros. & Gabriel, 39 Waterloo Road, S.E., for a group of Irises.

To Messrs. J. Cheal & Sons, Crawley, for a collection of hardy flowers.

To Messrs. J. Cocker & Sons, Aberdeen, for a group of Violas, &c.

To Mr. J. R. Chard, Brunswick Nursery, Stoke Newington, for table decorations.

Other Exhibits.

Mr. J. Gifford, Montague Nurseries, Tottenham, exhibited a group of *Pæonia albiflora*.

Mr. A. Smith, Downley, High Wycombe, exhibited a group of Pansies and Violas; also cut Roses and Pinks.

FLORAL COMMITTEE, AT CHISWICK, JUNE 1, 1893.

W. MARSHALL, Esq., in the Chair, and fourteen members present.

Awards Recommended:—

Highly Commended (× × ×).

To *Iris aphylla* Madame Chéreau (votes, unanimous) from

Messrs. Barr & Son, Covent Garden. Standards and falls large, white, blue edges.

To *I. aphylla* Bridesmaid (votes, 8 for, 4 against), from Messrs. Barr & Son. Standards white and lilac; falls white, purple veins.

To *I. amœna* Comte de St. Clair (votes, unanimous), from Messrs. Barr & Son. Standards white; falls purple and white; stigma white.

To *I. amœna reticulata alba* (votes, unanimous), from Messrs. Barr & Son. Standards white; falls white, striped violet.

To *I. neglecta* Cordelia (votes, unanimous), from Messrs. Barr & Son. Standards deep mauve; falls broad, deep purple.

To *I. neglecta* Wagner (votes, unanimous), from Messrs. Barr & Son. Standards pale mauve; falls long and broad, colour violet.

To *I. pallida* Walmer (votes, unanimous), from Messrs. Barr & Son. Standards large, lavender; falls purple-lilac.

To *I. p.* Khedive (votes, 10 for), from Messrs. Barr & Son. Standards and falls satiny mauve.

To *I. p.* Madame Pacquette (votes, 9 for, 1 against), from Messrs. Barr & Son. Standards violet; falls broad, colour deep purple.

To *I. squalens* Jacquiniana (votes, unanimous), from Messrs. Barr & Son. Standards pale bronzy crimson, spotted yellow at base; falls handsome, broad towards apex, rich deep purple.

To *I. sq.* Arnoli (votes, unanimous), from Messrs. Barr & Son. Standards bronzy purple; falls very handsome, rich purple.

To *I. sq.* Harrison Weir (votes, 6 for, 4 against), from Messrs. Barr & Son. Standards bronzy yellow; falls purple.

To *I. sq.* Mons. Chérion (votes, unanimous), from Messrs. Barr & Son. Standards gold and bronze; falls rich blood-red, beautifully veined.

To *I. variegata* Beaconsfield (votes, unanimous), from Messrs. Barr & Son. Standards primrose; falls rich purple.

To *I. var.* Chenedole (votes, unanimous), from Messrs. Barr & Son. Standards deep yellow; falls broad, purple.

To *I. var.* Hector (votes, unanimous), from Messrs. Barr & Son. Standards sulphur-yellow; falls amaranth and yellow.

To *I. var.* Honourable (votes, unanimous), from Messrs. Barr & Son. Standards deep yellow; falls yellow, shaded red.

To I. var. major (votes, unanimous), from Messrs. Barr & Son. Standards yellow ; falls brownish red.

To I. var. minor (votes, unanimous), from Messrs. Barr & Son. Standards clear yellow ; falls violet, margined primrose.

To I. var. John Fraser (votes, unanimous), from Messrs. Barr & Son. Standards broad, rich yellow ; falls purple, shaded with sulphur-yellow.

To I. var. Prince of Orange (votes, unanimous), from Messrs. Barr & Son. Standards bronzy yellow ; falls broad, brown suffused with yellow.

To I. flavescens (votes, unanimous), from Messrs. Barr & Son. Standards sulphur yellow ; falls creamy white.

To *Pæonia* Louis Parmentier (votes, 10 for, 1 against), from Messrs. Dicksons, Chester. Flowers beautiful pale rose.

To *P. tricolor grandiflora* (votes, unanimous), from Messrs. Dicksons. Flowers large, white, shaded rosy pink.

To *P. Comtesse de Bresson* (votes, unanimous), from M. C. Verdier, Rue Barbet, à Ivry, Paris. Flowers large, double, light pink towards centre, and deep-coloured guard petals.

To *P. carnea triumphans* (votes, unanimous), from M. C. Verdier. Flowers large, creamy white, pink guard petals.

To *P. Reine des Fleurs* (votes, unanimous), from M. C. Verdier. Rich rose.

To *P. Triomphe de Paris* (votes, unanimous), from M. C. Verdier. Flowers white, with primrose centre.

To *Pink Her Majesty* (votes, unanimous), from Mr. C. Turner, Slough, and Mr. Hooper, Bath. Large full flowers, pure white.

To *Pink Modesty* (votes, unanimous), from Mr. Turner. Flowers white, edged rosy pink.

Commended (× ×).

To *Iris neglecta* Virginie (votes, 7 for), from Messrs. Barr & Son. Standards pale mauve, red veins ; falls narrow, purple.

To *I. squalens* Herodotus (votes, unanimous), from Messrs. Barr & Son. Standards bronzy yellow ; falls purple, striped.

To *I. La Prestieuse* (votes, 8 for, 1 against), from Messrs. Barr & Son. Standards bronzy yellow ; falls long, dark purple.

To *I. squalens* Lady Seymour (votes, unanimous), from Messrs. Barr & Son. Standards pale mauve ; falls light purple. Dwarf habit.

To I. sq. Bronze Beauty (votes, unanimous), from Messrs. Barr & Son. Standards sulphur-yellow; falls soft yellow, shaded purple.

To I. variegata Apollon (votes, unanimous), from Messrs. Barr & Son. Standards sulphur-yellow; falls soft purple, beautifully marked.

To I. var. Favourite (votes, unanimous), from Messrs. Barr & Son. Standards clear yellow; falls light violet.

To Pæonia albiflora Marie Louise (votes, unanimous), from M. C. Verdier. Flowers large, very fine; colour clear rose.

To P. a. General Bedeau (votes, 6 for), from Messrs. Barr & Son. Flowers soft rose, shaded lilac.

To P. a. Josephine Parmentier (votes, 6 for), from Messrs. Barr & Son. Flowers pale peach, large guard petals.

To P. a. L'Elégante (votes, unanimous), from Messrs. Barr & Son. Flowers large, bright rose, centre petals deep rose and white.

To P. a. Maréchal MacMahon (votes, unanimous) from Messrs. Barr & Son. Flowers large and double, rosy crimson.

FLORAL COMMITTEE, JUNE 6, 1893.

W. MARSHALL, Esq., in the Chair, and eighteen members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Paul & Son, Cheshunt, for a group of herbaceous cut flowers and cut Roses.

Silver Banksian Medal.

To J. C. Tasker, Brentwood (gr. Mr. Perry), for cut Cannas, in which were good examples of Paul Bert, Progression, and W. Pfitzer. Also cut Roses, noteworthy being Caroline Kuster, Dr. Andry, W. A. Richardson, and Francisca Kruger.

To Mr. Geo. Prince, Oxford, for cut Roses, in which were some fine examples of (Tea) Princess of Wales, Ducher, Cleopatra, Grace Darling, Cornelia Koch, and Clara Watson. The Committee wished to see the last-named again.

To Messrs. Barr & Son, Covent Garden, for a rich display

of herbaceous cut flowers, which included some fine examples of Spanish Irises, Delphinium Princess Maud, Pæonies, &c.

To Mr. A. Waterer, Knap Hill, Woking, for hardy seedling Rhododendrons and Azaleas.

Bronze Banksian Medal.

To Messrs. E. D. Shuttleworth & Co., Fleet, Hants, for a group of herbaceous plants and cut flowers, noticeable being Gillenia trifoliata, Silene alpestris, Pink Modesty, and hardy Viola Admiration.

To Messrs. J. Cheal & Sons, Crawley, for cut Violas and herbaceous flowers.

First Class Certificate.

To Abies orientalis aurea (votes, 10 for), from Messrs. J. Veitch & Sons, Chelsea. A handsome Spruce, the young shoots of a rich golden yellow.

To Iris Lorteti (votes, unanimous), from Mr. C. G. Van Tubergen, Zwanenburg, Haarlem. A beautiful Iris belonging to the Susiana group. Falls mauve speckled brownish red; standards large, mauve ground with purple veins (fig. 24).

Award of Merit.

To hybrid Sweet Brier Matilda Marchmont (votes, unanimous), from Lord Penzance, Godalming. Flowers soft pink.

To hybrid Sweet Brier Minna (votes, unanimous), from Lord Penzance. Flowers medium size, rosy pink.

To Carnation Sir Charles Fremantle (votes, unanimous), from Martin R. Smith, Esq., Hayes (gr. Mr. C. Blick). This belongs to the Malmaison section. Flowers very large; colour carmine.

To Richardia aurata (Deleuil) (votes, 13 for), from Mons. J. B. Deleuil, Sainte-Anne, Marseilles. The spathes are of medium size; colour sulphur-yellow.

To Carnation Annie Sanders (votes, 11 for, 2 against), from Mr. G. Fry, Lewisham. Flowers medium size, bright rosy pink.

To Gladiolus delicatissima superbissima (votes, 12 for), from Messrs. Hubert & Mauger, Doyle Road, Guernsey. The upper petals are pure white, the lower petals have a blotch of pink in the centre.

To Pink Empress of India (votes, unanimous), from Mr. C. Turner, Slough. Flowers deep red, very full.

To Paeony Mons. Boucharlet (votes, unanimous), from Messrs. Paul & Son, Cheshunt. Flowers double, soft rose.



FIG. 24.—IRIS LORTETI. (*Journal of Horticulture.*)

To Pæony Marie Lemoine (votes, 12 for), from Messrs. Paul & Son. Flowers white, shaded rose.

To Pæony Jeanne d'Arc (votes, unanimous), from Messrs. Paul & Son. Flowers double, pink guard petals, rose-pink towards centre.

To Begonia gigantea (votes, 10 for), from Messrs. J. Laing & Sons, Forest Hill. Flowers about five inches across; colour salmon.

To Begonia Ernest Cook (votes, 10 for), from Messrs. J. Laing & Sons. Flowers medium size, colour rich crimson.

To Begonia Richard Dean (votes, 10 for), from Messrs. J. Laing & Sons. Flowers very distinct, of a beautiful orange-scarlet colour.

To strain of Pinks (votes, unanimous), from Mr. R. Dean, Ealing. Flowers of several shades of white and purple.

Commended.

Strain of Sweet William, Dobbie's Auricula-eyed (votes, unanimous), from Messrs. Dobbie & Co., Rothesay, N.B.

Other Exhibits.

De B. Crawshay, Esq., Rosefield, Sevenoaks, sent cut blooms of *Iris germanica* Lionel.

Lord Penzance, Godalming (gr. Mr. Baskett), exhibited a collection of hybrid Sweet Briars and old Garden Roses.

Messrs. de Rothschild, Acton (gr. Mr. J. Hudson), exhibited cut *Ixora* s Prince of Orange and Westii.

Rev. G. H. Engleheart exhibited white Pink Little Pearl, a seedling from Mrs. Sinkins. The Committee requested that it should be tried in the Society's Gardens.

W. Marshall, Esq., Bexley, exhibited *Salvia hians* (*B.M.* t. 6517). The Committee wished to see it in better condition.

Rev. W. Wilks, Shirley Vicarage, Croydon, exhibited a supposed hybrid Poppy named Rupert, its reputed parents being *P. orientale* and *P. rupifragum*.

G. F. Wilson, Esq., Heatherbank, Weybridge Heath, sent cut blooms of several *Calochortus*, which had been cut from plants in the open air.

Mr. C. T. Druery, Forest Gate, sent *Asplenium* (*Athyrium*) f. f. *congesto-cristatum*.

Mr. W. Salmon, Elder House, West Norwood, exhibited a group of Pyrethrums.

Mr. A. McMillan, Trinity Cottage, Edinburgh, sent a group of early Chrysanthemums.

Mr. Smythe, The Gardens, Basing Park, Alton, sent cut blooms of *Lilium japonicum rubrum*.

Mr. C. G. Van Tubergen, Haarlem, exhibited a new Mongolian variety of *Iris hispanica*. A beautiful and distinct flower of a deep golden yellow.

Mr. G. Fry, Lewisham, sent cut flowers of Carnations Princess May and Countess of Aberdeen.

Mr. T. Laxton, Bedford, sent cut flowers of a pink var. of Lord Anson's Pea (*Lathyrus magellanica*).

Mr. C. Turner, Slough, exhibited a box of laced Pinks.

Messrs. J. Veitch & Sons, Chelsea, sent a pan of *Cleome pungens*.

Messrs. E. D. Shuttleworth & Co., Peckham Rye, exhibited a group of plants consisting of Ferns, *Dracæna Lindenii*, Azaleas, *Hydrangea paniculata*, *Sonerila Baron Salier*, &c.

Messrs. W. Balchin & Sons, Hove, Brighton, sent cut flowers of *Pyrethrum Jubilee*.

Messrs. W. Paul & Son, Waltham Cross, exhibited blooms of cut Roses.

Messrs. J. Laing & Sons, Forest Hill, sent a group of Begonias and Ferns.

Prize.

Class 1.—Twelve Hardy Rhododendrons, three trusses of each, distinct. Amateurs. *First Prize*, Silver Flora Medal and £1, to His Grace the Duke of Northumberland, Syon House, Brentford (gr. Mr. Wythes).

FLORAL COMMITTEE, JUNE 20, 1893.

W. MARSHALL, Esq., in the Chair, and twenty-three members present.

Awards Recommended:—

Silver Flora Medal.

To Mr. C. Turner, Slough, for an excellent group of Carnation *Souvenir de la Malmaison*, pink and blush coloured varieties;

also C. Germania, and branches several feet in length of the new Rose, Turner's Crimson Rambler, laden with flowers.

Silver Banksian Medal.

To Messrs. Paul & Son, Cheshunt, for a fine group of cut Roses—Her Majesty, Madame Pernet Ducher; and a new variety, Charles Gater.

To Messrs. W. Paul & Son, Waltham Cross, for cut blooms of Roses Clio and Spenser.

To Messrs. E. D. Shuttleworth & Co., Peckham Rye, for a group of flowering and foliage plants, in which were some very well grown Liliiums, Hydrangeas, Crotons, and Palms.

To Messrs. E. D. Shuttleworth & Co., Fleet, Hants, for a group of herbaceous flowers, cut Roses, &c.

To Messrs. Barr & Son, Covent Garden, for a group of hardy flowers, consisting chiefly of varieties of Delphiniums, with Alstrœmerias, Scabiosa lutea, Hemerocallis Thunbergi, and Irises.

Bronze Banksian Medal.

To C. J. Grahame, Esq., Croydon, for cut Roses, in which were good examples of Ethel Brownlow, Madame Hoste, Baroness Rothschild, Edith Gifford, and Marie Baumann.

First Class Certificate.

To Crinum Powelli album (votes, 16 for), from F. W. Moore, Esq., Botanic Gardens, Glasnevin. Flowers pure white, bell-shaped, and borne in trusses.

Award of Merit.

To Border Carnation Hayes Scarlet (votes, unanimous), from Martin R. Smith, Esq., Hayes (gr. Mr. C. Blick). A large-flowered variety; colour orange-scarlet.

To Border Carnation King Arthur (votes, 10 for), from Martin R. Smith, Esq., Hayes. Flowers three inches across, very handsome; colour deep red.

To Climbing Rose Allister Stella Gray (votes, unanimous), from A. H. Gray, Esq., Newbridge, Bath. A beautiful seedling, in which the small orange-coloured flowers are produced in clusters.

To Calochortus venustus oculatus (votes, 10 for), from G. F. Wilson, Esq., Weybridge, and Mr. C. G. Van Tubergen, Haarlem. Flowers white, with blotches of brown and yellow at the base of each petal.

To *Calochortus venustus roseus* (votes, 10 for), from G. F. Wilson, Esq., and Mr. C. G. Van Tubergen. Flowers large, shaded rose, blotched red in the centre.

To *Calochortus venustus Vesta* (votes, 10 for), from Mr. C. G. Van Tubergen. A new variety. Flowers distinct, large, white suffused rose, blotched brown and gold at the base of the cup. It inhabits some of the high mountains of California and the adjacent States.

To *Rose Mrs. Harkness* (H.P.) (votes, unanimous), from Messrs. Harkness & Son, Bedale. Flowers large, beautiful soft pink.

To *Rose Merrie England* (votes, 11 for, 3 against), from Messrs. Harkness & Son. Flowers striped crimson and white.

To *Begonia John Fraser* (votes, unanimous), from Messrs. J. Laing & Sons, Forest Hill. A very handsome large-flowered double variety, the colour being deep crimson.

To *Begonia Countess of Craven* (votes, unanimous), from Messrs. J. Laing & Sons. Flowers large, white, greenish white towards centre.

To *Gloxinia Princess May* (votes, 6 for), from Messrs. J. Laing & Sons. Flowers white.

Botanical Certificate.

To *Heliophora nutans* (votes, 10 for), from Messrs. J. Veitch and Sons, Chelsea. Plant of dwarf habit. Pitchers like *Sarracenia*s, having long hairs on the inside. A native of British Guiana.

Other Exhibits.

E. Herbert Fison, Esq., Stoke House, Ipswich, exhibited from New Zealand six blocks of ice in which flowers and ferns were embedded. The form and colour of these were well preserved and very natural. They proved very interesting, and contained specimens of *Leptospermum scoparium*, *Callistemon speciosum*, *Statice latifolia*, *Hedycarya dentata*, *Clematis*, *Lomaria filiformis*, *Asplenium lucidum*, &c.

J. C. Tasker, Esq., Middleton Hall, Brentwood (gr. Mr. Perry), sent a group of cut Cannas and Roses.

G. A. Farini, Esq., Perry Vale, S.E., exhibited a group of Tuberous *Begonia*s, including well-flowered plants of *Avalanche*, *Gertrude*, *Anna*, &c.

A. H. Smee, Esq., The Grange, Wallington, Surrey (gr. Mr. C. W. Cummins), exhibited flowers of single and semi-double Delphiniums.

F. W. Moore, Esq., Botanic Gardens, Glasnevin, sent cut blooms of *Ismene longipetala*, *Lilium Martagon album*, *Alstroemeria Diazi*, and *Dicentra chrysantha*. The Committee desired to see the last-named again.

Mr. C. G. Van Tubergen, Haarlem, sent cut flowers of some new varieties of *Liliums* named Marhan G. F. Wilson, Marhan Frank Miles, and Marhan Max Leichtlin.

Lilium Marhan is a hybrid between *L. Martagon* ♀ and *L. Hansoni* ♂. The name "Marhan" is obtained by joining the first syllable of *Martagon* to the first syllable of *Hansoni*.

Messrs. F. Sander & Co., St. Albans, exhibited *Maranta Leonia*, and *Aristolochia gigas Sturtevantii* carrying a large flower.

Messrs. J. Laing & Sons, Forest Hill, sent a group of Tuberous Begonias with distinctly marked foliage, Gloxinias, and *Gerbera Jamesonii*.

Mr. G. Fry, Lewisham, exhibited cut blooms of several varieties of Carnations.

Mr. E. C. Goble, Monkton Street, Ryde, I. W., sent a group of seedling Carnations, *Madame de Falbe* and *Solent Queen* being very noticeable.

Messrs. J. Veitch & Sons, Chelsea, exhibited a group of rare hardy flowering shrubs, including *Zenobia (Andromeda) speciosa cassinæfolia*, bearing white flowers; *Notospartium Carmichæliæ*, its small pink flowers being carried on rush-like twigs; and *Escalonia Philippiana*, a neat small-leaved species bearing bell-shaped white flowers in abundance.

Messrs. H. Cannell & Sons, Swanley, exhibited Zonal Pelargonium *Madame Jules Chrétien*. Flowers red, pink eye.

Prize.

Class 5.—Six single and six double or semi-double Delphiniums, distinct, one spike of each. Amateurs. *First prize*, Kelway Silver Medal, to Joseph Brutton, Esq., Yeovil (gr. Mr A. Crossman).

FLORAL COMMITTEE, AT CHISWICK, JULY 4, 1893.

W. MARSHALL, Esq., in the Chair, and ten members present.

Awards Recommended :—

Highly Commended (× × ×).

To *Canna Quasimodo* (votes, unanimous), from M. V. Vilmorin, Paris. Flowers beautiful orange-scarlet, with golden edges; habit dwarf.

To *C. Alphonse Bouvier* (votes, unanimous), from M. V. Lemoine, Nancy, France. Flowers rich deep crimson.

To *C. Capucine* (votes, unanimous), from M. V. Lemoine. Flowers soft orange-scarlet.

To *C. Duchesse de Montmartre* (votes, 6 for, 5 against), from M. V. Lemoine. Flowers yellow, with brownish-red spots.

To *Viola Sylvia* (votes, 5 for), from Dr. Stuart, Hillside, Churnside, N.B. Beautiful cream-coloured flowers; habit dwarf.

To *V. George Muirhead* (votes, 4 for, 1 against), from Dr. Stuart. Flowers canary-yellow; compact habit.

To *V. The Mearns* (votes, 7 for), from Messrs. Dobbie & Co., Rothesay, N.B. Deep violet-purple, upper petals edged white.

To *V. Champion* (votes, 6 for), from Messrs. Dobbie & Co. Flowers medium size; colour sulphur-yellow.

To *V. Lord Elcho* (votes, unanimous), from Messrs. Dobbie & Co. Flowers deep yellow; foliage large, deep green.

To *V. Ardwell Gem* (votes, 7 for), from Messrs. Dobbie & Co. Flowers rich sulphur-yellow, deep yellow eye; free bloomer.

To *V. Victoria* (votes, unanimous), from Messrs. Dobbie & Co. Flowers white, yellow eye; foliage deep green.

To *V. Bridesmaid* (votes, 5 for), from Messrs. Dobbie & Co. Flowers soft primrose; very free, distinct.

To *V. Mrs. C. Turner* (votes, 6 for), from Messrs. Dobbie & Co. Flowers purple, distinct.

To *V. William Neil* (votes, 6 for, 1 against), from Messrs. Dobbie & Co. A beautiful pale rose-coloured variety.

ORCHID COMMITTEE.

JANUARY 17, 1893.

HARRY J. VEITCH, Esq., F.L.S., in the Chair, and ten members present.

Awards Recommended:—

Silver Banksian Medal.

To Messrs. B. S. Williams & Son, Upper Holloway, N., for a group in which *Cypripediums*, *Lælia anceps Stella*, *Cattleya Percivaliana*, *Miltonia Roezlii*, and *Odontoglossum* × *elegans* (a natural hybrid between *O. cirrhosum* and *O. Hallii*) were especially noticeable.

First Class Certificate.

To *Calanthe* × *gigas* (*C. vestita gigantea* ♀ × *C. Sanderiana gigantea* ♂) (votes, unanimous), from Messrs. Jas. Veitch & Sons, Chelsea. This was a strong plant, with a scape over 3 feet high, bearing fourteen expanded flowers. Sepals and petals cream-coloured; lip deep rose (fig. 25).

To *Cycnoches pentadactylon* (votes, unanimous), from W. W. Mann, Esq., Ravenswood, Bexley (gr. Mr. J. Simmon). This was a splendid specimen, bearing 250 swan-like flowers in gracefully drooping racemes.

To *Cypripedium* × *Penelaus* (*C. calurum* ♀ × *C. caudatum Lindeni* ♂) (votes, 7 for) from Messrs. J. Veitch & Sons. Two large purple-lipped flowers were borne on the scape.

Award of Merit.

To *Cypripedium* × *Phædra* (*C. Sedeni candidulum* ♀ × *C. Lindleyanum* ♂) (votes, 6 for), from Messrs. J. Veitch & Sons. Flowers cream and rose.

Botanical Certificate.

To *Bulbophyllum comosum* (votes, unanimous), from F. W. Moore, Esq., Botanic Gardens, Glasnevin. Flowers creamy white, fringed with short hairs.

To *Cynorchis grandiflora* (votes, unanimous), from Messrs. W. L. Lewis & Co., Chase Side, Southgate, N. A new Madagascar Orchid, with pale green sepals and petals blotched with red.

Lip soft purple-pink, divided into four lobes, and furnished with a spur 2 inches long.

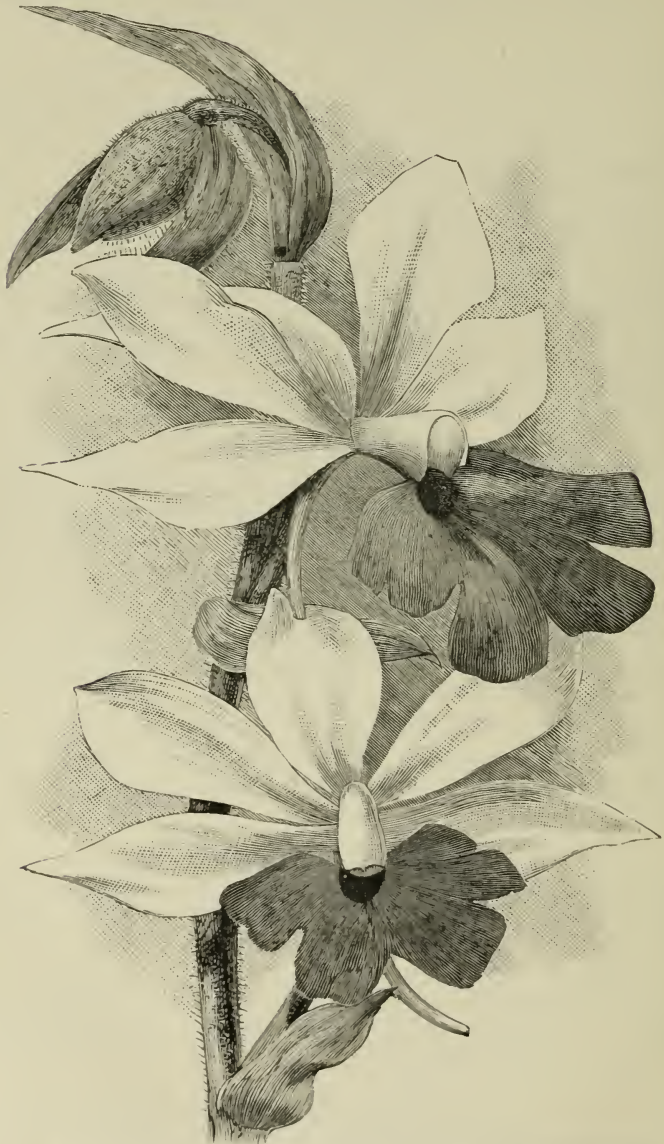


FIG. 25.—*CALANTHE GIGAS*. (From the *Journal of Horticulture*.)

Other Exhibits.

C. J. Ingram, Esq., Elstead, Godalming (gr. Mr. Bond), exhibited the pale rose *Cypripedium Lindleyanum superbum*.

Reginald Young, Esq., Linnet Lane, Liverpool, sent flowers of



FIG. 26.—*Zygo-colax Veitchii*. (From the *Journal of Horticulture*.)

Lælia anceps plumosa, the lips of which were feathered with purple.

Messrs. W. L. Lewis & Co., Southgate, exhibited spikes of the orange-red *Disa incarnata*.

Messrs. Hugh Low & Co., Clapton, E., exhibited a small group, the most effective feature in which were several plants of the pretty *Saccolabium bellinum*.

Messrs. Sander & Co., St. Albans, staged a group in which

the dusky purple-speckled *Pleurothallis ornatus*, a large brown and yellow flowered *Bulbophyllum* (*Sarcopodium*) *Godseffianum*, the orange *Masdevallia* × *Kimballiana* (*M. Veitchii* ♀ × *M. Shuttleworthii* ♂), and a few good *Cypripediums* were very noteworthy.

Messrs. J. Veitch & Sons exhibited several hybrid *Cypripediums*, such as *C.* × *Germinyanum*, *C.* × *Godseffianum*, *C.* × *Creon*, *C.* × *Lathamianum*, *C.* × *Æson* (*C.* × *Orion*), and a plant of *Zygo-colax* × *Veitchii* (*Z. crinitum* ♀ × *C. jugosus* ♂) (fig. 26).

ORCHID COMMITTEE, FEBRUARY 14, 1893.

Dr. MAXWELL T. MASTERS, F.R.S., in the Chair, and sixteen members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. B. S. Williams & Son, Upper Holloway, N., for an extensive group, containing good specimens of thirty-five species and varieties of *Cypripediums*, *Cattleya Trianæ* alba and other *Cattleyas* and *Lælias*, *Odontoglossums*, *Ada aurantiaca*, &c.

To Messrs. F. Sander & Co., St. Albans, for a smaller group of new or rare Orchids, in which were *Dendrobium* × *Owenianum* (*D. Linawianum* majus ♀ × *D. Wardianum* ♂), *D.* × *Sanderæ* (*D. nobile* albiflorum ♀ × *D. heterocarpum* ♂), like a pale *D. Ainsworthii*; *D. nobile* Ballianum, with pale pink flowers; *Lælio-Cattleya* × *Maynardii* (*L. pumila* Dayana ♀ *C. Walkeriana dolosa* ♂); several white *Lycaste Skinneri*; some fine-coloured varieties of the same species, &c.; and a strong plant of the Mexican *Arpophyllum spicatum*, with a dense spike of rosy-purple flowers (*Bot. Mag.* t. 6022).

To Messrs. Hugh Low & Co., Clapton, for a group of *Phalæopsis*, *Saccolabium bellinum*, and other Orchids.

Silver Banksian Medal.

To G. R. Le Doux, Esq., Langton House, East Molesey, for a group of *Cattleya labiata* *Trianæ*, *Odontoglossums*, &c.

To Messrs. Pitcher & Manda, Hextable, Swanley, Kent, for a group consisting chiefly of a large number of species and

varieties of *Cypripediums*, with some *Cattleyas* and *Odontoglossums*.

Bronze Banksian Medal.

To Mr. James Crispin, Fishponds, Bristol, for a stand of twenty-four varieties of cut flowers of *Cypripediums*, &c.

First Class Certificate.

To *Dendrobium* × *Owenianum* (*D. Liwanianum majus* ♀ × *D. Wardianum* ♂) (votes, 14 for, 1 against), raised by Norman C. Cookson, Esq., and exhibited by Messrs. F. Sander & Co., St. Albans. It resembles a fine form of *D. × chlorosteale*. Flowers nearly 4 inches across; sepals and petals white, tipped with purplish rose, lip having a reddish-brown blotch on a yellow disc, the front portion white with a purplish-rose tip.

To *Phaius* × *amabilis* (*P. grandifolius* ♀ × *P. tuberosus* ♂) (votes, unanimous), from Messrs. Jas. Veitch & Sons, King's Road, Chelsea. The plant has the dwarf habit of *P. tuberosus*, and the flowers have much the same form as those of that species; sepals and petals white, tinged with rose; lip large and finely crimped, claret colour with darker lines on a whitish ground at the base, the external part of the base of the labellum being yellow (fig. 27).

To *Cymbidium grandiflorum* (Griffith) (votes, unanimous) from Messrs. F. Ross & Co., Merstham. The plant exhibited was a good form, and it is known in some gardens as *C. Hookerianum*.

To *Phalænopsis Schilleriana vestalis* (votes, 7 for, 6 against), from Messrs. Hugh Low & Co., Clapton. A pure white variety of the type.

Award of Merit.

To *Cypripedium* × *conco-Lawre* (*C. concolor* ♀ × *C. Lawrenceanum* ♂) (votes, unanimous), from Sir Trevor Lawrence, Bart., Burford, Dorking (gr. Mr. W. H. White). This fine hybrid has a resemblance to *C. × Marshallianum*. The flowers cream-white, tinged with rose colour.

To *Cypripedium* × *Winnianum* (*C. villosum* ♀ × *C. Druryi* ♂) (votes, unanimous), from Messrs. Jas. Veitch & Sons. Flowers of the colour of *C. villosum* with the form of *C. Druryi*.

To *Dendrobium nobile Amesæ* (votes, 8 for, 4 against), from Messrs. F. Sander & Co., St. Albans. Flowers white, with a

faint sulphur tint, and a dark maroon blotch at the base of the lip.

To *Lælio-Cattleya* × *Maynardii* (*Lælia pumila* Dayana ♀ × *Cattleya Walkeriana dolosa* ♂) (votes, 10 for), from Messrs. F. Sander & Co. Habit of plant and size of flower similar to *Lælia Dayana*. Flowers shaded with dull rose, the crimped lip reddish purple.

To *Cattleya labiata* Trianæ, Hillingdon var. (votes, unanimous), from Mr. Wm. Whiteley, Hillingdon, Uxbridge. This

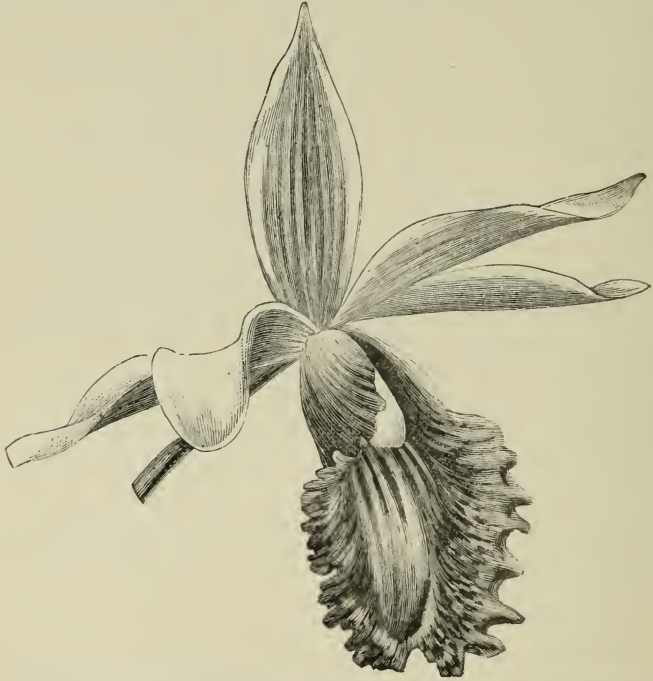


FIG. 27.—*PHAIUS AMABILIS*. (From the *Journal of Horticulture*.)

variety is of fine form and substance, the petals and lip beautifully crimped; the lip round, and of a rich claret-crimson colour.

To *Cattleya labiata* Trianæ, Florence Le Doux (votes, 7 for, 5 against), from G. R. Le Doux, Esq., Langton House, East Molesey. Sepals and petals white, slightly shaded with lavender; the front lobe of the lip rich dark crimson.

To *Odontoglossum cirrhosum*, Le Doux var. (votes, 7 for, 3 against), from G. R. Le Doux, Esq. A fine form, with much-branched spikes of large flowers, spotted with chocolate to the tips of the segments.

To *Cochlioda vulcanica grandiflora* (votes, 9 for), from G. R. Le Doux, Esq. A good example of the fine type of this plant recently imported by Continental and English growers.

Botanical Certificate.

To *Eria* (*Tænia*) *barbata* (votes, unanimous), from F. W. Moore, Esq., Royal Botanic Gardens, Glasnevin, Dublin.

To *Diuris maculata* (votes, unanimous), from F. W. Moore, Esq., Royal Botanic Gardens, Glasnevin, Dublin. The spike bore eight to ten flowers with yellow sepals and petals spotted with dark reddish brown on the outer surface. The plant is a native of New South Wales, and was introduced by Mr. Allan Cunningham in 1823. It flowered in the Royal Gardens, Kew, in March 1825.

Other Exhibits.

Sir Trevor Lawrence, Bart., sent a very singular *Maxillaria*, and a plant of *Masdevallia Schröderriana*.

Messrs. Jas. Veitch & Sons showed two plants of their beautiful *Epidendrum* × *Endresio-Wallisii*.

Chas. Winn, Esq., The Uplands, Selly Hill, Birmingham, sent *Cypripedium* × *The Duke* (*C. Stonei* ♀ × *C. barbatum grandiflorum* ♂), which resembled a good form of *C. × euryandrum*.

Walter C. Clark, Esq., Orleans House, Aigburth, Liverpool, sent for name *Cypripedium* × *vernixium*.

Thos. Statter, Esq., Stand Hall, Whitefield, Manchester, exhibited *Cypripedium* × *Daviesianum* (*C. Boxalli atratum* ♀ × *C. Argus Moensii* ♂).

Messrs. Lewis & Co., Southgate, sent the small orange-yellow *Habenaria cinnabarina* and a plant of *Cynorchis grandiflora*.

Henry Little, Esq., The Barrons, Twickenham, sent a form of *Cypripedium* × *Leeanum*.

Mr. H. A. Tracy, Amyand Park Road, Twickenham, staged a fine variety of *Cypripedium* × *Lathamianum*.

R. Brooman-White, Esq., Arddarroch, Garelochhead (gr. Mr.

Jas. Brown), sent flowers of *Cattleya guttata Prinzii* under the name of *C. Claesiana*.

Messrs. John Laing & Son, Forest Hill, showed a tall slender form of *Dendrobium crassinode*.

E. G. Wrigley, Esq., Victoria House, Dukinfield (gr. Mr. Harris), and Chas. Ingram, Esq., Godalming (gr. Mr. Thos. W. Bond), exhibited *Cattleya Trianæ alba*.

C. J. Lucas, Esq., Warnham Court, Horsham (gr. Mr. G. Duncan), sent *Angræcum hyaloides*, *A. polystachyum*, and several *Cattleya labiata Trianæ*.

ORCHID COMMITTEE, MARCH 14, 1893.

HARRY J. VEITCH, Esq., F.L.S., in the Chair, and sixteen members present.

Awards Recommended:—

Silver Flora Medal.

To Walter Furze, Esq., Roselands, Teddington (gr. Mr. E. Coombs), for a well-arranged group of showy Orchids, in which the *Dendrobiums* and *Cypripediums* were specially fine.

Silver Banksian Medal.

To Sir Trevor Lawrence, Bart., Burford, Dorking (gr. Mr. W. H. White), for a group of rare Orchids, among which were *Odontoglossum Ruckerianum splendens*, *Cypripedium Rothschildianum*, *C. × Dauthierii* "The Albino," *Dendrobium signatum*, *D. nobile Tautzianum*, *D. n. Murrhinianum*, *D. Findlayanum*, *D. × cheltenhamense* (*D. heterocarpum* ♀ × *D. luteolum* ♂), *Maxillaria sanguinea*, and *Holothrix* (*Tryphia*) *orthoceras*.

To Messrs. F. Sander & Co., St. Albans, for a group of rare Orchids, comprising *Phaius × amabilis*, *Oncidium Brunleesianum*, *Vanda teres* with blush-white flowers, &c.

To Messrs. B. S. Williams & Son, Upper Holloway, N., for a group of Orchids of excellent quality, the *Cypripediums*, including *C. × Huybrechtianum* (*C. hirsutissimum* ♀ × *C. Spicerianum* ♂), being especially fine.

First Class Certificate.

To *Lælia × vitellina* (votes, unanimous), from Baron Schröder, The Dell, Egham (gr. Mr. Ballantine). The parentage of this

was not recorded, but it is supposed to be out of *L. harpophylla*. The flower was five inches across, of a clear orange-tinted Indian



FIG. 28.—*CŒLOGYNE SANDEREANA*. (From the *Journal of Horticulture*.)

yellow; the labellum very narrow and elongated in the front lobe.

To *Dendrobium nobile* Ballianum (votes, 9 for, 8 against), from Messrs. F. Sander & Co., St. Albans. A beautiful form with blush-white flowers, the dark crimson disc usually seen in the type being in this of a soft pale rose-pink.

To *Cœlogyne Sanderæ* (fig. 28) (votes unanimous), from Messrs. F. Sander & Co., St. Albans. The flowers resembled



FIG. 29.—*ODONTOGLOSSUM RUCKERIANUM SPLENDENS*. (*Journal of Horticulture*.)

those of *C. Cumingii*; pure white, with orange and brown markings on the labellum ("Reichenbachia," vol. ii., 2nd ser. t. 56).

Award of Merit.

To *Maxillaria sanguinea* (votes, unanimous), from Sir Trevor Lawrence, Bart., Burford (gr. Mr. W. H. White). An elegant species with the habit of *M. tenuifolia*. Sepals and petals yellow tinged with red; lip white, crimson at the base.

To *Odontoglossum Ruckerianum splendens* (votes, unanimous), from Sir Trevor Lawrence, Bart. Flowers as large as those of *O. crispum*, richly spotted with red (fig. 29).

To *Lycaste Skinnerii* "Hettie" (votes, unanimous), from Messrs. Fred. Horsman & Co., Colchester. A finely formed flower, white with carmine base to the petals, and carmine tinge over the sepals.

Botanical Certificate.

To *Holothrix* (*Tryphia*) *orthoceras* (votes, unanimous), from Sir Trevor Lawrence, Bart. The plant was well grown, and had numerous sprays of white and lilac flowers.

Cultural Commendation.

To F. Wigan, Esq., Clare Lawn, East Sheen (gr. Mr. W. H. Young), for *Cœlogyne pandurata* (votes, unanimous). A very fine plant.

To Thos. Statter, Esq., Stand Hall, Whitefield, Manchester (gr. Mr. R. Johnson), for a fine example of *Lycaste Skinnerii alba* with nine large flowers from one bulb (votes, unanimous).

Other Exhibits.

C. J. Lucas, Esq., Warnham Court, Horsham (gr. Mr. Duncan), exhibited a small group of *Odontoglossums*.

W. Thompson, Esq., Walton Grange, Stone, Staffs. (gr. Mr. Stevens), showed a collection of *Odontoglossums*.

Messrs. Jas. Veitch & Sons, King's Road, Chelsea, sent *Dendrobium* × *Euryalus* (*D.* × *Ainsworthii* ♀, × *D. nobile* ♂), *D.* × *Æneas* (*D. japonicum* ♀ × *D. crystallinum* ♂), three plants of the pretty *Epidendrum* × *Endresio-Wallisii*, all distinct from each other in the flowers, and the brilliant dark scarlet *Epiphronitis* × *Veitchii*.

Thos. Statter, Esq., Stand Hall, Whitefield, Manchester, sent flowers of *Dendrobium nobile nobilius* and *D. n. virginalis*.

F. Wigan, Esq., Clare Lawn, East Sheen, showed *Megaclinium falcatum* and *Masdevallia vespertilio*.

Messrs. Pitcher & Manda, Hextable, Swanley, showed *Cattleya Trianæ Smithii*.

Messrs. Hugh Low & Co., Clapton, arranged a small group of *Phalænopsis*, *Dendrobiums*, &c., with plants of *Cypripedium callosum*, Low's var., *C.* × *De Witt Smith* (*C. Spicerianum* ♀ × *C. Lowii* ♂), and the pretty yellow *Bulbophyllum Sillemianum*.

Lord Foley, Ruxley Lodge, Esher, sent for name *Cœlogyne flaccida*.

G. R. Le Doux, Esq., Langton House, East Molesey (gr. Mr. B. Bowyer), sent *Cypripedium* × *Le Douxii* (*C. callosum* ♀ × *C. Harrisianum* ♂), which had some resemblance to *C. × œnanthum*; also *Cattleya Triana* "Ada Le Doux" and varieties of *Odontoglossum triumphans*.

Norman C. Cookson, Esq., Oakwood, Wylam-on-Tyne (gr. Mr. Murray), again exhibited *Cypripedium* × *Bryan* (*C. philippinense* ♀ × *C. Argus* ♂).

S. G. Lutwyche, Esq., Oakfield, Beckenham, sent a small plant of *Dendrobium Devonianum candidulum*.

J. Forster Alcock, Esq., Northchurch, Berkhamstead, staged a group of Orchids in which were *Cypripedium* × *Schröderæ* (*C. caudatum* ♀ × *C. × Sedeni* ♂) with three strong spikes, *C. × vernixium*, *C. Rothschildianum* (*Elliottianum*), *Cœlogyne cristata alba*, *Lælia anceps Stella*, and *Cattleya Harrisonæ violacea*.

Messrs. Laing & Son, Forest Hill, again showed *Dendrobium crassinode giganteum*.

William Soper, Esq., Clapham Road, S.W. (gr. Mr. J. N. Dains), sent varieties of *Odontoglossum Rossii*, *Sophronitis grandiflora*, *Oncidium pubes*, and a cut spike of *Cattleya Lodigesii*.

Walter C. Clark, Esq., Sefton Park, Liverpool, sent a fine spike of a good form of *Cymbidium Lowianum* with twenty-three flowers, the colour on the lip being very bright.

Reginald Young, Esq., Sefton Park, Liverpool, sent *Cattleya Trianae*, with rich magenta-purple lip.

Mr. Chas. Vuylsteke, Loochristi, Ghent, showed *Odontoglossum albo-cupreum*, a form of *O. blandum* differing widely in the colour, this being white, yellow, and deep brown, the white lip not exhibiting the purple spotting of the type.

A. H. Smee, Esq., The Grange, Hackbridge (gr. Mr. Cummins), sent a fine spike of *Cyrtopodium punctatum Saintlegerianum*.

H. Shaw, Esq., Stamford House, Ashton-under-Lyne (gr. Mr. J. Cliffe), sent flowers of *Maxillaria Sanderiana* and *Dendrobium Wardianum*.

W. E. B. Farnham, Esq., Quorndon House, Loughborough

(gr. Mr. Cooke), showed *Dendrobium splendidissimum grandiflorum*.

Messrs. Linden, l'Horticulture Internationale, Parc Leopold, Brussels, exhibited *Phalænopsis Aphrodite* (amabilis), Linden's variety, in which the purple colour at the base of the labellum of the type is entirely suppressed.

F. W. Moore, Esq., Royal Botanic Gardens, Glasnevin, Dublin, sent flowers of *Aërides platycheilum* and of *Lycaste xytriphora*.

ORCHID COMMITTEE, MARCH 28, 1893.

HARRY J. VEITCH, Esq., F.L.S., in the Chair, and eighteen members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. F. Sander & Co., St. Albans, for a group of rare Orchids, in which the varieties of *Dendrobium Dalhousieanum*, *Odontoglossum Pescatorei* "Model," *O. P. picturatum*, *O. crispum*, *Cattleya Trianae alba*, and *Cypripedium* were very fine. A curious plant in the group was *Cypripedium Chamberlainianum platytænium*, with broad labelloid petals.

Silver Banksian Medal.

To Philip Crowley, Esq., Waddon House, Croydon (gr. Mr. King), for a group of Orchids, made up chiefly of fine plants of *Ada aurantiaca* and *Cypripedium villosum*, with *Cattleya Lawrenceana*, *Odontoglossums*, a fine pan of *Sophronitis grandiflora*, &c.

First Class Certificate.

To *Dendrobium Wardianum album* (votes, unanimous), from William Rufus Lee, Esq., Beech. Lawn, Audenshaw, Manchester (gr. Mr. Billington). This fine variety is distinguished from *D. W. candidum*, Reich. f., by the almost entire absence of the chocolate blotches at the base of the labellum.

To *Dendrobium* × *Bryan* (*D. luteolum* ♀ × *D. Wardianum* ♂) (votes, unanimous), from Norman C. Cookson, Esq., Oakwood, Wylam-on-Tyne (gr. Mr. Murray). In habit, form, and colour of the flower this approaches *D. luteolum*, but the segments

exhibit a slight indication of the rose-coloured tips as in *D. Wardianum*.

Award of Merit.

To *Cochlioda Noezliana* (votes, unanimous), from Sir Trevor Lawrence, Bart., Burford, Dorking (gr. Mr. W. H. White). A pretty species which has been proved to be one of the most useful of dark scarlet cool-house Orchids.

To *Dendrobium* × *Sybil* (*D. Linawianum* ♀ × *D. bigibbum* ♂) (votes, unanimous), from Norman C. Cookson, Esq. (gr. Mr. Murray). The plants were similar in growth to *D. Linawianum*, but the leaves of the young growths were thicker, and seemed to bear traces of *D. bigibbum*. The flowers, which are borne in pairs, are equal in size to those of *D. Linawianum*; bright dark-rose colour, with the base of the segments white; lip white, with rose-coloured tip and yellow disc, on which at each side are a few brownish lines, ending in a small spot.

To *Cypripedium* × *T. W. Bond* (*C. × Swanianum* ♀ × *C. hirsutissimum* ♂) (votes, unanimous), from Charles Ingram, Esq., Elstead House, Godalming (gr. Mr. T. W. Bond). A fine bold flower, with a ground colour of dull light green, the base of the dorsal sepal profusely dotted with black, and dark lines radiating from the base. The petals are greenish at the base, spotted with black, the outer halves dark rose colour. Lip greenish, obscurely netted with pale brown.

To *Cypripedium* × *microchilum* (*C. niveum* ♀ × *C. Druryii* ♂) (votes, 10 for, 4 against), from Messrs. J. Veitch & Sons, Chelsea. Flowers small, white with slight purple markings.

To *Cattleya labiata* *Lüddemanniana*, Manda's var. (votes, 9 for), from Messrs. Pitcher & Manda, Hextable, Swanley, Kent. A form with very large and well-formed flowers.

Botanical Certificate.

To *Angræcum odoratissimum* (votes, unanimous), from Sir Trevor Lawrence, Bart., Burford, Dorking (gr. Mr. W. H. White). A curious African species, with a dense raceme of small orange-coloured flowers.

To *Calypso borealis* (votes, unanimous), from H. J. Elwes, Esq., Colesborne, Andoversford. A well-known species, but rarely seen. The specimen exhibited came from Alaska (fig. 30).

Cultural Commendation.

To Messrs. Heath & Son, Cheltenham, for a fine home-raised variety of *Odontoglossum* \times *excellens* named *Tresederianum* (votes, unanimous).

Other Exhibits.

Messrs. W. L. Lewis & Co. staged a good group of Orchids, embracing most of the showy species of the season. Among the *Odontoglossums* was *O. Pescatorei* *Lewisii*, which had the



FIG. 30.—CALYPSO BOREALIS. (From the *Journal of Horticulture*.)

labellum of each flower decorated with a purple wedge-shaped blotch.

Sir Trevor Lawrence, Bart., Burford, Dorking (gr. Mr. W. H. White), showed in fine condition the blush-white *Dendrobium superbum* *Burkei*, *D.* \times *Venus* (*D. nobile* ♀ \times *D. Falconeri* ♂), *D.* \times *micans* (*D. lituiflorum* ♀ \times *D. Wardianum* ♂), *D. superbum* *anosmum*, and *D. cretaceum*.

Thos. Statter, Esq., Stand Hall, Whitefield, Manchester (gr. Mr. R. Johnson), sent *Dendrobium* × *splendidissimum* *Statterianum*, which had very large flowers; *D. nobile* *Storerii*, with nearly white flowers, the lip having a dark chocolate disc with light yellow zone; *D. aureum* var., and *Cypripedium* *Exul annamense*.

Norman C. Cookson, Esq., showed varieties of *Dendrobium* × *Ainsworthii*, and a highly coloured *D. nobile* obtained by crossing *D. n.* *Cooksonii* with *D. nobile*.

H. J. Elwes, Esq., Colesborne, Andoversford, Gloucestershire, staged a small group of terrestrial Orchids, comprising *Brownleea cærulea*, *Ophrys speculum*, and *Orchis tridentata*.

Earl Cowper, Panshanger, Herts (gr. Mr. Joseph Fitt), sent four fine spikes of *Vanda suavis*.

G. R. Le Doux, Esq., Langton House, East Molesey (gr. Mr. B. Bowyer), showed *Cattleya intermedia* *Faustiana*, *Odontoglossum Andersonianum*, *Cypripedium barbatum nigrum*, and *Odontoglossum triumphans*.

J. W. Temple, Esq., Leyswood, Groombridge (gr. Mr. E. Bristow), showed *Lycaste plana* *Templeæ* and typical *L. plana*, the former having green sepals spotted with brown.

Messrs. Pitcher & Manda, Hextable, Swanley, Kent, staged a small group of Orchids, including several plants of *Cypripedium caudatum*, *C.* × *Greyanum* (*C. ciliolare* ♀ × *C. Druryi* ♂), *C.* × *macropterum* (*C. Lowii* ♀ × *C. superbiens* ♂), *C.* × *orphanum*, *C.* × *Godseffianum*, *C. Druryi*, &c.

Thos. Gabriel, Esq., Elmstead, Leigham Court Road, Streatham (gr. Mr. H. Guyatt), showed a well-bloomed plant of *Dendrobium Devonianum*.

W. C. Walker, Esq., Percy Lodge, Winchmore Hill (gr. Mr. G. Cragg), sent *Odontoglossum Andersonianum* and *Cypripedium Boxalli*.

Messrs. Jas. Veitch & Sons exhibited *Dendrobium* × *Alcippe*, a reputed cross between *D. lituiflorum* *Freemanianum* and *D. Wardianum*.

Baron Schröder, The Dell, Staines (gr. Mr. H. Ballantine), again exhibited a plant of his *Lælia* × *vitellina*.

Messrs. Fred. Horsman & Co., Colchester, sent for name *Epidendrum varicosum*.

H. Shaw, Esq., Stamford House, Ashton-under-Lyne, sent a

fine flower of *Dendrobium Wardianum*, said to be one of thirty-four borne on the same pseudo-bulb.

Reginald Young, Esq., Fringilla, Linnet Lane, Sefton Park, Liverpool, sent cut examples of *Odontoglossums*, &c.

From the Royal Botanic Gardens, Glasnevin, Dublin, came a cut specimen of *Physosiphon Moorei*, Rolfe, n. sp., a very near ally of *P. Loddigesii*.

ORCHID COMMITTEE, APRIL 11, 1893.

HARRY J. VEITCH, Esq., F.L.S., in the Chair, and fourteen members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. B. S. Williams & Son, Upper Holloway, London, N., for an extensive group of Orchids.

Silver Banksian Medal.

To Messrs. W. L. Lewis & Co. for a group of Orchids.

To Messrs. Hugh Low & Co. for a group of Orchids.

Award of Merit.

To *Cattleya guatemalensis* var. *Wischhuseniana* (votes, unanimous), from the Right Hon. Joseph Chamberlain, M.P., Highbury, Moor Green, Birmingham (gr. Mr. H. A. Burberry). This was a most interesting exhibit. The typical plant was collected, growing in company with *Cattleya Skinnerii* and *Epidendrum aurantiacum* (between which it is supposed to be a natural hybrid), by Mr. Ure-Skinner over thirty years ago. It was supposed to be lost to cultivation. The flowers, which were as large as those of *C. Skinnerii*, but with the lip less convolute, were orange, tinted with rose, and with a few purple lines at the base.

To *Cyrtopodium punctatum splendens* (votes, unanimous), from his Grace the Duke of Northumberland, Syon House, Brentford (gr. Mr. G. Wythes). A fine and very brightly coloured variety.

To *Odontoglossum* hybrid, Crawshay's var. (votes, unanimous), from De B. Crawshay, Esq., Rosefield, Sevenoaks (gr.

Mr. S. Cooke). A heavily spotted form of the *O. Andersonianum* type, with flowers nearly as large as those of *O. crispum*.

To *Dendrobium* × *Niobe* (*D. tortile* ♀ × *D. nobile* ♂) (votes, unanimous), from Messrs. Jas. Veitch & Sons, King's Road, Chelsea. The growths resembled those of *D. tortile*, but the flowers were scarcely distinguishable from those of a good *D. nobile* of the highly coloured class.

Other Exhibits.

His Grace the Duke of Northumberland (gr. Mr. G. Wythes) showed a fine nine-spiked plant of *Miltonia flavescens*.

The Rev. E. Handley, Royal Crescent, Bath (gr. Mr. Kerslake) showed *Cattleya Lawrenceana ornata*, a richly coloured variety, in which the petals were tipped with purple, and a spike of a good form of *Odontoglossum Andersonianum*.

De B. Crawshay, Esq., Rosefield, Sevenoaks (gr. Mr. S. Cooke), sent *Odontoglossum tentaculatum*, Reich. f.

Messrs. F. Sander & Co., St. Albans, showed four forms of *Cattleya labiata* Schröderæ, one nearly white; the new *Odontoglossum Kranzlinii*, *O. selwoodense*, an *O. Halli* hybrid (?); *Vanda teres*, and two specimens of the white-petalled *Dendrobium densiflorum* Schröderi.

Messrs. Jas. Veitch & Sons, Chelsea, S.W., exhibited *Cypripedium* × *Clymene* (*C. caricinum* ♀ × *C. caudatum* Wallisii), resembling *C. × Dominicanum*, but with whiter ground; *C. × Melanthus* (*C. Hookeræ* ♀ × *C. Stonei* ♂), with the colour as in *C. × vernixium*, but with long petals curved downwards; and *Cymbidium eburneo-Lowianum* (*C. Lowianum* ♀ × *C. eburneum* ♂).

Messrs. Charlesworth, Shuttleworth & Co., Heaton, Bradford, showed a light form of *Cattleya Warszewiczii*, said to have been imported with *C. Rex*.

The Right Hon. J. Chamberlain, M.P., sent flowers of *Cattleya labiata* Schröderæ and *Dendrobium* × *Nestor* (*D. Parishii* ♂ × *D. superbum anosmum* ♂).

Messrs. J. R. Pearson & Son, Chilwell, Notts, staged a spike of a very massive form of *Odontoglossum Pescatorei*.

Messrs. Pitcher & Manda, Hextable, Swanley, Kent, sent *Cypripedium* × *grande atratum*, the flowers of which are tinged with a much darker red than the original form.

ORCHID COMMITTEE, APRIL 25, 1893.

HARRY J. VEITCH, Esq., F.L.S., in the Chair, and thirteen members present.

Awards Recommended :—*Silver Flora Medal.*

To Sir Trevor Lawrence, Bart., Burford, Dorking (gr. Mr. W. H. White), for a select group of Orchids, among which were a fine *Cattleya Schröderæ*, with thirteen flowers; a grand form of *C. Mendelii*, with fifteen flowers; a large *Dendrobium thyrsoflorum* and *D. revolutum*; the exceedingly rare yellow *Bulbophyllum Sillemianum*, *B. Lobbi siamense*, *Cypripedium* × *Schröderæ*, *C. villosum aureum*, a large example of *Masdevallia Arminii*, *M.* × *Gelengiana* (*M. Estradæ xanthina* ♀ × *M. Shuttleworthii* ♂), &c.

Silver Banksian Medal.

To Messrs. F. Sander & Co. for a group of rare Orchids, including *Maxillaria Sanderiana*, *Cattleya* × *Burberryana*, *Zygotepalum Klabochorum*, *Lælia Digbyana*, *Cattleya Skinnerii alba*, &c.

First Class Certificate.

To *Masdevallia* × *Gelengiana* (votes, 7 for, 2 against), from Sir Trevor Lawrence, Bart., Burford, Dorking (gr. Mr. W. H. White).

To *Masdevallia Arminii* (votes, unanimous), from Sir Trevor Lawrence, Bart. The plant exhibited bore about seventy rosy-purple flowers with yellow tails.

To *Lælio-Cattleya* × *Ascania* (*Cattleya Trianae* ♀ × *Lælia xanthina* ♂) (votes, unanimous), from Messrs. Jas. Veitch & Sons, Chelsea, S.W. The flowers were in form like those of *C. labiata*, but smaller. Sepals sulphur-yellow; petals white, tinged with yellow; lip yellowish white, with a broad crimson mark on the front lobe (fig. 31).

Award of Merit.

To *Odontoglossum Roebelinianum* (votes, 8 for, 2 against), from Messrs. F. Sander & Co., St. Albans. A supposed natural hybrid, with some resemblance to *O. Coradinei*, but with shorter

and curved column. Flowers cream-white, blotched with reddish purple.

To *Maxillaria Sanderiana xanthoglossa* (votes, 6 for, 5 against), from Messrs. F. Sander & Co. A fine form, with a clear yellow labellum.

To *Stanhopea Amesiana* (*S. Lowii alba*?) (votes, unanimous), from Messrs. Hugh Low & Co., Clapton. A handsome variety, with white waxlike flowers, of the *S. ecornuta* section.



FIG. 31.—LÆLIO-CATTELEYA × ASCANIA. (From the *Journal of Horticulture*.)

To *Epidendrum atropurpureum album*, from Sir Trevor Lawrence, Bart.

Botanical Certificate.

To *Saccolabium cerinum* (votes, unanimous), from F. W. Moore, Esq., Curator, Royal Botanic Gardens, Glasnevin, Dublin.

To *Bulbophyllum Lobbii*, var. *siamense* (votes, unanimous), from Sir Trevor Lawrence, Bart.

Other Exhibits.

Messrs. W. L. Lewis & Co., Chase Side, Southgate, exhibited a well-arranged group of Orchids.

Messrs. Hugh Low & Co., Clapton, sent a group of Orchids, including many *Cypripediums*, *Phalænopsis*, *Dendrobiums*, &c.

Earl Cowper, Panshanger, Herts (gr. Mr. J. Fitt), sent varieties of *Cypripedium barbatum*, a nearly white *Lycaste Skinnerii*, resembling *L. S. armeniaca*, and an *Odontoglossum mulus* var.

Mr. Wm. Whiteley, Hillingdon, near Uxbridge, showed *Odontoglossum excellens*, Whiteley's var., a bright and richly spotted form.

W. W. Mann, Esq., Ravenswood, Bexley (gr. Mr. Simmon), again showed *Cynoches pentadactylon*, on which were male and female flowers.

Thos. Statter, Esq., Stand Hall, Whitefield, Manchester (gr. Mr. R. Johnson), staged *Dendrobium nobile*, Statter's var. ; *Cypripedium Measuresianum aureum*, and *C. Boxalli superbum*.

Messrs. Seeger & Tropp, Lordship Lane, East Dulwich, sent *Lycaste lasioglossa*.

E. G. Wrigley, Esq., Victoria House, Dukinfield, Cheshire (gr. Mr. C. Harris), showed three varieties of *Dendrobium nobile*, *Sophronitis grandiflora*, and *Cattleya citrina*.

De Barri Crawshay, Esq., Rosefield, Sevenoaks (gr. Mr. S. Cooke), exhibited five very fine forms of *Odontoglossum crispum*.

C. E. Goodhart, Esq., Langley Park, Beckenham (gr. Mr. W. R. Padbury), sent *Cypripedium caudatum Wallisii*.

Messrs. Condon & Raphael, Hazelwood, King's Langley (gr. Mr. Geo. E. Day), showed *Dendrobium amœnum* and varieties of *Cypripedium niveum*.

Chas. Winn, Esq., The Uplands, Selly Hill, Birmingham, showed *Dendrobium* × *Nestor* (*D. superbum anosmum* ♀ × *D. Parishii* ♂).

Reginald Young, Esq., Linnet Lane, Sefton Park, Liverpool, and W. C. Clark, Esq., Sefton Park, Liverpool, both sent cut flowers of Orchids.

S. G. Lutwyche, Esq., Oakfield, Beckenham, sent *Cattleya Lüddemanniana*.

Messrs. Jas. Veitch & Sons, King's Road, Chelsea, again

exhibited the beautiful Indian yellow and purple *Lælia* × *Latona* (*L. cinnabarina* ♀ × *L. purpurata* ♂).

ORCHID COMMITTEE, MAY 9, 1893.

HARRY J. VEITCH, Esq., F.L.S., in the Chair, and eighteen members present.

Awards Recommended:—

Silver Flora Medal.

To W. F. Darnell, Esq., Devonshire House, Stamford Hill (gr. Mr. W. Davis), for a fine group of Orchids tastefully arranged with foliage plants.

Silver Banksian Medal.

To Messrs. Pitcher & Manda, Hextable, Swanley, Kent, for a group of Orchids, in which there were many forms of *Cattleya labiata* Mossiæ.

First Class Certificate.

To *Dendrobium Bensonæ album* (votes, unanimous), from Thomas Statter, Esq., Stand Hall, Whitefield, Manchester (gr. Mr. R. Johnson). A form of this plant had previously received an Award of Merit, but that now exhibited was a larger and much better variety.

Award of Merit.

To *Lælia purpurata Lowiana* (votes, unanimous), from Messrs. Hugh Low & Co., Clapton. The labellum of this form is of a dark purplish maroon.

To *Odontoglossum crispum* var. *De Barri* Crawshay (votes, unanimous), from De B. Crawshay, Esq., Rosefield, Sevenoaks (gr. Mr. Sydney Cooke). A heavily spotted and fine form.

To *Cattleya* × *Harold* (*C. labiata Gaskelliana* ♀ × *C. Warscewiczii* ♂) (votes, 9 for, 1 against), from Norman C. Cookson, Esq., Oakwood, Wylam-on-Tyne (gr. Mr. Murray). The single flower borne on the small plant exhibited resembled some of the forms of *C. Warscewiczii*.

To *Cypripedium* × *Chas. Rickman* (votes, 11 for, 1 against), from *Chas. Rickman, Esq., Springfield, Trowbridge*. The parentage was stated to be *C. bellatulum* × *C. barbatum* var. The flower resembled *C. × Lawrebel Hyeanam*.

Other Exhibits.

Messrs. *Jas. Veitch & Sons, King's Road, Chelsea*, exhibited *Dendrobium* × *Mentor* (*D. primulinum* ♀ × *D. superbum* ♂) and *Lælio-Cattleya* × *Hippolyta*.

Messrs. *F. Sander & Co., St. Albans*, staged a select group of Orchids.

Major-General *Berkeley, Bitterne, Southampton*, showed *Galeandra nivalis*, *Dendrobium sulcatum*, *D. hercoglossum*, and *D. transparens album*.

T. B. Haywood, Esq., Woodhatch, Reigate (gr. *Mr. Salter*), sent for name *Epidendrum Schomburgkii*.

W. Thompson, Esq., Walton Grange, Stone, Staffordshire (gr. *Mr. W. Stevens*), sent two fine spikes of distinct forms of *Odontoglossum triumphans*.

C. L. N. Ingram, Esq., Elstead House, Godalming (gr. *Mr. T. W. Bond*), showed *Cypripedium* × *striatum*, stated to be *C. niveum* ♀ × *C. lævigatum* ♂, but bearing no trace of the latter species. It resembled *C. × Tautzianum*.

Messrs. *Charlesworth, Shuttleworth & Co., Heaton, Bradford*, sent varieties of *Oncidium macranthum*, *O. serratum*, and a curious little *Odontoglossum* from Peru.

A. J. Hollington, Esq., Forty Hill, Enfield (gr. *Mr. Ayling*), showed a good variety of *Cypripedium* × *Evenor* (*C. Argus* ♀ × *C. bellatulum* ♂).

Stephen White, Esq., Oakwood, Crayford, Kent (gr. *Mr. A. Tomalin*), sent for name a fine spike of *Cyrtopodium Andersonii cardiochilum*.

R. Brooman-White, Esq., Arddarroch, Garelochhead, Dumbartonshire (gr. *Mr. Brown*), sent a curiously striped form of *Cypripedium concolor*.

ORCHID COMMITTEE, MAY 25, 1893.

IN THE INNER TEMPLE GARDENS.

HARRY J. VEITCH, Esq., F.L.S., in the Chair, and twelve members present.

Awards Recommended:—

Silver Flora Medal.

To Baron Schröder, The Dell, Staines (gr. Mr. H. Ballantine), for a magnificent specimen of *Cœlogyne Dayana* with twenty-six spikes.

First Class Certificate.

To *Cattleya* × William Murray (*C. labiata Mendelii* ♀ × *C. Lawrenceana* ♂) (votes, unanimous), from Norman C. Cookson, Esq., Oakwood, Wylam-on-Tyne (gr. Mr. W. Murray). The plant, which was a small one with one flower, resembled *C. Mendelii* in growth. The flower had the dark purplish crimson of *C. Lawrenceana* in the labellum, which, however, was expanded in front as in the seed-bearing parent.

To *Cœlogyne Dayana* (votes, unanimous), from Baron Schröder.

Award of Merit.

To *Lælia purpurata nobilis* (votes, unanimous), from Messrs. F. Sander & Co., St. Albans. A very fine flower and richly coloured.

To *Miltonia vexillaria* Princess May (votes, 4 for, 1 against), from Messrs. F. Sander & Co. A splendid light-coloured form of the large-flowered type.

To *Odontoglossum Wattianum*, Hardy's var. (votes, unanimous), from Messrs. F. Sander & Co., St. Albans. A singular variety, with yellowish flowers heavily blotched with chocolate. The award was made subject to the specific name being found correct, for some of the members doubted its identity with typical *O. Wattianum*.

To *Cattleya labiata Warneri* var. *formosa* (votes, unanimous), from Messrs. Charlesworth, Shuttleworth & Co., Heaton, Bradford. A form in which the colouring of the lip was a rich crimson-maroon.

To *Lælia purpurata atropurpurea* (votes, unanimous), from Mr. Jas. Cypher, Queen's Road, Cheltenham. This beautiful

variety had pure white sepals and petals, and very dark purple lip, with pale lilac blotch at the tip.

To *Lælia purpurata* Niobe (votes, 7 for, 1 against) from Mr. Jas. Cypher. Flowers white, with a violet-crimson lip.

To *Cypripedium Volonteanum giganteum* (votes, unanimous), from Messrs. Hugh Low & Co., Clapton. In this variety the flowers are much larger than in any of the others of this variable section of *C. Hookeræ* which have yet been submitted to the Committee. The colouring also is good.

Botanical Certificate.

To *Epidendrum Claesianum* (votes, unanimous), from C. J. Lucas, Esq., Warnham Court, Horsham (gr. Mr. Duncan). Flowers in terminal heads, reddish salmon, and in form near to *E. Schomburgkii*.

Other Exhibits.

C. J. Lucas, Esq., Warnham Court, Horsham, exhibited fine plants of *Grammatophyllum Fenzlianum* and the smaller-flowered *G. Rumphianum* (also as *G. Fenzlianum* var.); *Bulbophyllum Lobbii*, Warnham Court var.; and *Lælia purpurata*, Warnham Court var., a very dark variety, closely resembling *L. p. Lowiana*, which had previously been recognised.

De B. Crawshay, Esq., Rosefield, Sevenoaks (gr. Mr. S. Cooke), sent *Odontoglossum crispum* Princess May. One of the very finest of the large unspotted forms.

Messrs. F. Sander & Co., St. Albans, exhibited *Cattleya Mendelii alba* (previously certificated as *C. Bluntii*); *Miltonia vexillaria Leopoldii* var., *M. v. Beauty*, *M. v. H. E. Milner* *Cattleya Mossiæ* Fairy Queen, *C. O'Brieniana splendens*, &c.

Reginald Young, Esq., Sefton Park, Liverpool, sent flowers of *Cattleya Mendelii*, Young's var.

Henry Shaw, Esq., Ashton-under-Lyne, sent *Cattleya Mendelii* var.

Thos. Statter, Esq., Stand Hall, Whitefield, Manchester (gr. Mr. R. Johnson), showed *C. Mendelii superbiens*.

Messrs. Heath & Son, Cheltenham, showed *Lælio-Cattleya* × (*C. Mossiæ* ♀ × *L. purpurata* ♂), which the Committee pronounced to be a light form of *L.-C. Canhamiæ* ×; also *Cattleya Mossiæ Hardyana* and forms of *Lælia purpurata*.

Messrs. W. L. Lewis & Co., Southgate, N., exhibited *Brassia*.

Lewisii, like a small form of *B. caudata*, and *Odontoglossum polyxanthum Lewisii*, a brightly coloured flower.

Messrs. Hugh Low & Co. showed *Cattleya Mossiæ* Princess May.

Chas. Ingram, Esq., Elstead House, Godalming (gr. Mr. T. W. Bond), again exhibited *Lælio-Cattleya* × *Ingrami* (*L. pumila* Dayana ♀ × *C. Dowiana* ♂), which had much improved since it was exhibited in 1892, when a F.C.C. was awarded it.

Special Awards made by the Council.

Silver Cup.

To Baron Schröder, The Dell, Staines, for a group of Orchids.

To Sir Trevor Lawrence, Bart., Burford, Dorking, for a group of Orchids.

To C. J. Lucas, Esq., Warnham Court, Horsham, for a group of Orchids.

To Messrs. F. Sander & Co., St. Albans, for a group of Orchids.

To Mr. J. Cypher, Cheltenham, for a group of Orchids.

To Messrs. Pitcher & Manda, Hextable, Swanley, for a group of Orchids.

Silver Gilt Flora Medal.

To Messrs. H. Low & Co., Clapton, for a group of Orchids.

To Messrs. B. S. Williams & Co., Upper Holloway, for a group of Orchids.

To Messrs. Charlesworth, Shuttleworth & Co., Heaton, Bradford, for a group of Orchids.

Silver Flora Medal.

To his Grace the Duke of Northumberland, Syon House (gr. Mr. Geo. Wythes), for a group of Orchids.

To Messrs. W. L. Lewis & Co., Chase Side, Southgate, for a group of Orchids.

Silver Gilt Knightian Medal.

To F. W. Wigan, Esq., Clare Lawn, East Sheen (gr. Mr. W. H. Young), for a group of Orchids.

Silver Knightian Medal.

To Hamar Bass, Esq., Byrkley, Burton-on-Trent (gr. Mr. J. Hamilton), for a group of *Cattleya labiata Mossiæ*.

ORCHID COMMITTEE, JUNE 6, 1893.

HARRY J. VEITCH, Esq., F.L.S., in the Chair, and nine members present.

Awards Recommended:—*Silver Flora Medal.*

To Messrs. Hugh Low & Co., Clapton, for a group of showy Orchids, in which the varieties of *Cypripedium bellatulum* were remarkable. An interesting plant in the collection was *Odontoglossum crinitum sapphiratum*, Reich. f.

Silver Banksian Medal.

To Messrs. W. L. Lewis & Co., Southgate, N., for a well-arranged group of Cattleyas, *Lælias*, *Masdevallias*, &c.

To A. H. Smee, Esq., The Grange, Wallington (gr. Mr. G. W. Cummins), for a collection of cut flowers of fine varieties of *Cattleya Mossiæ*.

Other Exhibits.

Captain Hincks, Terrace House, Richmond, Yorks, sent *Masdevallia* × *Veitchiano-Estradæ*, a pretty hybrid with apricot-coloured flowers.

Messrs. F. Sander & Co., St. Albans, showed *Zygopetalum Burtii*, *Dendrobium hercoglossum*, *Lælia* × *Oweniana*, and *Physosiphon Loddigesii*.

A. H. Smee, Esq., The Grange, Wallington, showed *Lycaste Deppei viridis*, in which the sepals were emerald green and unspotted.

Thos. Statter, Esq., Stand Hall, Whitefield, Manchester (gr. Mr. R. Johnson), exhibited *Cattleya Warscewiczii delicata*, C. W. Stand Hall var., *Lælia purpurata gigantea*, *L. tenebrosa*, and *Cypripedium superbiens* var.

Prize.

Class 3.—For the best seedling Orchid not exhibited previously to January 1, 1893. (Open.) Silver Gilt Flora Medal, to Messrs. F. Sander & Co., St. Albans, for *Lælio-Cattleya* × *Maynardii*

(*Lælia pumila* Dayana ♀ × *Cattleya dolosa* ♂). The plant, which was rather larger in growth than *Lælia pumila*, exhibited one and two leaves alternately on its pseudo-bulbs. The sepals



FIG. 32—LÆLIO-CATTELEYA × MAYNARDII. (*Journal of Horticulture*.)

and petals of the flowers were rosy lilac; the open labellum bright purplish crimson; column white, with purple cap (fig. 32).

ORCHID COMMITTEE, JUNE 20, 1893.

HARRY J. VEITCH, Esq., F.L.S., in the Chair, and thirteen members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. B. S. Williams & Son, Upper Holloway, N., for a fine group of Orchids.

Silver Banksian Medal.

To Messrs. Hugh Low & Co., Clapton, for a group of Orchids.

Bronze Banksian Medal.

To Messrs. W. L. Lewis & Co., Southgate, N., for a group of Orchids.

Award of Merit.

To Cattleya Warscewiczii Sanderæ (votes, 7 for, 6 against), from Messrs. F. Sander & Co., St. Albans. This was a very dark and richly coloured form of *C. Warscewiczii Sanderiana*.

Botanical Certificate.

To *Luisia volucris* (votes, unanimous), from Sir Trevor Lawrence, Bart., Burford, Dorking (gr. Mr. W. H. White). An extraordinary species, with yellowish sepals and petals, the latter about one inch in length and erect. The lip brownish purple, and in the mature flower closely clasping the stem of the plant, which somewhat resembles the lip in colour.

To *Luisia Amesiana* (votes, unanimous), from Sir Trevor Lawrence, Bart. Flowers large for the genus; pale greenish yellow, the lip spotted with chestnut-red.

To *Lælia crispilabia* var. (votes, 7 for, 4 against), from Sir Trevor Lawrence, Bart. Flowers pink, with bright yellow crimped labellum.

To *Hexisia bidentata* (votes, 5 for, 4 against), from Sir Trevor Lawrence, Bart. A pretty species with scarlet flowers.

To *Odontoglossum peruvienne* (votes, unanimous), from Messrs. Charlesworth, Shuttleworth & Co., Heaton, Bradford. A curious species, with brown flowers tipped with yellow, and about equal to those of *O. Lindleyanum* in merit.

To *Platyelinis (Dendrochilum) filiformis*, from Messrs. F. Sander & Co., St. Albans.

To *Epidendrum Forgetianum* (votes, unanimous), from Messrs. F. Sander & Co., St. Albans. A pretty species, with flowers somewhat resembling those of *E. alatum*, but borne in a dense dwarf panicle. The flowers were cream-colour, veined with dull lilac.

Cultural Commendation.

To Messrs. F. Sander & Co. for a specimen of *Platyclinis filiformis* with about ninety spikes.

Other Exhibits.

M. Wells, Esq., Broomfield, Sale, Manchester (gr. Mr. Hinds), sent cut spikes of *Lælio-Cattleya* × *Phœbe*, L.-C. × *Arnoldiana*, the nearly white *Cattleya Mendelii delicata*, &c.

Messrs. James Backhouse & Son, York, exhibited a pan of *Disa* × *Veitchii* with several fully expanded blooms.

Messrs. F. Sander & Co. showed *Cypripedium* × *inulus* (*C. hirsutissimum* ♀ × *C. Lawrenceanum* ♂), *C.* × *selligerum majus*, *Zygopetalum* (*Pescatorea*) *Klabochorum*, *Sobralia xantholeuca*, *Cattleya Warscewiczii Sanderiana*, &c.

Chas. Winn, Esq., The Uplands, Selly Hill, Birmingham, sent a supposed hybrid *Cypripedium* named "Psyche," but which seemed merely a form of *C. Godefroyæ*.

Norman C. Cookson, Esq., Oakwood, Wylam-on-Tyne (gr. Mr. W. Murray), sent a spike of *Cypripedium caudatum Wallisii*, and a flower of *C.* × *vexill-Io* (*C. vexillarium* ♀ × *C.* × *Io* ♂), which the Committee desired to see again.

Sir Trevor Lawrence, Bart., sent *Masdevallia demissa* and *Cœlogyne sulphurea*.

Messrs. Hugh Low & Co., Clapton, showed *Sarcanthus Lowii*, Hort. Low., which the Committee referred to Kew.

G. W. Law-Schofield, Esq., New Hall Hey, Rawtenstall, Manchester, sent flowers of *Lælio-Cattleya* × *Arnoldiana*.

Thomas Statter, Esq., Stand Hall, Whitefield, Manchester, showed a pale form of *Cattleya Warscewiczii*, cut spikes of *Odontoglossum Wilekeanum superbum*, and *Cypripedium* × *Aylingii*.

F. W. Moore, Esq., Royal Botanic Gardens, Glasnevin, Dublin, sent a cut spike of a very fine form of *Aërides virens*.

NARCISSUS COMMITTEE.

MARCH 28, 1893.

Rev. G. H. ENGLEHEART in the Chair, and six members present.

Dr. Laumonier, of Vernuil, France, sent a large number of flowers for name. Many of them were faded, but the Committee were able to recognise most of them.

The Rev. N. Miller, Winestead Rectory, Hull, also sent a number for name.

The Rev. G. H. Engleheart exhibited some very beautiful flowers, the result of his own careful hybridisation. Of them the following were the most noteworthy:—

“Snowdrop”—*Cernuus* ♀ × *Triandrus* ♂.—This was a flower of most exquisite beauty, of a fine clear white throughout, somewhat larger than, but very similar to what a pure white “Mrs. Cammell” would be, only with two flowers on a stem.

Triandrus (Glenan’s var.) ♀ × *Albicans* ♂ and also with wild Pyrenean *Moschatus* ♂.—This was a potful of plants from seed, some being little, if at all, removed from *Triandrus*, but amongst them were three lovely plants very similar to the one last described, but a trifle smaller.

Empress ♀ × *Triandrus* ♂.—A lovely pale straw-coloured “Johnstoni” with two flowers on a stem.

There were also some beautiful seedlings from Horsfieldi, and a quantity of more or less white hybrid trumpet Daffodils, the result of crossing early yellow trumpets with pollen of *Cernuus*.

NARCISSUS COMMITTEE, APRIL 11, 1893.

Rev. G. H. ENGLEHEART in the Chair, and nine members present.

Awards Recommended:—*Silver Gilt Banksian Medal.*

To Messrs. Barr & Son, Covent Garden, for a collection of Daffodils.

To Mr. T. S. Ware, Hale Farm, Tottenham, for a collection of Daffodils.

The Rev. T. Longley sent varieties for name.

Messrs. Pearson & Son, of Chilwell, sent blooms of a new seedling. It was like a very fine *Princeps* with, what *Princeps* always lacks, a good stiff perianth.

The Rev. N. J. Miller sent varieties for name.

Miss Mellish, Hodrock Priory, Worksop (gr. Mr. Mallender), sent blooms of two seedling Daffodils, *Horsfieldi* ♀ × *Princeps* ♂. No. 2 was hardly more than a very big *Princeps*, and the Committee considered that it was hardly wanted, but No. 1 was a decidedly better flower; it has a very grand trumpet indeed, and a very passable perianth, and would probably make a good market flower. The Committee would like to see it another year with a name attached.

Messrs. James Veitch & Sons, of Chelsea, sent seventeen new hybrids, nine of which were of the *Tridymus* type, being crosses with *Tazetta* varieties, viz. :—

1. Charles Dickens ♀ × Golden Spur ♂.
2. Apollo ♀ × Sir Watkin ♂.
3. Gloriosa ♀ × Golden Spur ♂.
4. Gloriosa ♀ × Poeticus ♂.
5. Apollo ♀ × Obvallaris ♂.
6. Pallidus præcox ♀ × Gloriosa ♂.
7. Apollo ♀ × Cernuus ♂.
8. Apollo ♀ × Obvallaris ♂.
9. Charles Dickens ♀ × Pallidus præcox ♂.

The Committee desired to know something of the constitution these plants, as it has been noticed that *Tazetta* hybrids are

as a rule somewhat weakly and very shy bloomers. A question was also asked as to whether they had been bloomed out of doors in this country. Nos. 7 and 9 are very pretty flowers of a pale creamy colour, while No. 8 is like a miniature bunch-flowering *Obvallaris*, and very distinct.

10. *Obvallaris* ♀ × *Poeticus* ♂.
11. Golden Spur ♀ × *Stella* ♂.
12. *Pallidus præcox* ♀ × *Poeticus* ♂.
13. Henry Irving ♀ × *Stella* ♂.
14. General Gordon ♀ × *Cernuus* ♂.
15. General Gordon ♀ × *Burbidgei* ♂.
16. *Pallidus præcox* ♀ × *Burbidgei* ♂.
17. Golden Spur ♀ × *Burbidgei* ♂.

Of these No. 12 is a good *Incomparabilis* variety with large perianth, the segments being individually unusually broad. No. 14 has a very pretty trumpet, but is weak in the perianth. In No. 16 the red cup of the male parent has apparently had no effect, the only result of the cross being to have shortened the crown of the mother, thus leaving it with enormously long perianth segments, out of all proportion to the crown. It was considered very curious, but hardly desirable.

The Rev. G. H. Engleheart brought a number of seedlings, among which were the following:—

1. "Sol," raised from seed of *Emperor*.—A very large flower indeed, with a fine trumpet and noble perianth.

2. "Aurora."—A grand trumpet, but perhaps a little weak in the perianth, but this may very probably come stiffer and broader the second year of flowering.

3. *Ajax* ♀ × *Triandrus* ♂.—These were brought to show the marvellous potency of the pollen of *Triandrus*, which must, Mr. Engleheart said, have been blown by the wind out of a frame and infected plants at a considerable distance. Three flowers were shown, the two smaller ones being very charming in form, and of a pale lemon colour.

4. *Empress* ♀ × *Poeticus* ♂.—This was brought to show the probable parentage of *Nelsoni*, the seedling being almost identical with *Nelsoni* major.

5. White *Ajax* ♀ × *Poeticus* ♂.—This was brought to show

the probable parentage of Leedsii, and as also exemplifying how in crosses between White Ajax and Poeticus the colour in the cup of Poeticus has little or no influence on the hybrid.

6. Moschatus (Pyrenean) ♀ × Poeticus.—This is a very lovely little nodding flower of pure white-marble colour, reminding one somewhat of Montanus.

7. Yellow Ajax ♀ × Poetarum ♂.

8. "Firefly"—Ornatus ♀ × red-eyed Incomparabilis ♂.—A small but very beautiful flower of the Burbidgei type, with an orange-crimson cup of exceedingly deep and vivid colour.

9. Horsfieldi ♀ × Poeticus ♂.—This was brought to exemplify the very frequent result of Poeticus crosses on Ajax being only to shorten the trumpet of the Ajax mother.

The Rev. T. H. Marsh brought three of his new hybrids:—

1. Cernuus pulcher ♀ × Gem ♂.—This flower reminded one a little of Leedsii superbus, but the three blooms sent held their heads up almost erect, a character which, if maintained, would make this hybrid very distinct.

2. Cernuus ♀ × Gem ♂.—A very pretty flower indeed, white, and a little like Minnie Hume.

3. Tortuosus ♀ × Gem ♂.

The Rev. C. MacMichael brought flowers for naming.

Mr. J. W. Wilson, South Cave, East Yorks, sent a small collection of blooms arranged in bunches with foliage of the Arbor Vitæ. The Committee considered that it would be better to use only natural Daffodil foliage.

The Earl of Dysart, Ham House, Richmond (gr. Mr. Sage), also exhibited flowers.

Prizes.

Class 1.—Nine varieties of Daffodils, distinct, grown in the open; five blooms of each. Amateurs. *First Prize*, Bronze Flora Medal and 15s., to Rev. S. E. Bourne, Dunston Vicarage, Lincoln. *Second Prize*, 10s., to Mr. Kingsmill, Bushey Heath.

Class 2.—Six varieties, three blooms of each. Amateurs. *First Prize*, Bronze Banksian Medal and 10s., to Rev. G. P. Haydon, Hatfield Vicarage, Doncaster. *Second Prize*, 7s. 6d., to J. W. Melles, Esq., Sewardstone, Chingford.

Class 3.—Collection of Daffodils. Open. *First Prize*, Barr large Silver Medal, to Rev. S. E. Bourne. *Second Prize*, Barr small Silver Medal, to Mr. Kingsmill. *Third Prize*, Barr large Bronze Medal, to Rev. G. P. Haydon. *Fourth Prize*, Barr small Bronze Medal, to J. W. Melles, Esq.

NARCISSUS COMMITTEE, APRIL 25, 1893.

Rev. G. H. ENGLEHEART in the Chair, and five members present.

The Rev. W. Wilks read a letter which Messrs. Veitch had sent to him in accordance with the Committee's request for information as to his hybrids at their last meeting. In it Messrs. Veitch say: "They were grown in sandy soil in the open ground and without any protection, and have not been transplanted for three years. They all look strong and healthy. We send you a few more hybrids, which we fear may be over before the next meeting."

Mr. Wilks reported that he had received the additional hybrids referred to, and had carefully examined them, but that they were all too much faded to bring up to the meeting. He reported of them as follows:—

1. Charles Dickens ♀ × Burbidgei ♂.—Large white perianth, with exceedingly deep orange-red cup. A very fine flower.

2. Pallidus præcox ♀ × Burbidgei ♂.—No trace of Burbidgei. A very large flower, like an almost white-perianthed Sir Watkin.

3. Charles Dickens ♀ × P. præcox.—A fine Tridymus of two shades of yellow.

4. Charles Dickens ♀ × Moschatus ♂.—A very pale Tridymus.

5. Golden Spur ♀ × Burbidgei ♂.—Straw-coloured perianth, deep yellow trumpet—reminding one of Sir Watkin.

6. Obvallaris ♀ × Burbidgei ♂.—Somewhat smaller than the last, and with darker perianth.

7. Charles Dickens ♀ × Golden Spur ♂.—A fine Tridymus, pale perianth, large rich-coloured cup, but variable, one spike sent having much smaller self-coloured flowers.

8. Apollo ♀ × Obvallaris ♂.—A good Tridymus, with nearly white perianth and deep yellow trumpet.

9. Apollo ♀ × Cernuus ♂.—A charming, nearly white, Trydimus.

10. Pallidus præcox ♀ × Poeticus ♂.—An Incomparabilis of great merit, having remarkably broad white perianth segments of great substance, with a large clear canary-yellow cup.

The Committee desired that Mr. Wilks's report should be entered on the minutes, and that Messrs. Veitch be requested to send the flowers for inspection next year.

Mr. Wolley Dod sent Bernardi "Philip Hert," white perianth, with a most beautifully deep orange cup; and Bernardi "Orange Tip," similar to the preceding, but with much paler cup. He also sent seedlings to show how they revert to original forms.

Mr. Barr exhibited flowers of Mrs. A. Pearson, a very fine bold white trumpet Daffodil, but somewhat ragged in form.

It was decided to hold no meeting of the Committee in May, as the hot weather had already dried up the flowers.

Prize.

Class 4.—Best English-raised seedling. (1893.) Open. Barr Silver Gilt Flora Medal to the Rev. G. H. Engleheart.

EXTRACTS FROM THE PROCEEDINGS
OF THE
ROYAL HORTICULTURAL SOCIETY.

GENERAL MEETING.

JULY 25, 1893.

Mr. GEO. PAUL in the Chair.

Fellows elected (13).—C. A. Adams, Lord Battersea, Miss Briggs, J. W. Denton, Mrs. C. de Salis, Mrs. E. J. de Vezian, J. Ford, Charles Gowie, Mrs. W. Holding, W. J. Paulin, Mrs. J. Samuel, Col. I. Davis-Sewell, W. W. Woosnam.

A paper on "Alpine Houses and Plants" was read by Mr. H. Selve Leonard. (See page 161.)

GENERAL MEETING.

AUGUST 8, 1893.

J. T. BENNETT-POË, Esq., in the Chair.

Fellows elected (3).—James Murray, H. T. Seamark, Mrs. E. J. Stephens.

A paper on "Cannas" was read by Mr. J. G. Baker, F.L.S. (See page 178.)

GENERAL MEETING.

SEPTEMBER 12, 1893.

J. T. BENNETT-POË, Esq., in the Chair.

Fellows elected (10).—John Basham, N. F. Barnes, W. H. Cloake, G. H. Mackereth, T. B. Morris, Lieut.-Col. Murray, A.

St. Geo. Sanders, J. H. Seabrooke, Mrs. Hepburn Thomson, J. T. Wiltshire.

A paper on "Garden Phloxes and Pentstemons" was read by Mr. James Douglas. (See page 188.)

GENERAL MEETING.

SEPTEMBER 26, 1893.

Mr. JAMES DOUGLAS in the Chair.

Fellows elected (4).—E. A. N. Arber, W. A. Cox, Maro Guerin, W. N. Saunders.

A lecture on "The Causes of Failure in Eucharis Culture" was given by Mr. W. Iggulden. (See page 194.)

GENERAL MEETING.

OCTOBER 10, 1893.

Mr. GEO. BUNYARD in the Chair.

Fellows elected (5).—Miss Brown, E. Domaille, Miss C. Manning, R. Nicholas, John Vicary, J.P.

A paper on "Pears" was read by Mr. W. Crump. (See page 200.)

GENERAL MEETING.

OCTOBER 24, 1893.

Mr. J. C. CHEAL in the Chair.

Fellows elected (9).—Chas. Bailey, Peter Blair, Chas. Maynard, A. Purdie, M.A., John Rose, Chas. C. Tudway, Mrs. Wakeman-Newport, G. N. Wilson, A. Wright.

A lecture on "Onions" was given by Mr. A. Dean. (See page 209.)

GENERAL MEETING.

NOVEMBER 14, 1893.

Mr. GEO. PAUL in the Chair.

Fellows elected (7).—H. Albert, Rev. M. J. Bacon, E. Beckett, Mrs. Deverill, A. Herbert, Mrs. H. Norton, G. G. Paton.

A paper on "Chrysanthemums" was read by Mr. R. Parker. (See page 220.)

GENERAL MEETING.

NOVEMBER 28, 1893.

Mr. GEO. BUNYARD in the Chair.

Fellows elected (8).—John B. Blandy, W. M. Costa, Geo. E. Grimes, E. N. Kent, W. C. G. Ludford, John Ough, W. G. Romaine, John Smith.

A lecture on "Late-keeping Grapes" was read by Mr. T. H. Crasp. (See page 227.)

GENERAL MEETING.

DECEMBER 12, 1893.

H. SELFE LEONARD, Esq., in the Chair.

Fellows elected (19).—H. Anderson, G. Barr, W. Barr, A. Bentley, A. Bradshaw, W. B. Cranfield, G. V. Dujardin, E. Gilman, T. Glen, W. P. Horton, A. Hutchinson, C. Carter Page, W. Pope, W. T. Sharp, A. Thornley, H. W. Weguelin, J. Jenner Weir, M. Wells, O. O. Wrigley.

SCIENTIFIC COMMITTEE.

JULY 25, 1893.

Dr. H. MÜLLER, F.R.S., in the Chair, and five members present.

Dianthus sp., &c.—Dr. Müller showed a specimen of a Pink from Val d'Annivières, in the Rhône Valley. It was referred to Mr. F. N. Williams for identification, and proved to be *Dianthus prolifer*, L. He also exhibited an "Edelweiss," from Mount Cook, New Zealand. Though the inflorescence bore much resemblance to the European form, the foliage was quite distinct, the leaves being obovate, and one-quarter of an inch in length. It was referred to Kew for identification. He also exhibited a Peach, apparently attacked by fungi. It was also referred to Kew for investigation.

Fir-leaved Clover.—Dr. Bonavia showed a specimen of this tolerably well-known form from garden culture.

Preserving Fresh Ripe Fruit.—Mr. W. Sykes, of Woodleigh, East Dulwich, described some methods for preserving fruit in tins and otherwise, the air being exhausted from the tins. The following is the description of Tomatos:—"The fruit was quite ripe and perfect; after seven days they had not altered, and kept two or three days after being exposed to the atmosphere. After fourteen days the fruit showed signs of 'sweating.' They kept the same time exposed, and ate all right. After twenty-one days there was considerable sweating, after thirty days more so, after thirty-seven days still more, the juice draining out badly. The fruit throughout never lost its bright, brilliant colour." A discussion arose as to the advisability of adopting the plan of exhausting the tins of air. Both Dr. Müller and Dr. Russell were of the opinion that this method was unadvisable, inasmuch as the vacuum can never be perfect, and it tended to expand the cells, and so, by rupturing the tissues, "sweating" would increase. Another method described was to bury the fruit like Potatos or Mangold. "Apples buried straight from the trees in heaps like Potatos, surrounded by straw, and covered with earth a few inches thick, keep well into the following year. Nonpareil, a very astringent, bright-coloured, and bad keeper, loses neither colour nor flavour after being buried. Similarly Peas in jars covered over with a bladder, and buried, were quite 'fresh' at

Christmas. In these and similar cases it appears to be the carbonic acid evolved by respiration of the fruit which acts as a preservative by driving away the air from the enclosed space. This tends to destroy, or at least hinder, the fermentive or putrefactive action of bacteria." Mr. Sykes hopes to communicate further results from experiments with this year's fruit.

Pelargonium ignescens, β sterile.—Mr. Henslow exhibited a specimen of this plant found in a cottage garden at Zeals, Dorset. On referring to Sweet's "Geraniaceæ," it appears to have been raised from the seed of *P. fulgidum* by Sir R. C. Hoare. Another seedling of the same species was *P. scintillans*. Though called "hybrids," the parentage is unknown. The word "sterile" refers to the anthers being devoid of pollen. *P. ignescens* (proper), as well as the above, are all figured by Sweet, *op. cit.*, viz. *P. ignescens*, vol. i. No. 2; *P. ign. β sterile*, i. 55; *P. scintillans*, i. 28; and *P. fulgidum*, i. 69. The date given is 1821.

"*Shaky*" *Ash-wood*.—Messrs. Holland & Holland, of Oxford Street, forwarded a remarkable specimen of the peculiarity known as "shaky timber" among carpenters. On splitting the wood a central portion separates from the surrounding layers. It is probably due to some seasonal influence when the cambium formed an imperfect and easily separable layer.

SCIENTIFIC COMMITTEE, OCTOBER 10, 1893.

R. McLACHLAN, Esq., F.R.S., in the Chair, and six members present.

Peach Disease.—With reference to the diseased Peaches brought to the last meeting by Dr. Müller, Mr. G. Masee, of Kew, reports as follows: "The Peach disease is caused by the fungus *Glœosporium fructigerum*, *Berk.*, or rather by *G. lacticolor*, *Berk.*, which is in reality only the former species modified by the host, as proved by cultures. In America, where the disease is too well known, and has also attacked Grapes during the last two or three years, it has been found that the fungus can be kept well under control by two or three sprayings of potassic sulphide (half an ounce to a gallon of water) applied in June or July. Of course, it is too late to attempt spraying this year, but all diseased fruit should be removed and destroyed to

prevent the diffusion of the spores." Dr. Müller observed that he had seen the disease twice soon after the setting of the fruit. This appeared to be locally arrested in growth where the fungus occurred, the rest of the Peach growing normally.

Pyrus japonica Fruiting.—Mr. Blandford exhibited specimens, and commented on the very large size to which the fruit had attained this year. It does not appear to be capable of being put to any use as yet.

Oranges from Australia.—Dr. Bonavia communicated the following remarks on a curious phenomenon connected with Oranges: "On July 12, 1893, a box of Oranges was shipped to me by a friend in South Australia. It contained four varieties of the so-called 'Portugal' Orange, viz. the 'Navel' Orange, a large and a small Blood Orange, and the Egg Orange. Each Orange was wrapped in tissue paper, and the whole were packed tightly in hay. They reached me, after having been about five weeks on the sea, in very sound condition, with the exception of one which was spoilt. Probably this had been bruised before it was packed.

"On the voyage the Oranges sweated and the hay became damp, for when I opened the box a musty smell of damp hay pervaded the whole box; and now comes an interesting point.

"I unpacked all the Oranges and freed them from paper and hay. They all had a musty smell. I washed some of them and dried them. Apparently the musty smell was completely removed from the outside; but on cutting open the Oranges every one of them had not only a musty smell in the juice carpels, but also a peculiar musty flavour.

"It would appear that the mustiness of the damp hay penetrated through the peel and pervaded the whole interior of the Orange, giving a peculiar and unpleasant flavour to the juice.

"There was no difference in the four varieties. They were all equally contaminated by the musty smell and flavour, although otherwise quite sound, and when washed the mustiness could not be detected in the rind.

"I ate some of them every day, and by keeping the mustiness of the juice became less, till about the fourth week after unpacking the mustiness in the juice was scarcely perceptible.

"All the varieties were rather thick-skinned, and were very juicy, and all kept very well. Probably the soft hay-packing

may have had something to do with their not getting bruised on the way. The 'Navel' Oranges were more juicy than the same variety we get in London from California.

"I hardly know how to explain the contamination of the juice by the musty air in the box. The peel contains a large quantity of essential oil. This may have absorbed the musty aroma, and then, when saturated, passed it on to the juice vesicles, which also contain a considerable proportion of essential oil. By keeping and exposure to the air this process may have been reversed."

With regard to the cause of the flavour of the Oranges, Prof. Church explained it by the fermentation of the hay and *osmose* causing the scent to enter; then transpiration would subsequently bring about the odour externally. It was remarked by Mr. McLachlan that certain Oranges were eaten green in Java and Ceylon. Dr. Bonavia added that such become yellow subsequently, though they were edible in the green state. They have been illustrated by Miss North among her paintings at Kew.

Pears diseased.—Messrs. J. Cheal & Sons forwarded samples of Pitmaston Duchess Pears affected apparently by a fungus, giving the fruit a warty appearance. They were referred to Kew for examination.

Salisburia diseased.—A branch of this tree was received from South Dorset, evidently in a very enfeebled condition. It was the general opinion that the mild, damp, maritime climate of the situation was unfavourable to it, and the probable cause of its unhealthiness.

Wasps and Pears.—Mr. Blandford observed on the habit of tomtits, which he had seen pecking holes in Pears, which gave wasps access to attack the juicy tissues. Application of nicotine to the wound kept them at bay for six hours. Mr. Henslow added that he had noticed wasps attacking mealy-bugs in a vinery before the Grapes were ripe. Mr. McLachlan added that he had noticed tomtits attacking Cobnuts for the purpose of extracting the grubs within them.

Cypripedium, Synanthy.—Sir Trevor Lawrence exhibited a plant having two flowers welded into one. It possessed one lower smaller sepal, two large ones above, three nearly equal sized petals, two perfect labella, and two staminodia; the ovary showed the fusion by a longitudinal groove.

Rhododendron Hybrid.—Mr. Henslow exhibited a specimen received from Mr. Veitch, the result of crossing “Lord Wolseley” by the bigener “Indico javanicum,” this having been the result of crossing “Lord Wolseley” with *Azalea indica* Stella. The flowers were more or less malformed, having a strong tendency to be polypetalous; the stamens were occasionally epipetalous or sub-petaloid. The form of the flower showed no improvement on that of *Indico javanicum*, though it was a little brighter in colour (orange).

Oak Galls.—Some curious many-pointed galls on the acorns of Oaks at Versailles were sent by Mr. Belt, of Ealing. Mr. McLachlan reports that they are the product of *Cynips calycis*, and that this species of gall has never been found in this country.

Rayless Matricaria Chamomilla.—Mr. Henslow exhibited specimens found by road-sides in Ealing. They appeared to be particularly abundant last year. Seed obtained failed to germinate in the present dry season.

SCIENTIFIC COMMITTEE, OCTOBER 24, 1893.

Dr. RUSSELL, F.R.S., in the Chair, and four members present.

Galls on Oak.—With reference to the galls exhibited at the last meeting and recognised as those of *Cynips calycis*, Mr. Blandford observed that they are used for tannic acid on the Continent, as well as the more common form, on *Quercus infectoria*, which contain 50 per cent.

Daffodils and Mice.—Rev. W. Wilks exhibited several bulbs which had been attacked by Merodon; but subsequently mice had eaten into the bulbs, apparently in order to extract the grub, as no perfect bulb was ever touched. Mr. Wilks intends, and suggests as a means of selection, to spread out bulbs supposed to be affected where mice can have access to them, as the sound bulbs will be left untouched.

Decaying Daffodil.—He also showed a bulb which had decayed up the middle, while the base of the stem was detached together with the roots. It was referred to Kew for examination.

Diseased Onions.—Some large flattish Onions were exhibited,

which had become completely rotten in the middle at the base of the stem. Two-thirds of a crop were said to have been lost. They were also referred to Kew.

Injured Timber, Photograph.—Prof. Farmer showed photographs of sections of an ancient Elm, lately cut down at Oxford. They showed a separation, for three parts of a circle, deeply seated within the stem. As the subsequent annual rings were at first discontinuous over the middle point, but gradually closed over it, the interpretation seemed to be that the tree had been partially decorticated, the wound being subsequently completely concealed.

Proliferous Fern.—Mr. Veitch forwarded a plant of *Adiantum* (which appeared among *A. Capillus-Veneris*, but had broader pinnules) having minute fronds starting from the situation of the sori, apparently being aposporous, and developing new fronds in the place of sporangia. Mr. Veitch remarks that this is the first time that he had seen this occurrence on an *Adiantum*.

Diseased Pears.—With reference to the Pears sent to the last meeting, Mr. Masee reports that “the fungus is *Glœosporium fructigerum*, *Berk.* There is no possibility of arresting the disease in the mature state of the fruit, but this can be done by using the proper remedy during the development of the fruit.” The remedy suggested for the same fungus in Peaches was “two or three sprayings of potassic sulphide (half an ounce to a gallon of water).”

SCIENTIFIC COMMITTEE, NOVEMBER 14, 1893.

Dr. M. T. MASTERS, F.R.S., in the Chair, and nine members present.

Diseased Onions.—Mr. Masee reported as follows upon the samples brought to the last meeting: “The Onions are attacked by a *Botrytis*, the same species as the one described by Prof. Marshall H. Ward in “A Lily Disease” (*Ann. of Bot.*, vol. ii.). The bulbs cannot possibly be saved now, the fungus having spent its active period on the leaves; while the hyphæ are now passing into the bulb to form sclerotia. If the foliage had been sprayed with a fungicide the mischief would have been kept within bounds. The diseased Onions should be *burnt*, and not thrown on to the manure-heap.”

Diseased Daffodil Bulb.—He also reported upon the specimen brought by Mr. Wilks, that a saprophytic fungus was now present, which had followed a disease induced by some other unascertainable cause.

Diseased Pears.—Mr. Massee sent the following additional remarks upon the fruit reported upon at the last meeting: “The fungus attacking the Pears first appears upon the leaves, and from thence it passes on to the fruit. The tree should have been sprayed with a fungicide previous to the appearance of bloom, and once or twice after the fruit had set. Bordeaux mixture has been proved effective.” A unanimous vote of thanks was given to Mr. Massee for his interesting and valuable reports.

Job's Tears (Coix lachryma, L.).—Mr. McLachlan exhibited a specimen of this Grass, grown at Loughborough, Leicestershire, in the open air. It is remarkable for the stony involucre, often used as beads. Prof. Church drew attention to another species, *C. gigantea*, Roxb., which is cultivated in the Khasia hills, and elsewhere in Bengal. *C. lachryma* is not cultivated, though the grain of wild plants is eaten. Prof. Church's analysis of the grain of *C. gigantea* shows that it contains 16·8 albuminoids and 58·9 starch, &c., so that its “nutrient value” is very high, being 90 per cent. (*Kew Bulletin*, 1888, p. 267.)

Sphæria Robertsii.—Mr. Harry Veitch exhibited specimens of this well-known parasitic fungus of New Zealand issuing from the neck of a large caterpillar (*Hipialis virescens*). It is called aweto or “vegetable caterpillar.” The latter frequents particularly, if not quite exclusively, the Rata tree (*Metrosideros robusta*), and when the pupa burrows into the ground at the foot of the tree, the spores of the fungus attack it, the mycelium ramifying through the body, while the stem bearing the sporiferous asci issues erect from between the folds in the neck of the caterpillar.

Split Planorbis Shells.—Mr. Wilson sent specimens split transversely, with the following observations: “The shells are deposited in large numbers on the bent-down rushes at the water's edge of one of our ponds at Oakwood, Wisley. There are no signs of rats near. I much wish to know what cuts them, whether beast or bird.” It was suggested by Mr. Michael that if the shell lay half in water a severe frost might possibly have effected

it; but they appeared to be quite fresh shells. Mr. McLachlan suggested herons as having perhaps done it. The cause of the peculiarity, however, was recognised generally as obscure.

Winter Moth.—Mr. Wilson sent the following observations on this insect: "On the 3rd of this month there were fifty-four females on the greased bands on our fruit trees at Oakwood. They do not usually appear so early with us. Great quantities of both females and males have been caught since the above date. Perhaps the wood and ponds are attractive to them. We have so few at Weybridge that it is not worth while to band the trees."

Clitorca ternatea peloric.—Dr. Bonavia showed photographs and a coloured drawing (by a native) of this plant from India, illustrating transitions from the normal "Pea-like" blossom to the regular or peloric condition, much resembling a Periwinkle. The colour is a bright blue. It appears to be not uncommon in this species.

Casuarina dimorphic.—Dr. Masters exhibited a specimen received from Baron von Müller, in which a portion had developed sharp-pointed leaves exactly similar to the pointed-leaved form of Juniperus, which is often dimorphic in the same way. Mr. Henslow mentioned that these changes are paralleled by the Thuja-leaved forms of Veronica, which grow at great altitudes in New Zealand, and observed that analogies seemed to suggest varying degrees of drought or moisture as likely to be the direct cause of the different kinds respectively.

Wheat-eared Sweet William.—Dr. Masters also showed a specimen of this well-known malformation, in which, while the flowers are suppressed, the small bracts at the base become multiplied excessively. Mr. Veitch observed that it is very common and difficult to eradicate. No cause could be suggested for its occurrence.

Canna Madame Crozy.—Dr. Masters observed that it has been stated that this variety of Canna was really a very old form, having been figured in Loddiges' Cabinet, No. 449; but, as he pointed out, though the colours were similar, the petals having a yellow rim, the size was very different, the modern form very probably having originated from that older variety.

Germinating Cocoa-nut.—Dr. Masters showed a drawing of the globular cotyledon developed within the cavity and applied against the edible endosperm. With reference to its power of

secreting a ferment to digest the food, Prof. Green remarked that he had not succeeded in isolating the ferment; but the epidermis of the cotyledon was quite of the character suggesting the presence of one. He noticed a fatty acid present, apparently indicating reactions produced by some ferment.

SCIENTIFIC COMMITTEE, NOVEMBER 28, 1893.

DR. M. T. MASTERS, F.R.S., in the Chair, and six members present.

Pears and Fungicides.—With reference to the remedies suggested by Mr. Masee, Dr. Masters inquired of Mr. Bunyard as to his experience in their use. He replied that growers were frequently deterred from employing any poisonous preparations in consequence of the carelessness of the men from their want of realising the dangers involved in using them, so that they preferred to employ sulphur, and especially the “black” impurer sort.

Tamarix dimorphica.—Mr. Henslow remarked that the two species common in Egypt, *T. articulata* and *T. nilotica*, corresponded with the two forms of *Casuarina* exhibited by Dr. Masters at the last meeting, who observed that *T. gallica* not infrequently develops the two forms on the same plant.

Sterculia nobilis, R. Br.—A fruiting specimen of this plant was received from Syon House. A synonym is *Southwellia nobilis*, of Salisbury’s “*Paradisus Londinensis*.” It has been known to fruit in this country, but Dr. Masters observed that it is rarely now seen. The present tree is eighty years old, but never fruited before. Dr. Church observed that being closely allied to *Theobroma cacao*, or Chocolate, it would be interesting to examine the seeds for theobromine.

Primula capitata and Basal Rot in Daffodils.—The following communication was received from Rev. C. Wolley Dod, Edge Hall: “I have been engaged for several years in investigating that mysterious phenomenon, basal rot in Daffodils. The Scientific Committee have assured me (after repeated examination of bulbs sent by me) that no specific cause of it can be detected. I am inquiring whether there is anything analogous to it in any other plants—viz. death from general unsuitable conditions, commencing at the juncture between the root and

the bud, and producing decay there, partial or entire. I have noticed something similar in some Himalyan Primroses, especially *Primula Stuarti*, which I have ceased to cultivate because the base of the bud (I use bud in its botanical sense of crown from which the leaves sprout) is so apt to rot into pulp. In *P. capitata*, however, of which I have grown and flowered thousands during the last fifteen years, no winter bud is ever formed. Mr. G. Wilson tells me that in his garden at Wisley it is a hardy perennial, but with me it invariably dies if left out in winter. The tissues are not destroyed by hard frosts, for after a hard winter the leaves in the centre of the tuft often continue green in February, but rot seems to commence at the base, as in the specimens enclosed, and the open leaf tuft invariably rots off before spring, being often still green. I should be glad of an opinion whether the case is likely to be analogous to that of basal rot in Daffodils?" Mr. Wilks corroborated Mr. Dod's experience, as he found the plants died in a similar manner in his garden. The specimen was forward to Kew for examination.

Cuscuta reflexa.—A specimen of this parasite growing on *Jasminum revolutum* was received from Mr. F. W. Burbidge, of the Tr. Col. Botanic Gardens, Dublin. He observes that "it does nearly as well on *Forsythia viridissima* and *F. suspensa*, as well as on Ivy. Indoors in a warm house, Pelargoniums, Fuchsias, and Crotons seem to suit it best. We had it growing on a Zonal Pelargonium which was placed in the Jasmine on a west wall last May, and it now forms a wiry net-like mass 10 feet high and 8 feet wide. It often twists upon itself." An examination of the suckers or haustoria showed that the *Cuscuta* often preyed upon itself whenever two branches were spirally twisted together. As far as a few observations can be trusted, the roots of the thicker of the two stems always penetrated the other. It frequently fixed itself to the surface of the leaves of the Jasmine as well as around the stems and petioles.

Preserving Fresh Fruit in Carbonic Acid Gas.—The following communication was received from Mr. W. Sykes, of Woodleigh, East Dulwich, being a description of experiments suggested at a meeting of the Scientific Committee on July 25: "On August 23 I put down some Apples, Pears, Plums, Tomatos, and eggs, but am sorry to say that, so far, my experiments with carbonic acid gas are unsatisfactory; neither does it appear to

check the ripening or decomposition, and it gives the fruit a peculiar flavour. The Apples have a musty, coddled taste. With the Plums the gas centres round the stones. In the Tomatos there is a sharp, forbidding, pungent taste throughout, which leaves them after standing twenty-four hours in the air. I allowed the gas to pass through the washing bottle into the tins, the natural air escaping through a pipe. After the fresh air had escaped (tested with a lighted match), I closed the latter pipe and let the gas work itself dead slow. After giving them all a good application (three dozen taking in both applications some six hours) I went through them again, opening the escape pipe mentioned above to scour out. Then I reclosed it with pliers. Before closing the entrance pipe the gas had worked dead slow, the top and bottom bulging out. The pressure at the gauge stood at 5 lbs. The water in the washing bottle was fresh boiled and put into the washer (just bearable), being changed for every dozen tins. I did not exhaust the air, and found with this test of a week that the Tomatos were sweating equal to those kept for over a fortnight after the air was exhausted. Some Coreopsis, white Marguerites, and Nasturtiums were put under the same process (August 23). The first kept well, and after being in water looked none the worse; the white of the Marguerites turned to a pale chocolate beyond recovery, and the Nasturtiums collapsed into a withered heap." Professor Church observed that the failure might have been due to an insufficient time having been allowed for the atmospheric air to diffuse. He added that much carbonic acid had been proved to exist around Mangold roots when turfed over, which undoubtedly acted as a preservative.

FRUIT COMMITTEE.

CHISWICK SHOW, JULY 11, 1893.

P. CROWLEY, Esq., in the Chair, and seventeen members present.

Awards Recommended:—

Silver Gilt Knightian Medal.

To Messrs. Veitch and Sons, Chelsea, for a collection of 120 varieties of Gooseberries.

Silver Knightian Medal.

To Messrs. T. Rivers & Son, Sawbridgeworth, for a collection of twenty varieties of Cherries, including Early Rivers, Bigarreau Noir de Guben, and White Bigarreau; Peaches, Hale's Early and Princess of Wales, together with fine Nectarines, Plums, and Grapes, all in very fine condition.

Cultural Commendation.

To Messrs. de Rothschild, Gunnersbury House, Acton (gr. Mr. Hudson), for six bunches of Black Hambro' Grapes cut from a pot vine.

To Lord Foley, Ruxley Lodge, Esher (gr. Mr. Miller), for several very large and well-grown varieties of Peaches and Nectarines; also fruits of Tomato Ponderosa.

To Mr. Owen Thomas, Royal Gardens, Windsor, for very fine Peaches and Melons.

Other Exhibits.

Mrs. Whitbourne, Great Gearies, Ilford (gr. Mr. J. Douglas), sent a seedling white Grape, raised from Black Hambro' crossed with Royal Muscadine.

Seedling Melons were shown by Mr. C. Brooks, Red Rice Gardens, Andover; Mr. James Barkham, The Gardens, Longford House, Ryde; and Mr. J. Crawford, Coddington Hall Gardens, Newark.

Messrs. R. Veitch & Sons, Exeter, sent samples of Alexander Peach from the open wall; and pods of Lotus tetragonolobus, which he recommended for use as a vegetable.

Mr. T. Berridge, Norwood Lodge, Southall, sent a pot plant of a new Tomato.

Messrs. Hurst & Sons sent examples of a fine Tomato named Dunedin Favourite, which was recommended to be tried at Chiswick.

Messrs. Cooper, Taber, & Co., Rivenhall, sent examples of a white-eyed Longpod Bean, which is stated to be more prolific and hardier than the black-eyed form.

W. A. South, Esq., Neasden (gr. Mr. C. Payne), sent five dishes of Tomatos, and a Grape-vine having the foliage and parts of the berries variegated with white.

E. J. Lowe, Esq., Shirenewton Hall, Chepstow, sent two new varieties of Red Currants named Jubilee and Lord Llangattock, which the Committee desired to see again.

FRUIT COMMITTEE, JULY 25, 1893.

T. F. RIVERS, Esq., in the Chair, and fourteen members present.

Awards Recommended :—

Silver Knightian Medal.

To Messrs. T. Rivers & Son, Sawbridgeworth, for a collection of fruit containing very fine examples of Nectarines Lord Napier and Dryden; Apricots Grosse Pêche and Mexican; Ribston Pippin Apples; Louise Bonne of Jersey and Souvenir du Congrès Pears; and several varieties of Plums and Cherries.

To Messrs. George Bunyard & Co., Maidstone, for thirty dishes of very fine early Apples and seven varieties of Apricots.

Bronze Banksian Medal.

To the Duke of Northumberland, Syon House, Brentford, for an exhibit of Melons, Morello Cherries, and Apricots.

Award of Merit.

To Melon Lee's Perfection, from F. Lee, Esq., Lynford Hall, Mundford, Norfolk.

Cultural Commendation.

To Lord Foley, Ruxley Lodge, Esher (gr. Mr. Miller), for four varieties of Peaches, including Alexander, from the open wall.

To Mr. Owen Thomas, The Royal Gardens, Windsor, for a

large and well-grown Pine Apple, reared from a rootless sucker planted September 1892.

To J. T. Hopwood, Esq., Ketton Hall, Stamford (gr. Mr. Divers), for very fine and highly coloured examples of Crimson Galande and Dagmar Peaches, with Lord Napier Nectarines.

To Mr. Woodward, Barham Court Gardens, Maidstone, for very fine Peaches and Nectarines.

To S. G. Lutwyche, Esq., Eden Park, Beckenham (gr. Mr. May), for beautiful examples of Tomato Perfection.

Other Exhibits.

Mr. Owen Thomas, The Royal Gardens, Windsor, sent a bunch of a white Grape, believed to be Golden Hambro'.

Messrs. Wm. Miller & Co., West Brighton, sent examples of Crown Bob Gooseberry.

A. H. Smee, Esq., The Grange, Wallington (gr. Mr. Cummins), sent examples of an Apple named Early Joe.

Mr. F. W. Rick, Royal Nurseries, Sandford, Bristol, sent an early seedling Apple.

Examples of well-kept Apples of the 1892 crop were exhibited by Col. Smyth, Theescombe House, Stroud.

Seedling Melons were exhibited by Mr. J. Rodbourne, Haling Park, Croydon.

Mr. G. McDougall, Ravenna Cottage, Stirling, sent a new Tomato.

Messrs. Cooper, Dennison, & Walkden, 7 Bride Street, E.C., exhibited specimens of their handy Fruit Baskets, made of stiff paper, which were highly approved by the Committee.

From the Society's Gardens came thirty-four varieties of Tomatos and nine varieties of Apricots.

FRUIT COMMITTEE, AUGUST 8, 1893.

JOHN LEE, Esq., in the Chair, and eleven members present.

Awards Recommended :—

Silver Knightian Medal.

To Messrs. James Veitch & Sons, Chelsea, for an exhibit of seventy-five dishes of Apples, Pears, and Plums, all in very fine condition.

To Lord Fortescue, Castle Hill, South Devon (gr. Mr.

Nicholas), for a dozen large and well-grown Smooth Cayenne Pine Apples.

Silver Banksian Medal.

To Mr. Owen Thomas, The Royal Gardens, Windsor, for twenty-one dishes of Peaches and Nectarines from the open wall.

To Messrs. Cheal & Sons, Crawley, Sussex, for seventy dishes of well-grown Apples, Pears, and Plums.

Award of Merit.

To Melon Hero of Isleworth, from the Duke of Northumberland, Syon House (gr. Mr. Wythes). A cross between Wythes' Seedling and Syon House.

To Melon County Councillor, from Mr. W. Palmer, Cobden Villas, Andover.

To Melon Royal Prince, from Mr. Palmer.

Cultural Commendation.

To Messrs. G. Bunyard & Co., Maidstone, for exceedingly beautiful examples of Apple Lady Sudeley.

Other Exhibits.

Messrs. G. Bunyard sent examples of the new early Pears *Précoce de Frémont* and *Petite Marguerite*, with *Beurré Giffard*.

New Melons were exhibited by C. Carr-Gomm, Esq., Farnham Royal, Slough; Mr. F. W. Samson, Widworthy Court Gardens, Honiton; and R. H. Murray, Esq., Springfield, Great Marlow.

MM. Letellier et Fils, fruit growers, Caen, Calvados, France, sent fruits of a Plum named *Burbank*, received from California. This seemed to be a variety of the *Kelsey Plum*, of a very distinct character, large, and of fairly good quality.

Mr. Thomas, Maresfield Park, Uckfield, Sussex, sent fruit of the *Sanguinole Peach*, which is deep red in the flesh like *Beet-root*, and its juice almost like blood.

Messrs. Jarman & Co., Chard, sent examples of their new outdoor Cucumber, *Baker's Triumph*, which was considered somewhat too large and coarse.

Mr. A. G. Freer, Nelson Nursery, New Brompton, sent a box of very fine Tomatos named *Freer's Abundance*.

A very handsome, rough-skinned, round Potato was received from Mr. H. W. Mackereth, Ulverston, samples of which were requested to be tried at Chiswick.

FRUIT COMMITTEE, AT CHISWICK, AUGUST 17, 1893.

H. BALDERSON, Esq., in the Chair, and seven members present.

The collection of Onions and Potatoes growing in the Gardens were examined and reported on (*vide* pp. 253, 257).

FRUIT COMMITTEE, AGRICULTURAL HALL SHOW,
AUGUST 29, 1893.

P. CROWLEY, Esq., in the Chair, and twenty-two members present.

Gold Knightian Medal.

To Messrs. Rivers & Son, Sawbridgeworth, for a most beautiful exhibit of fruit-trees in pots—Apples, Pears, Plums, Grapes, and Figs, in great variety; together with fruits of large size and fine quality in baskets and dishes.

Silver Gilt Knightian Medal.

To Messrs. George Bunyard & Co., Maidstone, for a very large collection of trees in pots, laden with fine fruit; also trees showing different systems of training, pruning, &c.; 125 dishes of Apples, Pears, Grapes, Filberts, &c.; together with a large collection of various kinds of highly ornamental Crab Apples.

To Messrs. Cheal & Sons, Crawley, for a large collection of fruit-trees in pots, including Apples, Pears, Plums, &c., with numerous dishes of well-grown fruit.

To Messrs. Wm. Paul & Son, Waltham Cross, for a large quantity of trees in pots, well-cropped, with 90 dishes of fruit.

To Messrs. Veitch & Sons, Chelsea, for a large and varied collection of over 200 dishes of Apples, Pears, Plums, Figs, Cherries, &c.

Silver Knightian Medal.

To Messrs. Spooner & Sons, Hounslow, for a collection of 94 dishes of well-grown Apples.

To Mr. Bythway, Llanelly, Carmarthen, for 60 dishes of magnificent Apples, large and well-coloured.

To Mr. W. A. Trotter, Broomsberrow Place, Ledbury, for several cases of preserved and evaporated fruits and vegetables, which proved of much interest.

To Lady Theodora Guest, Inwood House, Henstridge (gr. Mr. Wilkins), for very large and fine Onions.

Silver Banksian Medal.

To Messrs. Cannell & Sons, Swanley, for a collection of very large Onions.

Bronze Flora Medal.

To Dr. P. H. Emerson, 'Claringbold, Broadstairs, for an extremely interesting miscellaneous exhibit of foreign vegetables, including several curious American Squashes, Sweet Potatos, Egg Plants, Turnip-rooted Parsley, Lima Beans, and Pe-Tsai, a sort of Japanese or Chinese Cabbage, which was requested to be sent to Chiswick for trial in the Gardens.

To Mr. T. Clarke, Albion Nursery, Farnham, for a collection of Grapes grown in a cool house.

To Messrs. J. Peed & Sons, Roupell Park, S.E., for 50 varieties of Apples.

Cultural Commendation.

To Mr. J. Johnson, Charterhouse Works, E.C., for good examples of Apples grown in a London back garden.

To Earl Cowper, Panshanger, Herts (gr. Mr. Fitt), for two fine bunches of Banana Lady's Finger.

Other Exhibits.

Messrs. A. Cross & Son, 19 Hope Street, Glasgow, and Mr. Davis, 104 High Holborn, sent examples of Grapes, Tomatos, &c., grown with their special manures.

Mr. Hudson, The Gardens, Gunnersbury House, Acton, sent examples of Grapes Appley Towers and Lady Hutt, which amply maintained the good opinion formed by the Committee when they were certificated. Also Grape Gros Maroc, grafted on Foster's Seedling, showing the improvement gained in its flavour.

Mr. Calver, Ludlow, sent a basket of Apples.

Mr. W. H. Divers, Ketton Hall, Stamford, sent a seedling Peach named Late Crimson.

Lord Foley (gr. Mr. Miller) sent two dishes of large and fine Peaches.

L. Hughes, Esq., 10 Ella Road, Islington, sent a dish of Apples.

Messrs. R. Veitch & Sons, Exeter, sent Peach Late Devonian, a cross between Belle de Vitry and Late Admirable.

Mr. Owen Thomas, Royal Gardens, Windsor, sent several varieties of Melons.

Melons were also exhibited by the Earl of Shrewsbury, Ingestre Hall, Stafford (gr. Mr. Gilman), and E. Hart, Esq., Fairlawn, Totteridge (gr. Mr. Smith).

Tomatos came from Messrs. Carter & Co., High Holborn, who staged Duke of York and Blenheim Orange; from Mr. John Allsopp; from Messrs. Hazel Brothers, 35 The Broadway, Crouch End; and from Messrs. Collins Bros., 39 Waterloo Road, who staged the variety named Challenger certificated at a previous meeting.

Mr. A. Young, The Gardens, Barton Court, Kintbury, sent some seedling Potatos of good appearance.

From W. A. South, Esq., Neasden House, Neasden, N.W., came a long, very peculiar, dark blue Potato named *Viola nigra*, having the flesh, even when cooked, of a dark purple; also a Vine with the foliage variegated with white.

From the Society's Garden were sent examples of the small Currant Grape.

FRUIT COMMITTEE, SEPTEMBER 12, 1893.

P. CROWLEY, Esq., in the Chair, and sixteen members present.

Awards Recommended:—

Silver Knightian Medal.

To Messrs. Rivers & Son, Sawbridgeworth, for a collection of twenty-five dishes of fruit, including several varieties of new seedling Plums, Apples, and Pears.

To Messrs. John Laing & Sons, Forest Hill, for ninety dishes of Apples and Pears. Handsome in appearance, and of good size.

Bronze Banksian Medal.

To the Bishop of Bath and Wells, The Palace, Wells (gr.

Mr. Payne), for six very large and handsome Peasgood's Nonesuch Apple.

First Class Certificate.

To Plum Golden Transparent, a large golden variety of most excellent quality, from Messrs. T. Rivers & Son.

To Onion Sutton's No. 1, from Messrs. Sutton & Sons, Reading.

To Potato Windsor Castle, from Messrs. Sutton & Sons, Reading.

To Potato Triumph, from Messrs. Sutton & Sons, Reading.

Award of Merit.

To Grape Cape Muscat, from Mr. Walter Weir, The Gardens, Acton Park, Wrexham. A variety of considerable promise; bunches and berries of good size, ovate, black, with a decided Muscat flavour. Received from the Cape.

To Peach Duchess of York, from Mr. Divers, Ketton Hall, Stamford. Fruit large, conical, pale coloured, good quality; raised from the Byron Nectarine.

To Apple Bartlett's Glory, somewhat resembling Cellini, from W. E. Brown & Sons, Wells, Somerset.

Cultural Commendation.

To H. St. Vincent Ames, Esq., Cote House, Westbury-on-Trym (gr. Mr. Bannister), for twelve dishes of large, well-grown Pears.

To Mr. Crawford, Gatton, Reigate (gr. Mr. Howgrove), for seven dishes of Pears, and a box of Strawberries (second crop).

To the Rev. J. H. Brown, Redstone Rectory, Shropshire, for some very large and handsome Lane's Prince Albert Apples.

Other Exhibits.

Messrs. Brown & Sons, Wells, sent specimens of a large Apple named Monster, greatly resembling Warner's King.

Seedling Apples were shown by Miss Winckworth, The Little Hermitage, Rochester, and D. R. Carter, Esq., Station Road, Petersfield.

Messrs. R. Veitch & Sons, Exeter, sent a new Peach named Late Devonian, a cross between Belle de Vitry and Late Admirable; fruits of medium size, and somewhat astringent.

Lord Foley, Esher (gr. Mr. Miller), exhibited some well-grown Barrington Peaches, and a large green Melon.

Dr. P. H. Emerson, Claringbold, Broadstairs, exhibited six small Melons which had been grown in the open air, which, although presenting a poor appearance, were of very fair quality.

Mr. A. Haggart, Moor Park, Ludlow, sent fruits of the 1892 crop of an Apple supposed to be Rambour d'Hiver.

Examples of Shepherd's Seedling Apple were shown by Mr. Dean, who stated that the variety is much grown in Somersetshire.

Mr. H. W. Pitcher, Albury House Gardens, Surbiton, staged some very fine Tomatos.

From the Society's Gardens came examples of forty-eight varieties of Onions.

A collection of beautiful coloured drawings of fruits were exhibited by Messrs. Cheal & Sons, Crawley, and were greatly admired.

FRUIT COMMITTEE, SEPTEMBER 26, 1893.

PHILIP CROWLEY, Esq., in the Chair, and twenty-two members present.

Awards Recommended:—

Silver Gilt Knightian Medal.

To Mr. O. Thomas, The Royal Gardens, Windsor, for eighteen Queen and Smooth Cayenne Pine Apples, large in size, and in fine condition.

Silver Knightian Medal.

To the Earl of Cork and Orrery, Marston House, Frome (gr. Mr. Iggulden), for a collection of thirty varieties of Pears grown on a stiff clay soil. The most noticeable varieties were Pitmaston Duchess, General Todtleben, Easter Beurré, and Doyenné Boussoch.

To Messrs. Cannell & Sons, Swanley, Kent, for a large display of Apples, Potatos, Onions, Tomatos, Beet, Turnips, Carrots, and other vegetables.

Silver Banksian Medal.

To Messrs. de Rothschild, Gunnersbury (gr. Mr. Reynolds), for twenty handsome Melons of large size.

To Mr. J. Chinnery, The Gardens, Downton Castle, Ludlow, for some large well-grown Onions, Plums, and six varieties of Apples.

To J. Nix, Esq., Tilgate Manor, Crawley (gr. Mr. Dibden), for a collection of twenty-four varieties of Pears—Louise Bonne of Jersey and White Doyenné being especially fine.

To the Dowager Lady Freake, Fulwell Park, Twickenham (gr. Mr. A. Rickwood), for a collection of Apples and Pears—the varieties Dumelow's Seedling and King of the Pippins Apples being especially good.

Bronze Banksian Medal.

To the Earl of Cork and Orrery (gr. Mr. Iggulden), for Doyenné du Comice Pears of large size and very handsome.

Award of Merit.

To Apple Wealthy, from Mr. Molyneux, Swanmore Park Gardens, Bishop's Waltham. An American variety. Fruits of medium size, generally highly coloured. Flesh tender, and of good quality.

Other Exhibits.

W. Palmer, Esq., Cobden Villas, Junction Road, Andover, sent a dish of Duke of Wellington Pea (second crop), and some good specimens of Jersey Gratioli Pears.

Sir J. H. Amory, Bart., Knightshayes Court, Tiverton, Devon (gr. Mr. R. Grigor), sent a large white-fleshed Melon named Maximus, a seedling from Sutton's Windsor Castle.

The Hon. Mrs. Hay, Clyffe Hall, Market Lavington (gr. Mr. Lye), exhibited a handsome Melon named Lye's Eclipse, a cross between Sutton's Empress and Fidler's Defiance.

Sir E. Loder, Bart., Leonardslee, Horsham, sent a dish of ripe Pomegranates grown in the open air.

W. H. Evans, Esq., Forde Abbey, Chard (gr. Mr. Crook), sent some very fine Cox's Orange and King of the Pippins Apples, with Coe's Golden Drop and Transparent Gage Plums.

FRUIT COMMITTEE, AT CHISWICK, OCTOBER 5, 1893.

JOHN LEE, Esq., in the Chair, and eight members present.

The Committee examined the collection of Potatos growing in the Gardens. The following were selected as being of handsome appearance and of good cropping qualities. On being sub-

jected to the test of cooking, the following were awarded × × ×, i.e. *Highly Commended* (see page 257):—

Major Neve, from Mr. Fincham, Hartley House, Cranbrook.
 Conference, from Mr. R. Dean.
 Success, from Mr. Alpin.

FRUIT COMMITTEE, OCTOBER 10, 1893.

P. CROWLEY, Esq., in the Chair, and twenty-two members present.

Awards Recommended:—

Gold Knightian Medal.

To Messrs. James Veitch & Sons, Chelsea, for a splendid collection of 200 dishes of Apples and 35 of Pears. Very noticeable amongst the Apples were Bismarck, Sandringham, American Mother, Mère de Ménage, and Seaton House.

To Messrs. Geo. Bunyard & Co., Maidstone, for a splendid collection of 120 varieties of dessert Apples, containing specimens of almost every good variety, and all in very fine condition. Also a collection of Apples arranged in their various classes, e.g. Pearmain, Pippins, Reinettes, Calvilles, Russets, &c., which proved most interesting, and 40 dishes of Pears of very great merit.

Silver Knightian Medal.

To Messrs. John Laing & Sons, for 120 dishes of Apples, remarkably well grown.

To Mr. John Watkins, Pomona Farm, Hereford, for a collection of Cider and other Apples, remarkable for their very brilliant colouring, the majority being of a deep crimson.

To P. Saillard, Esq., Buchan Hill, Crawley (gr. Mr. J. Martin), for 61 dishes of Apples and Pears of large size and handsome appearance.

To Earl Beauchamp, Madresfield Court, Great Malvern (gr. Mr. Crump), for 40 dishes of Pears of large size, remarkably well grown.

Silver Banksian Medal.

To Mr. O. Thomas, The Royal Gardens, Windsor, for 60

dishes of Pears, Knight's Monarch and Seckel being remarkably fine.

Bronze Banksian Medal.

To the Earl of Galloway, Galloway House, Garlieston, N.B. (gr. Mr. James Day), for 12 dishes of large and specially well-grown Pears, which, coming from so far north, were considered very meritorious.

To A. D. Druce, Esq., Gatton, Merstham, Surrey (gr. Mr. Nancey), for some very large and fine Pitmaston Duchess Pears.

To Charles E. Tudway, Esq., The Cedars, Wells, Somerset, for 12 large and very fine fruits of Doyenné du Comice Pears.

First Class Certificate.

To Pear Beurré Fouquieray, from Messrs. Veitch & Sons, Chelsea. Fruits large, obovoid, of a dull green colour. Flesh melting, and of a very pleasant flavour.

To Apple Hambling's Seedling, from W. J. Hambling, Esq., Eastham, Birkenhead (gr. Mr. T. Hazelby). Fruit large, round, pale yellow; very distinct. A promising kitchen variety.

To Potato Early Regent, from Messrs. Veitch & Sons, Chelsea.

To Potato Conference, from Mr. R. Dean, Ealing.

To Potato Jeannie Deans, from Messrs. Carter & Co., Holborn.

To Potato Major T. Neve, from Mr. Fincham, Hartley House, Cranbrook.

To Potato Lillie Langtry, from Mr. H. Fletcher, Annesley.

To Potato Radcliffe Kidney, from Mr. A. Selby, Radcliffe, Notts.

To Onion Cocoanut, from Mr. Deverill, Banbury.

To Onion Globe Madeira, from Messrs. Vilmorin, Paris.

To Onion Prizetaker, from Messrs. Henderson, New York, U.S.A.

To Onion Southport Yellow Globe, from Messrs. Henderson.

To Onion Southport Red Globe, from Messrs. Henderson and Mr. Deverill.

To Onion White Italian Tripoli, from Messrs. Vilmorin.

Cultural Commendation.

To Mr. Sidney Ford, The Laurels, Cowfold, Horsham, for some fine large Marie Louise Pears.

To Mr. John Masterson, Weston House Gardens, Shipston-on-Stour, for very large and fine fruits of Pitmaston Duchess and Uvedale's St. Germain Pears.

To Mr. O. Thomas, The Royal Gardens, Windsor, for a fine Smooth Cayenne Pine Apple, grown from a rootless sucker planted in September 1892.

To Lord Foley, Ruxley Lodge, Esher (gr. Mr. J. Miller), for a Pumpkin weighing 154 lbs.

Other Exhibits.

From the Society's Gardens, Chiswick, were exhibited four varieties of European Grapes, viz. Royal Muscadine, Espiran, Miller's Burgundy, and Chasselas Rose, grown and ripened on an open wall. Also four American varieties, viz. Brighton, Moore's Early (small round black), Virginius, and Duchess (white). The flavour of the American varieties was by some considered to be extremely nice, although peculiar and very distinct from the European Grapes.

Mr. Tayler, Osborn's Nursery, Hampton, exhibited a red Grape named Princess Olga de Würtemberg, which proved to be identical with the old Chasselas Rose.

Mr. Molyneux, Swanmore Park, Bishop's Waltham, sent large and fine fruits of Bramley's Seedling Apple.

Mr. Joseph Lane, Palgrave, Diss, Norfolk, sent six fruits of Grosse Calebasse Pear weighing 7 lbs. 6 oz., and a pretty seedling Apple not quite in condition.

Messrs. Cheal & Sons, Crawley, exhibited 12 dishes of new and little known Apples, some well worthy of attention.

Messrs. R. Veitch & Sons, Exeter, submitted examples of Marie Louise Pears from a tree grafted on the Jargonelle—to show the influence of the stock—the fruits being very much altered in character.

Messrs. Lane & Son exhibited some very large and handsome examples of Lane's Prince Albert Apple.

Messrs. Rivers & Son, Sawbridgeworth, sent fruits of the purple-fruited Crab, a variety very pleasant to the palate.

S. G. Lutwyche, Esq., Eden Park, Beckenham, sent a dish of Improved Perfection Tomato; and Mr. Mortimer, Swiss Nursery, Farnham, sent Tomato Jones's Perfection.

From the Society's Gardens, Chiswick, were sent the several Potatos and Onions which received awards after trial in the Gardens.

FRUIT COMMITTEE, OCTOBER 24, 1893.

P. CROWLEY, Esq., F.L.S., in the Chair, and twenty members present.

Awards Recommended:—

Silver Gilt Knightian Medal.

To the Earl of Harrington, Elvaston Castle, Derby (gr. Mr. Goodacre), for a remarkably fine collection of 80 varieties of Apples and 60 of Pears. The fruits were all large in size, and of very handsome appearance.

To Mr. Deverill, Banbury, for a large and exceptionally fine collection of Onions, containing examples of the following varieties: Anglo-Spanish, Rousham Park, Ailsa Craig, The Lord Keeper, Royal Jubilee, and Advancer. The bulbs were very large and well-ripened, six of the largest weighing 15 lbs.

To Messrs. Sutton & Sons, Reading, for a magnificent and most interesting collection of vegetables—Onions, some very large and fine, showing high cultivation, others as selected for planting for seed; Potatos, several very fine varieties; Scarlet Runners, Turnips, Carrots, Cauliflowers, Green and Purple Kales, &c.

Silver Gilt Banksian Medal.

To Mr. Mortimer, Swiss Nursery, Farnham, for an exhibit of 48 bunches of Alicante and Gros Colmar Grapes, well grown and well coloured; also Apples and Pears, with some very large Quinces.

Silver Banksian Medal.

To Messrs. Rivers & Son, Sawbridgeworth, for a collection of Apples and Pears, amongst them being many little-known sorts of some merit.

Other Exhibits.

From the Government of Nova Scotia came a collection of 100 varieties of Apples, many of great excellence, the most noticeable being Ribston Pippin, Gravenstein, King of Tomkins County, Emperor Alexander, Blenheim Orange, Baldwin, Northern Spy, Wealthy, La Fameuse, Cox's Orange Pippin, and King of the Pippins, all of these being sorts well known and generally grown in this country.

Mr. Weller, Glenstall Gardens, Murroe, Limerick, sent some fine examples of Ribston Pippin Apple.

Mr. Thomas, The Royal Gardens, Windsor, sent a Melon, which proved to be wonderfully good for so late in the season.

Another Melon came from Mr. Perkins, Thornham Hall, which was also of high quality.

Seedling Apples were submitted by Mr. A. T. White, Bow Hill, Maidstone; Mr. Crump, Madresfield; Messrs. Cooper, Taber & Co.; and Messrs. Paul & Son, Cheshunt.

Mr. Allis, Old Warden Park, Biggleswade, sent some Gros Colmar Grapes ripened on the open wall, and some late Tomatos.

From Mr. John Basham, Fair Oak Gardens, Bassaleg, Newport, came examples of Green Curled Savoys and Early Dwarf Cabbages.

Mr. Carmichael, 14 Pitt Street, Edinburgh, sent a Savoy having the edges of the leaves of a silvery white.

From the Society's Gardens were exhibited examples of Batavian Endive, the hearts beautifully blanched. This is a very excellent salad for the autumn months, not sufficiently known or cultivated.

Prizes.

Class 2.—Pears grown in the open, six dishes of dessert, six fruits to a dish. Amateurs. *First Prize*, Silver Banksian Medal and £1, to J. W. Melles, Esq., Sewardstone Lodge, Chingford (gr. Mr. J. Nicholson). *Second Prize*, 15s., to Mr. T. Osman, Ottershaw Park, Chertsey.

Class 3.—Six bunches of Grapes, not less than three varieties. Amateurs. *First Prize*, Silver Banksian Medal and £2, to Mr. T. Osman, Ottershaw Park, Chertsey.

Class 4.—Six bunches of Grapes, for flavour; not less than three varieties. Amateurs. *First Prize*, Silver Banksian Medal and £2, to Mr. T. Osman, Ottershaw Park, Chertsey.

FRUIT COMMITTEE, NOVEMBER 14, 1893.

P. CROWLEY, Esq., F.L.S., in the Chair, and twelve members present.

Awards Recommended:—

Silver Banksian Medal.

To Messrs. Cannell & Sons, Swanley, for a collection of 62

varieties of Potatos. The following were the more noticeable and attractive varieties: Our Boy, Come to Stay, Vicar of Laleham, The Dean, Snowdrop, and Schoolmaster.

Other Exhibits.

W. Jenkins, Esq., The Willows, Abergavenny, sent examples of Monmouthshire Beauty Apple. The fruits are of medium size, somewhat conical in shape, of a beautiful rich crimson colour; flesh tender and sweet.

J. Hopwood, Esq., Ketton Hall (gr. Mr. Divers), sent Apple Barnack Beauty, a variety raised at Burghley. Fruits medium size, roundish, flushed and streaked with rich crimson; fair quality.

W. Roupell, Esq., Harvey Lodge, Roupell Park, S.W., exhibited very large and handsome examples of Apple Newton Wonder, a variety certificated in 1887.

Mr. T. Edmeads, Bevingford, Uckfield, sent a seedling Apple named Edmeads' Seedling.

Mr. W. J. Godfrey, Claremont, Exmouth, sent examples of a second crop of Apples which had been produced on some young trees planted late in spring.

W. H. Evans, Esq., Forde Abbey (gr. Mr. J. Crook), sent a dish of Coe's Late Red Plum.

Earl Cowper, Panshanger, Herts (gr. Mr. Fitt), sent a fine bunch of Banana Lady's Finger, a variety of excellent quality.

From the Society's Gardens came a large collection of Celeries which had been grown for trial (*see* p. 249).

FRUIT COMMITTEE, NOVEMBER 28, 1893.

P. CROWLEY, Esq., F.L.S., in the Chair, and eighteen members present.

Awards Recommended:—

Silver Knightian Medal.

To Sir E. G. Loder, Bart., Leonardslee, Horsham (gr. Mr. Goldsmith), for a large and very fine collection of 28 varieties of

Apples and 13 of Pears. Conspicuous amongst the Apples were King of the Pippins, Newton Wonder, Bismarck, Barnack Beauty, Sandringham, Adams's Pearmain, Annie Elizabeth, Blenheim Orange, Cox's Orange, and Ribston Pippin; and amongst the Pears—Beurré Bachelier, Huyshe's Victoria, Duchesse de Mouchy, Beurré Gendron, Beurré Alexandre Lucas, and Bergamotte d'Esperen.

Bronze Banksian Medal.

To T. Arnall, Esq., Brookside, Headington Hill, Oxford, for 11 enormously large fruits of Uvedale's St. Germain Pears.

Award of Merit.

To Apple Byford Wonder (votes, unanimous), from The English Fruit and Rose Co., Hereford, and from Mr. J. Watkins, Withington Nurseries, Hereford. Fruits large, greenish yellow; flesh tender, juicy, and pleasant.

Cutural Commendation.

To C. E. Smith, Esq., The Lodge, Silvermere, Cobham, for a fine bunch of Banana (Musa) Cavendishi.

Other Exhibits.

Messrs. W. E. Browne & Sons, Wells, Somerset, exhibited examples of Apple Bartlett's Glory, which had been kept at Chiswick from the meeting on September 26, to test their keeping properties.

Messrs. Geo. Bunyard & Co., Maidstone, sent two seedling Apples named Foster's Scarlet Pippin and Bunyard's Christmas Pearmain.

Messrs. John Peed & Sons, Norwood, sent a pretty-looking Apple named Ouseley's King of the Valley.

Messrs. Chantrier Frères, Mortefontaine, France, sent some fruit of Diospyrus Kaki grown on an open wall.

The Liverpool Horticultural Co., Garston, Liverpool, sent examples of a new seedling Grape named Hambro' Colmar, which very closely resembled Gros Colmar.

FRUIT COMMITTEE, DECEMBER 12, 1893.

PHILIP CROWLEY, Esq., F.L.S. in the Chair, and twenty-two members present.

Awards Recommended :—

Silver Knightian Medal.

To Messrs. Lane & Son, Berkhamstead, for a collection of 70 varieties of highly coloured and well-grown Apples, especially noticeable being Lane's Prince Albert, Cox's Orange Pippin, Golden Noble, Hoary Morning, Gascoigne's Scarlet, King of the Pippins, Bismarck, and Dumelow's Seedling.

Bronze Banksian Medal.

To Messrs. John Laing & Sons, Forest Hill, for 30 dishes of well-grown Apples—Claygate Pearmain, Sandringham, Lane's Prince Albert, and King of the Pippins being particularly fine.

First Class Certificate.

To seedling Orange Edith (votes, unanimous), from D. C. A. Cave, Esq. (gr. Mr. Stevens), Stoneleigh House, Clifton Park, Bristol. Fruits of good size, roundish ovoid, pale yellow, very juicy and richly flavoured.

Award of Merit.

To Cabbage Christmas Drumhead (votes, unanimous), from the Society's Gardens, Chiswick, from seed received from M. Vilmorin, of Paris, and M. Guiheneuf, of Nantes, France. A dwarf, very hardy variety of the St. John's Day Drumhead Cabbage.

Cultural Commendation.

To Mr. O. Thomas, Royal Gardens, Windsor, for some very fine winter Tomatos. The Committee expressed a wish to see the same variety in February.

Other Exhibits.

Messrs. Veitch & Sons, Chelsea, sent several varieties of Curled Kale and Brussels Sprouts; and from the Society's Gardens were brought varieties of Brussels Sprouts and examples of Couve Tronchuda.

Messrs. Osman & Co., 132 Commercial Street, sent a pair of Grape-scissors of a novel pattern, which were requested to be sent to Chiswick for trial with others.

FLORAL COMMITTEE.

CHISWICK SHOW, JULY 11, 1893.

W. MARSHALL, Esq., in the Chair, and eleven members present.

Awards Recommended :—

Silver Gilt Flora Medal.

To Messrs. C. Lee & Son, Hammersmith, for a splendid collection of the variegated forms of hardy evergreen and deciduous trees and shrubs, amongst which were some excellent examples of *Salisburia adiantifolia aurea*, *Acers* in variety, *Euonymus*, *Osmanthus aurea variegata*, *Prunus Pissardii*, Golden Privet, &c.

To Mr. H. B. May, Dyson's Lane, Edmonton, for a magnificent group of plants, consisting principally of a great variety of Ferns, noteworthy being *Adiantum farleyense*, *Pteris Mayi*, *P. Victoriæ*, *Nephrolepis davallioides multiceps*; also *Aralia elegantissima*, *Dracænas*, *Caladiums*, and a few richly coloured *Codiæums*. The group was edged with *Isolepis gracilis*.

Silver Flora Medal.

To Martin R. Smith, Esq., Hayes Common, Beckenham (gr. Mr. Blick), for a beautiful display of Carnations, of old and new varieties, noticeable being *Siurus*, a beautiful yellow, spotted with scarlet; *Catherine Glover*; *Bendigo*, large purple flowers; *Duke of Orleans*, flowers rich yellow; *Cherry Ripe*; *Ellen Terry*, a fine large white variety, &c.

To Messrs. B. S. Williams & Son, Upper Holloway, for a group of plants, conspicuous amongst them being *Codiæum Golden Ring*, a fine variety; *Caladiums*, *Bertolonias*, *Ochna multiflora*, *Dracæna Goldieana*, *Brassavola Digbyana*, &c.

To Messrs. Sutton & Sons, Reading, for a group of the *semperflorens* section of *Begonias*. The plants were only six months old from the seed, and were flowering in the greatest profusion. The following varieties are worthy of special mention: *Crimson Gem*, flowers crimson, dwarf habit; *Duchess of York*, bright rose; *Coral Gem*, flowers pink, carried in clusters; *Reading Snowflake*, white. *Stocks* and *Achimenes* were also shown.

Silver Banksian Medal.

To Mr. T. S. Ware, Hale Farm, Tottenham, for a group of Carnations.

Bronze Banksian Medal.

To E. H. Watts, Esq., Devonhurst, Chiswick (gr. Mr. Porteous), for a group of large Ferns—Platyceriums, Adiantums, Davallias, &c.

First Class Certificate.

To *Lilium Lowii* (votes, 8 for), from Messrs. Hugh Low & Co., Clapton. Flowers medium-sized, white, spotted with crimson.

Award of Merit.

To *Alstrœmeria aurantiaca* (votes, 8 for, 1 against), from G. H. Cammell, Esq., Hathersage, Sheffield. Flowers large, deep orange, the two upper petals striped with dark brownish crimson. An old garden favourite.

To *Nicotiana colossea variegata* (votes, 6 for, 2 against), from Mons. J. Sallier, Neuilly, Paris. The plant exhibited was about 8 inches high, with handsome broad leaves, pale green in the centre, with irregular creamy-white edges.

To *Dracæna indivisa aurea variegata* (votes, 7 for, 1 against), from Messrs. J. Laing & Sons, Forest Hill. Leaves long and narrow, green, striped with creamy white.

To *Caladium Baronne de Maimore* (votes, 6 for), from Messrs. J. Laing & Sons. Leaves large and handsome, the ground colour creamy white, with deep red veins and markings.

Botanical Certificate.

To *Ferraria antherosa* (votes, unanimous), from Messrs. J. Veitch & Sons, Chelsea. Leaves long and narrow; flowers borne on a spike 18 inches long, brown, with a yellow base and deep brown blotches.

Other Exhibits.

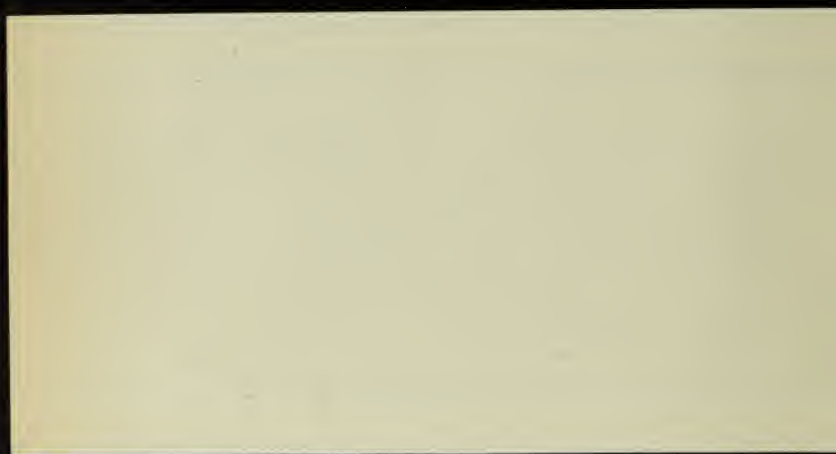
G. H. Cammell, Esq., Hathersage, Sheffield, sent cut blooms of *Aster diplostefioides*.

Mrs. Blake, Duppas Hill Terrace, Croydon (gr. Mr. G. Lewry), exhibited a new *Lobelia* named Lewry's Beauty.

The Hon. G. M. Fortescue, Dropmore (gr. Mr. C. Herring), sent cut blooms of a seedling crimson Clove Carnation.

ERRATUM.—Under “*First Class Certificate*” on p. cl insert

To *Lilium japonicum Alexandræ* (votes, unanimous), from Messrs. J. Veitch & Sons, Chelsea, and from Messrs. Wallace & Co., St. John's Street, Colchester. This beautiful Lily was shown under the name of *L. Alexandræ* by Messrs. Veitch, and as *L. Ukeyuri* by Messrs. Wallace & Co., but Mr. J. G. Baker, of Kew, has defined it as a variety of Thunberg's *L. japonicum*. (See *Gard. Chron.*, July 22, 1893, p. 86; Aug. 26, 1893, p. 242, fig. 44.) The large white flowers are six to eight inches across when fully expanded, and the plant is vigorous in growth.



Mons. V. Lemoine, Nancy, exhibited Begonias Illustration, La France, Sieberiana, &c.

Mr. Anthony Waterer, Knap Hill, Woking, exhibited Spiræa Bumalda Anthony Waterer (*see* page clvii).

Messrs. Laxton Bros., Bedford, sent flowers of Sweet Pea Princess May. The Committee requested that it might be tried at Chiswick.

Messrs. R. Veitch & Son, Exeter, exhibited cut flowers of hardy shrubs—*Colutea arborescens purpurea*, *Cytisus capitatus*, *C. nigricans*. The Committee desired to see a plant of the last-named.

Messrs. J. Veitch & Sons, Chelsea, sent plants of *Strobilanthes Dyerianus*, and *Pitcairnia amaryllidifolia*, the latter with flowers of a brilliant scarlet colour, borne on a spike.

Messrs. J. Laing & Sons exhibited Begonias Sunbeam and Lady Balfour of Burleigh.

CHISWICK LOCAL SHOW.

Prizes.

Class 1.—Group of Plants arranged for effect, to occupy a space not exceeding 100 square feet. Open. *First Prize*, R.H.S. Silver Flora Medal, and £3. 3s. (presented by Lady George Hamilton), to Messrs. Fromow & Sons, Chiswick.

Class 2.—Group of Plants arranged for effect, to occupy a space not exceeding 75 square feet. Amateurs. *First Prize*, R.H.S. Silver Flora Medal, and £3 (presented by the Duke of Devonshire), to E. H. Watts, Esq., Devonhurst, Chiswick (gr. Mr. A. Porteous). *Second Prize*, £2, to Dr. Tuke, Chiswick House (gr. Mr. Apland).

Class 3.—Group of Pelargoniums (of any class) in pots, to occupy a space not exceeding 100 square feet. Open. *First Prize*, £3. 3s. (presented by Leopold de Rothschild, Esq.), to Mr. C. Turner, Slough.

Class 4.—Group of 12 Tuberous Begonias in flower, distinct, arranged with small foliage plants. Amateurs. *First Prize*, Silver Cup, value £5 (presented by the Turner Memorial Trustees), to Sir C. Pigott, Bart., Wexham Park, Slough (gr. Mr. Ford).

Class 6.—Six Coleus, distinct, in pots not exceeding 10 inches. Amateurs. *First Prize*, £1, to A. Russell, Esq., The Woodlands, Isleworth, W.

Class 7.—Three Zonal Pelargoniums, distinct. Amateurs. *First Prize*, 10s., to T. F. H. Hodgson, Esq., Ranelagh House, Chiswick (gr. Mr. Davis).

Class 9.—Six Hardy Ferns, distinct. Amateurs. *First Prize*, 15s., to Col. the Hon. W. P. Talbot, Glenhurst, Esher (gr. Mr. C. J. Waite).

Class 13.—Six Gloxinias, in pots, distinct. Amateurs. *First Prize*, 15s., to T. E. H. Hodgson, Esq.

Class 19.—Twenty-four Roses, distinct, 3 blooms of each. Open. *First Prize*, Silver Challenge Cup, value £26. 5s. (presented by J. Mantell, Esq., Ringstead, Gunnersbury), to Messrs. Harkness & Son, Bedale, Yorks. *Second Prize*, £3, to Mr. B. R. Cant, Colchester. *Third Prize*, £2, to Mr. Frank Cant, Colchester. The winner of the cup will hold it for one year, but it will become the property of any exhibitor winning it three times (not necessarily in succession). It has been won twice by Mr. B. Cant, once by Mr. F. Cant, and now by Messrs. Harkness & Son.

Class 20.—Twenty-four Roses, distinct. Open. *First Prize*, Silver Flora Medal, and £2 (presented by the Marquis of Bute), to Messrs. Harkness & Son. *Second Prize*, £1. 10s., to Mr. George Mount, Canterbury. *Third Prize*, £1, to Mr. B. Cant.

Class 21.—Twelve bunches of Hardy Herbaceous Perennials, distinct, bulbs admissible. Amateurs. *First Prize*, Silver Flora Medal and £1. 10s., to the Earl of Dysart, Ham House, Richmond (gr. Mr. G. H. Sage). *Second Prize*, £1, to Dr. Tuke.

Class 22.—Eight bunches of Hardy Herbaceous Perennials, distinct, bulbs admissible. Amateurs. *First Prize*, Bronze Flora Medal and £1, to Miss R. Debenham, St. Albans, Herts. *Second Prize*, 15s., to Messrs. de Rothschild, Gunnersbury House, Acton (gr. Mr. J. Hudson).

Class 23.—Twelve Roses, distinct. Amateurs. *Second Prize*, 15s., to John Bateman, Esq., Rosevale, Archway Road, N.

Class 25.—Twelve bunches of Stove or Greenhouse Flowers, distinct. Amateurs. *First Prize*, £1, to E. H. Watts, Esq.,

Chiswick (gr. Mr. Porteous). *Second Prize*, 15s., to Dr. Tuke. *Third Prize*, 10s., to T. E. H. Hodgson, Esq. *Extra Prize*, 10s., to T. J. Cooper, Esq., The Grange, West Molesey (gr. Mr. J. Hoar).

Class 26.—Twelve bunches of Zonal Pelargoniums, not less than 6 varieties, 3 trusses to a bunch. Amateurs. *First Prize*, 10s., to T. E. H. Hodgson, Esq. *Second Prize*, 7s., to T. J. Cooper, Esq.

Class 28.—A Stand or Vase of Flowers for table decoration. Amateurs. *First Prize*, 15s., to Miss Lilian Hudson, Gunnersbury House, Acton.

Class 29.—A Stand or Vase of Flowers, &c., for hall decoration. Amateurs. *First Prize*, 15s., to Miss Lilian Hudson.

Class 35.—Two bunches of Black Grapes, ripe. Amateurs. *First Prize*, 15s. (presented by J. Colbourne, Esq., F.R.H.S.), to Mr. T. Osman, Ottershaw Park Gardens, Chertsey. *Second Prize*, 10s., to Col. the Hon. W. P. Talbot.

Class 36.—Two bunches of White Grapes, ripe. Amateurs. *First Prize*, 15s. (presented by J. Colbourne, Esq., F.R.H.S.), to Mr. T. Osman. *Second Prize*, 10s., to W. A. South, Esq., Neasden House, N.W. (gr. Mr. C. Payne). *Third Prize*, 6s., to E. H. Watts, Esq.

Class 38.—A dish of Strawberries, 30 fruits, one variety. Amateurs. *First Prize*, 5s. (presented by J. Colbourne, Esq., F.R.H.S.), to J. T. Hopwood, Esq., Ketton Hall, Stamford (gr. Mr. W. H. Divers).

Class 40.—Six Peaches. Amateurs. *First Prize*, 7s. 6d. (presented by J. Colbourne, Esq., F.R.H.S.), to A. Pears, Esq., Spring Grove, Isleworth (gr. Mr. Debnam). *Equal First*, 7s. 6d., to Mr. R. Gilbert, Burghley. *Second Prize*, 5s., to Sir C. Pigott. *Third Prize*, 3s., to Col. the Hon. W. P. Talbot.

Class 41.—Six Nectarines. Amateurs. *First Prize*, 7s. 6d. (presented by J. Colbourne, Esq., F.R.H.S.), to Col. the Hon. W. P. Talbot. *Second Prize*, 5s., to Sir C. Pigott. *Third Prize*, 3s., to the Earl of Dysart.

Class 42.—Six dishes of Vegetables, distinct. Amateurs. *First Prize*, £1, to Col. the Hon. W. P. Talbot. *Second Prize*, 10s., to W. A. South, Esq. *Third Prize*, 5s., to A. Russell, Esq. Prizes presented by Messrs. James Carter & Co., 237 High Holborn, London.

Class 43.—Three dishes of Potatos, distinct, 9 tubers to a dish. Amateurs. *First Prize*, 10s., to Col. the Hon. W. P. Talbot. *Second Prize*, 7s., to Mr. A. Farmer, Blenheim Road, Gunnersbury. *Third Prize*, 4s., to the Earl of Dysart.

Class 44.—Three dishes of Tomatos, distinct, 9 fruits to a dish. Amateurs. *First Prize*, 10s., to the Earl of Dysart. *Second Prize*, 7s. 6d., to W. A. South, Esq.

Class 45.—A brace of Cucumbers. Amateurs. *First Prize*, 5s., to T. E. H. Hodgson, Esq. *Second Prize*, 4s., to Dr. Tuke. *Third Prize*, 3s., to A. Russell, Esq.

Class 46.—Three dishes of Peas, 24 pods each, of Sharpe's Sir F. A. Milbank, Sharpe's Queen, and Sharpe's Triumph. Open. *First Prize*, £2. 2s., to H. Balderson, Esq., Corner Hall, Hemel Hempstead. *Second Prize*, £1. 1s., to Col. the Hon. W. P. Talbot. *Third Prize*, 10s. 6d., to Mr. T. Watkins, Grove House, Merrow. Prizes presented by Messrs. Sharpe & Co., Sleaford, Lines.

Class 48.—Specimen Plant in flower. Cottagers. *First Prize*, 5s., to Mr. A. Farmer. *Second Prize*, 3s., to Mr. R. Walker, Dean's Cottages, Strand-on-the-Green.

Class 49.—Two Fuchsias in bloom. Cottagers. *First Prize*, 5s., to Mr. A. Farmer.

Class 50.—Two Zonal Pelargoniums in bloom. Cottagers. *First Prize*, 5s., to Mr. R. Walker. *Second Prize*, 3s., to Mr. A. Farmer. *Third Prize*, 2s., to Mr. J. J. Stickler, 386 High Road, Chiswick.

Class 51.—Two Begonias in flower. Cottagers. *First Prize*, 5s., to Mr. R. Walker. *Second Prize*, 3s., to Mr. A. Farmer. *Third Prize*, 2s., to Mr. J. J. Stickler.

Class 52.—Two Balsams in flower. Cottagers. *Second Prize*, 3s., to Mr. A. Farmer.

Class 53.—A Window-box of Flowering Plants, not exceeding 3 ft. 6 in. long. Cottagers. *First Prize*, 10s., to Mr. J. Gale, Belgrave Terrace, Bollo Lane, Chiswick. *Second Prize*, 7s., to Mr. T. Nelhams, Reynolds Road, Acton Green. Prizes presented by Mr. Alderman Hardy, F.R.H.S.

Class 54.—Six Plants in pots, in flower, distinct. Cottagers. *First Prize*, 10s., to Mr. R. Walker. *Second Prize*, 6s., to Mr. A. Farmer.

Class 56.—Vegetables, distinct, in basket or tray not ex-

ceeding 3 ft. in diameter. Cottagers. *First Prize*, 10s., to Mr. A. Farmer. *Second Prize*, 7s., to Mr. J. Gale. *Third Prize*, 4s., to Mr. Eli Dean, 84 Antrobus Road, Acton Green. Prizes presented by W. Mobsby, Esq.

Class 57.—Twenty-four pods of Broad Beans. Cottagers. *First Prize*, 4s., to Mr. A. Farmer. *Second Prize*, 3s., to Mr. J. J. Stickler.

Class 58.—Thirty-five pods of Scarlet Runner Beans. Cottagers. *First Prize*, 4s., to Mr. A. Farmer.

Class 59.—Three Cabbages. Cottagers. *First Prize*, 4s., to Mr. A. Farmer. *Second Prize*, 3s., to Mr. Jesse Mole, Old Oak Common, Acton Green. *Third Prize*, 2s., to Mr. J. Gale.

Class 60.—Twelve Onions. Cottagers. *First Prize*, 4s., to Mr. A. Farmer.

Class 61.—Two dishes of Potatos, distinct, 8 tubers to a dish. Cottagers. *First Prize*, 4s., to Mr. A. Farmer. *Second Prize*, 3s., to Mr. J. Gale. *Third Prize*, 2s., to Mr. J. Mole.

Class 62.—A dish of Potatos, 8 tubers to a dish. Cottagers. *First Prize*, 3s., to Mr. J. J. Stickler. *Second Prize*, 2s., to Mr. E. Dean.

Class 63.—A dish of Peas, 60 pods. Cottagers. *First Prize*, 4s., to Mr. W. Wells, 2 Mitchel's Row, Richmond. *Second Prize*, 3s., to Mr. A. Farmer.

Class 64.—Two Vegetable Marrows. Cottagers. *First Prize*, 4s., to Mr. J. Mole. *Second Prize*, 3s., to Mr. A. Farmer.

Class 65.—Six Carrots. Cottagers. *First Prize*, 4s., to Mr. A. Farmer. *Second Prize*, 3s., to Mr. J. Mole. *Third Prize*, 2s., to Mr. J. Gale.

Class 66.—Six Turnips. Cottagers. *First Prize*, 4s., to Mr. A. Farmer.

Class 67.—Four Hardy Fruits, distinct, shown in basket or tray. Cottagers. *First Prize*, 7s. 6d., to Mr. A. Farmer.

FLORAL COMMITTEE, AT CHISWICK, JULY 20, 1893.

W. MARSHALL, Esq., in the Chair, and five members present.

The Committee met at the Society's Gardens to examine Cannas, Carnations, Phloxes, and Violas.

Awards Recommended :—

Highly Commended (× × ×).

(For Cannas, Phloxes, and Violas, *see* pp. 242 to 247.)

To Carnation Meteor (votes, 3 for, 2 against), from Mr. J. Forbes, Hawick. Flowers scarlet, flaked with slate colour.

To Carnation Vesuvius (votes, unanimous), from Mr. Forbes. Flowers deep crimson, edged with purple.

To Carnation Mrs. Gifford (votes, unanimous), from Messrs. J. Veitch & Sons. Flowers pure white, large, and of good form ; petals slightly fringed.

To Carnation Lady Gerard (votes, 3 for), from Messrs. Dicksons, Chester. Flowers soft salmon colour, medium sized ; petals fringed.

To Carnation Blushing Beauty (votes, 4 for, 1 against), from Messrs. Dicksons. Flowers delicate pink.

To Carnation Hofgartner Schofer (votes, unanimous), from Messrs. Dicksons. Flowers white, striped with vermilion.

FLORAL COMMITTEE, JULY 25, 1893.

W. MARSHALL, Esq., in the Chair, and seventeen members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. J. Laing & Sons, Forest Hill, S.E., for a fine display of foliage and flowering plants, consisting of Palms, Tuberous and Rex Begonias, Codiaëums Countess, Golden King, and Aigburth Gem ; Caladium Lillie Burke, leaves large, white, rose-coloured centre, netted with deep rose ; Abutilon Souvenir de Bonn, Saccolabium Blumei majus, &c.

Silver Banksian Medal.

To Messrs. E. D. Shuttleworth & Co., Peckham Rye, for a group of plants, amongst which were some small well-coloured Codiaëums, noteworthy being C. Hawkeri, leaves green, yellow centre ; C. Princess of Wales ; C. Chelsoni, a rich narrow-leaved variety ; also Dracæna Lindenii, Caladium argyrites, Hydrangea paniculata grandiflora, &c.

To Messrs. H. Cannell & Sons, Swanley, for a group of Tuberous Begonias, grown from seed sown in February. The plants were dwarf, and flowering very freely.

To Mr. H. Eckford, Wem, Salop, for a collection of Sweet Peas and seedling Pansies. Among the Sweet Peas the following were noticeable: Novelty, flowers salmon-pink; Mrs. Eckford, very pale yellow; Blanche Burpee, white; W. E. Gladstone, rosy pink; Lady Penzance, soft salmon-red; Captain of the Blues, light blue, &c.

Bronze Banksian Medal.

To J. T. Hopwood, Esq., Ketton Hall, Stamford (gr. Mr. W. H. Divers), for a group of Border Carnations, arranged in bunches with foliage. Amongst them were good examples of Ketton Rose, a beautiful free-flowering variety; Fireman, scarlet; Duchess of Portland, Winter Cheer, &c.

To Mr. P. McArthur, London Nursery, Maida Vale, W., for a group of foliage and flowering plants, consisting of Palms, *Eucomis undulata*, *Cypripedium Volonteanum*, *C. Curtisii*, *Oncidium prætextum*, Ferns, *Codiaeums*, &c.

First Class Certificate.

To *Cupressus macrocarpa lutea* (votes, 9 for, 5 against), from Messrs. Dicksons, Chester. A compact and slender-growing Conifer, in which the young shoots are of a golden-yellow colour. Very distinct and handsome.

To *Campanula (Platycodon) grandiflora Mariesi* (votes, unanimous), from Messrs. Paul & Son, Cheshunt. A very dwarf-growing *Campanula*, with large bell-shaped flowers, measuring about three inches across, of a pretty shade of blue.

To *Spiræa Bumalda* Anthony Waterer (votes, unanimous), from Mr. Anthony Waterer, Knap Hill, Woking. A splendid dark crimson-scarlet variety of this pretty, free-flowering, hardy *Spiræa*, of dwarf habit and compact growth.

Award of Merit.

To Tuberous Begonia Mrs. Bourne (votes, 12 for, 2 against), from Mrs. Darwin, The Grove, Huntingdon Road, Cambridge (gr. Mr. Bourne). Flowers single, deep orange-yellow, the sepals shading from yellow to green.

To Carnation *Esmeralda* (votes, 12 for), from Mr. F. Bull,

Wormingford, Colchester. Flowers bronzy yellow, splashed with violet-mauve.

To Sweet Pea Eliza Eckford (votes, 12 for, 3 against), from Mr. Eckford, Wem. Flowers white, tinged with pink.

To Sweet Pea The Belle (votes, 8 for, 7 against), from Mr. Eckford, Wem. Flowers of a rich pink.



FIG. 33.—*DIDYMOCARPUS LACUNOSA*. (*Gardeners' Chronicle*.)

To *Caladium Le Nain Rouge* (votes, 11 for), from Messrs. J. Laing & Sons, Forest Hill. Leaves small, red; habit dwarf, similar to *C. argyrites*.

Botanical Certificate.

To *Didymocarpus lacunosa* (votes, unanimous), from Messrs. J. Veitch & Sons, Chelsea. A very dwarf-growing plant with

bright green serrated leaves; flowers of a deep violet-purple, carried on stalks about four inches high (fig. 33).

Other Exhibits.

L. de Bunsen, Esq., Wisbech, sent blooms of a seedling Carnation.

Lady Ethel Wickham, Barnwell Castle, Oundle, Northamptonshire, exhibited blooms of Carnations Mrs. Reynolds Hole and some unnamed seedlings.

Messrs. Paul & Son, Cheshunt, staged a very bright collection of hardy herbaceous flowers, amongst which were some good examples of *Callirhoe involucrata*, *Coreopsis lanceolata*, *Oenothera speciosa*, and *Gladiolus Saundersi superbus*.

Mr. James Taylor, 5 Leigh Road, New Ferry, Cheshire, sent blooms of Tuberous Begonias.

Mr. F. Rømer, Quedlinburg, exhibited plants of *Humulus japonicus variegatus*.

E. Domaille, Esq., La Colombelle, Guernsey, sent blooms of a seedling Carnation, La Villette.

Mr. C. Titmus, Harvey Road Nursery, Leytonstone, exhibited *Pelargonium Duchess of York*, a sport from Mrs. Parker.

Messrs. J. Veitch & Sons, Chelsea, exhibited a group of flowering plants, conspicuous amongst them being *Rhododendron* × *Sylvia*, flowers rich clear yellow; *Lantana Drap d'Or*, dwarf habit with yellow flowers; *Gladiolus* in variety, &c.

Mr. F. Bull, Wormingford, Colchester, sent blooms of Carnations *Espérance*, *The Nabob*, &c.

FLORAL COMMITTEE, AT CHISWICK, AUGUST 2, 1893.

W. MARSHALL, Esq., in the Chair, and ten members present.

The Committee met at the Society's Gardens to examine Phloxes, Begonias, &c.

Awards Recommended:—

Highly Commended (× × ×).

(For Phloxes see p. 242.)

To Tuberous Begonia Lafayette (votes, unanimous), from

M. Vilmorin, Paris. Flowers double, brilliant crimson-scarlet ; very dwarf.

Commended (× ×).

To strain of *Dianthus Heddewigii* (votes, 9 for), from M. Vilmorin, Paris.

FLORAL COMMITTEE, AUGUST 8, 1893.

W. MARSHALL, Esq., in the Chair, and nineteen members present.

Awards Recommended:—

Silver Gilt Flora Medal.

To Messrs. de Rothschild, Gunnersbury House, Acton (gr. Mr. J. Hudson), for a magnificent group of well-grown *Campanula pyramidalis* and *C. pyramidalis alba*, arranged with Ferns.

To Messrs. Kelway & Sons, Langport, Somerset, for an extensive collection of *Gladioli*, *Gaillardias*, Cannas, *Amaryllis Belladonna*, *Delphiniums*, &c. Amongst the *Gladioli* the following were very striking : Duke of Edinburgh, large salmon-pink ; *Maricanus*, crimson ; Hermon, a beautiful salmon-red ; Leonard Kelway, red ; Castro, James Payne, &c.

To Messrs. J. Laing & Sons, Forest Hill, for a group of plants. Specially noticeable were *Begonia semperflorens*, Vernon's variety (*see p. clxv*), a pretty dwarf, free-flowering bedding variety, with crimson flowers and bronzy-green foliage ; *Codiaeum Mortii*, having large green leaves with yellow midrib and veins ; *Strobilanthes Dyerianus*, *Caladiums*, Ferns, Palms, &c.

Silver Flora Medal.

To Mr. John Forbes, Hawick, N.B., for a large exhibit of Hollyhocks, the spikes being remarkably fine, and the flowers double ; the most noticeable varieties were *Excelsior*, James Macdonald, *Alba superba*, &c. *Antirrhinums* and *Pentstemons* were also shown.

To Messrs. Paul & Son, Cheshunt, for a collection of *Polyantha* and Hybrid Perpetual Roses, herbaceous flowers, hardy shrubs, &c. (the Roses included good examples of *Bouquet d'Or*, *Her Majesty*, *Alfred Colomb*, &c.); *Liliums*,

Phloxes, Montbretias, *Zauschneria californica*, Cannas, *Clethra speciosa* (a somewhat rare shrub of dwarf habit, with white sweetly scented flowers), &c.

To Messrs. Cannell & Sons, Swanley, for an extensive display of single and double Begonias, noteworthy being Mrs. G. Gurney; Octavie, pure white; Sir J. D. Hooker, salmon-red, &c.

To Messrs. Dobbie & Co., Rothesay, N.B., for a group of Border Carnations and Sweet Peas. Amongst the former were good specimens of Gloire de Nancy, large pure white flowers; Leander, very deep yellow; Mary Morris, a beautiful rosy pink. Amongst the Sweet Peas the following were worthy of note: Her Majesty, bright rosy pink; Boreaton, dark crimson; and Queen of England, pure white.

Silver Banksian Medal.

To Sir Trevor Lawrence, Bart., Burford Lodge, Dorking (gr. Mr. Bain), for a group of Cannas, including Madame Crozy, Professor David, &c. Also spikes of varieties of *Gladiolus Childsii*, William Falconer and Columbia being very conspicuous.

To Messrs. E. D. Shuttleworth & Co., Fleet, for a group of herbaceous flowers and Roses. Amongst the herbaceous flowers were some very good examples of *Scabiosa caucasica* (flowers pale blue), *Polemonium himalaicum*, *Gladioli*, &c.

To Messrs. J. Cheal & Sons, Crawley, for a very fine display of Sweet Peas; Single, Fancy, Cactus, and Pompon Dahlias; Antirrhinums and Pentstemons.

First Class Certificate.

To *Tritonia crocosmæflora* fl. pl. (votes, 13 for, 1 against), from Sir Trevor Lawrence, Bart., Burford Lodge, Dorking (gr. Mr. Bain). A free-blooming variety, in which the flowers are semi-double and of a bright golden yellow (fig 34.).

To *Liatris pycnostachya* (votes, unanimous), from Messrs. Paul & Son, Cheshunt. An old-fashioned hardy herbaceous plant, which carries its soft purple flowers upon long spikes.

To *Grevillea Banksii* (votes, 13 for), from Messrs. J. Laing & Sons, Forest Hill. The plant shown was about 18 inches high; leaves 8 inches long, pale green in colour, and deeply pinnatifid.

Award of Merit.

To *Canna Michelet* (votes, unanimous), from Sir Trevor Lawrence, Bart., Dorking. Flowers large brilliant crimson.



FIG. 34.—TRITONIA CROCOSMEFLORA FL. PL. (*Journal of Horticulture.*)

To *Hedera helix tessellata* (votes, 9 for), from Miss Brown-ing-Hall, Algiers. A free-growing, broad, green-leaved Ivy, beau-tifully netted with yellow.

To *Canna Duchess of York* (votes, 9 for, 2 against), from Messrs. Kelway & Son, Langport. Large yellow flowers, spotted and stripped with brownish red.

To *Canna Königin Charlotte* (votes, 13 for), from Herr W. Pfitzer, Stuttgart, Germany. The plant is of dwarf habit, with broad dull green foliage and large orange-scarlet flowers, with a bordering of clear yellow.

To *Canna Gloire d'Empel* (votes, unanimous), from Messrs. Vilmorin, Paris. Large rich crimson-scarlet flowers.

To *Canna Lohengrin* (votes, unanimous), from Messrs. Vil-morin. Flowers orange-scarlet ; distinct.

To *Canna Capitaine de Suzzoni* (votes, unanimous), from M. Lemoine, Nancy. A very large-flowered variety ; clear yellow, with brown spots.

To *Hollyhock Amaranth* (votes, unanimous) from Messrs. Webb & Brand, Saffron Walden. A seedling with large double flowers ; colour beautiful rich pink.

To *Tritoma (Kniphofia) Osiris* (votes, 10 for, 2 against), from Messrs. Paul & Son, The Old Nurseries, Cheshunt. Pale yellow flowers, borne upon spikes 4 feet long ; very distinct.

To *Phlox Etna* (votes, 13 for), from Messrs. Paul & Son, Cheshunt. A free-flowering variety ; colour deep salmon-scarlet. A very beautiful variety.

To *Gladiolus Duke of York* (votes, 7 for), from Messrs. Kelway & Son, Langport. The spike long, flowers large ; colour salmon-red, lower segments white striped with purple.

To *Gladiolus Alfred Henderson* (votes, 6 for), from Messrs. Kelway & Son. A noble spike, with large scarlet flowers ; lower segments blotched and striped with purple.

To *Gladiolus Grover Cleveland* (votes, 7 for), from Messrs. Kelway & Son. Flowers bluish pink, with a prominent white stripe along the centre of each segment.

To *Gladiolus John Warren* (votes, 5 for), from Messrs. Kelway & Son. Flowers orange-scarlet, lower segment having two purple blotches at the base.

To *Codiaeum Madame Ernest Bergman* (votes, 11 for), from Mr. F. Bause, South Norwood. Broad orange-yellow leaves, with green blotches and crimson veins. A grand variety.

To *Dracæna Alexander Laing* (votes, 11 for), from Mr. Bause. A free-growing and graceful variety, with long, narrow green leaves edged with red.

To *Caladium Président de la Devansaye* (votes, 10 for), from Mr. Bause and Messrs. J. Laing & Sons. A dwarf variety, with reddish leaves, carmine veins, and margined with green.

To *Begonia semperflorens*, Vernon's variety (votes, unanimous), from Messrs. Laing & Son (*see pp. clx, clxv*).

Cultural Commendation.

To Lord Ashcombe, Denbies, Dorking (gr. Mr. J. Beesley), for *Bignonia grandiflora*. A climber of vigorous growth, laden with bell-shaped orange-yellow flowers.

Other Exhibits.

G. F. Wilson, Esq., Weybridge, sent a plant of *Primula Poissonii*, which the Committee desired to see again.

The Duke of Northumberland, Syon House, Brentford (gr. Mr. G. Wythes), exhibited *Cereus hexagonus*, having large white flowers; also *Cunonia capensis*, with small white flowers.

Mr. C. Holden, Warwick Road, Ealing, exhibited a group of foliage and flowering plants, amongst which was a very fine batch of *Coleus Distinction*, a good dark bedding variety, Ferns, Begonias, &c.

Mr. J. O'Brien, Harrow-on-the-Hill, sent *Cyrtanthus McKennii*. A pretty sweetly scented flower.

Mr. F. Bause, South Norwood, exhibited *Caladium L'Insolite*, a new variety, with green and yellow leaves, spotted with red.

Mr. T. S. Ware, Hale Farm, Tottenham, exhibited *Cactus Dahlia Ernest Glasse* and *Gaillardia Surprise*.

Mr. F. Bull, Wormingford, Colchester, sent blooms of *Carnation Golden Nugget*. The Committee requested that the plant might be tried at Chiswick.

Mr. H. J. Jones, Ryecroft Nursery, Lewisham, staged *Pelargonium Mrs. W. Wright* and *Chrysanthemum Lady Fitzwilliam*.

Messrs. Dicksons, Chester, sent *Tropæolum Boule d'Or*, *Petunia Silver Queen*, and *Cockscomb Sunset*.

Messrs. Wallace & Co., Colchester, exhibited *Arundo Phragmitis foliis aureo-variegatis* and *Lilium auratum Wittei*.

Messrs. J. Cheal & Sons, Crawley, sent Cactus Dahlia Crawley Gem, which the Committee desired to see again.

M. V. Lemoine, Nancy, exhibited Begonia semperflorens La France.

FLORAL COMMITTEE, AUGUST 29, 1893.

AGRICULTURAL HALL SHOW.

GEO. PAUL, Esq., in the Chair, and twenty-two members present.

Prior to signing the minutes the Chairman brought under the notice of the Committee that Begonia semperflorens rubra, Vernon's variety, had already been awarded a certificate under the name B. semperflorens rubra (Aug. 23, 1892). It was, therefore, moved and carried that the certificate granted on August 8 (*see* pp. clx, clxiv) be withdrawn.

Awards Recommended:—

Silver Gilt Flora Medal.

To Messrs. E. D. Shuttleworth & Co., Peckham Rye, London, for a magnificent group of plants, in which were some large and well-grown Palms, Codiæums in variety, Ficus elastica variegata, Liliiums, Caladiums, Ferns, &c.

To Messrs. B. S. Williams & Son, Upper Holloway, N., for a very fine display of foliage and flowering plants, composed of large Tree Ferns, Codiæums (a very highly coloured variety was named Queen Victoria), Palms, Caladiums, Dracænas, Bertolonias, Anthuriums, Nepenthes amabilis, and numerous Orchids, including nicely flowered pieces of Cœlogyne Massangeana.

To Messrs. Dobbie & Co., Rothesay, N.B., for an extensive exhibit of Violas (Duchess of Fife, rich yellow, edged with mauve; Crimson King, deep crimson), Quilled Asters, African Marigolds, Sweet Peas, Veronicas, Cactus, Fancy, and Pompon Dahlias, &c.

Silver Flora Medal.

To Messrs. de Rothschild, Gunnersbury House, Acton (gr. Mr. J. Hudson), for a group of very large and well-grown scented-leaved Pelargoniums, Campanulas, Dracænas, standard Lippia (Aloysia) citriodora. Amongst the Pelargoniums were some exceptionally fine plants of P. radula, very prettily trained on

fan-shaped trellises and balloons measuring about six feet in diameter.

To Messrs. Cutbush & Sons, Highgate Nurseries, N., for a highly ornamental group of foliage and flowering plants arranged with great taste, including *Dracænas*, large Palms, *Codiæums*, Lilies, *Bouvardias*, *Caladiums*, Carnations, *Eurya japonica variegata*, &c.

To Messrs. Paul & Son, Cheshunt, for a group of Feathery Bamboos (hardy varieties), *Eulalia japonica*, &c.; also some very fine Cannas in flower.

To Messrs. W. & J. Birkenhead, Fern Nursery, Sale, Manchester, for a splendid exhibit of Exotic and Hardy Ferns and Selaginellas, which included small but admirably grown plants of *Platynerium*, *Scolopendrium ramosissimum* (pretty dwarf habit), *Polystichum acrostichoides lobatum* (new), *Adiantum pentaphyllum*, *Adiantum mundulum*, *Gymnogramme Pearcei robusta*, &c.

To Mr. P. McArthur, 4 Maida Vale, W., for a group of foliage and flowering plants, consisting of *Dracænas*, Palms, *Pandanus*, *Codiæums* (finely coloured), Ferns, Tuberoses, *Odontoglossum Harryanum*, *Cypripediums*, &c.

To Messrs. W. Paul & Son, Waltham Cross, for a group of Roses, amongst them being good blooms of Marie Van Houtte, Grace Darling, Corinna, and several of the *Polyantha* section; also shoots with foliage and berries of the Japanese *R. rugosa*.

Silver Banksian Medal.

To Messrs. Barr & Son, Covent Garden, for a large collection of hardy herbaceous flowers, amongst which were some excellent examples of *Funkia grandiflora*, *Colchicum bizantinum* and *C. variegatum*, Liliams, *Helianthus Soleil d'Or*, some very fine *Gladiolus* seedlings, *Montbretias*, *Gaillardias*, &c.

To Messrs. W. Cutbush & Sons, Highgate Nurseries, N., for a very interesting exhibit of hardy cut flowers, containing well-grown examples of *Lobelia splendens* with deep crimson flowers, *Helianthus rigidus*, *Anthemis tinctoria sulphurea*, *Pyrethrum Mont Blanc*, *Gladioli*, *Heliopsis lævis*, &c.

To Mr. H. J. Jones, Ryecroft Nursery, Lewisham, for a group of *Pelargonium* Mrs. W. Wright, *Dahlia Ryecroft Gem*, Tuberoses *Begonias*, and Palms.

To Messrs. Kelway & Son, Langport, for an extensive group

of Gladioli, consisting of some very well-grown spikes of Dr. Benson, Princess Royal, Duke of Buccleuch, &c. Also a collection of Dahlia serratifolia Duke of York, Pyrethrums, Gaillardias, Cannas, Asters, &c.

To Messrs. J. Peed & Sons, Roupell Park Nurseries, Norwood Road, S.E., for a group of Caladiums (including many new varieties), Palms, Bertolonias, and Strobilanthes Dyerianus. The group was edged with the pretty little Caladium argyrites and Isolepis gracilis.

To Mr. C. Turner, Royal Nurseries, Slough, for a very fine group of Lilies, Hydrangea paniculata, Palms, Ferns, &c.

To Messrs. B. S. Williams & Son, Upper Holloway, for four very large specimen Tree Ferns.

To Messrs. B. S. Williams & Son, Upper Holloway, for two large specimen Dracæna lineata.

To Messrs. H. Cannell & Sons, Swanley, for a group of Cacti, &c., noticeable being Mammillaria mecomeris, Cereus chilensis, double and single Begonias, &c.

Bronze Flora Medal.

To Mr. Anthony Waterer, Knap Hill, Woking, for a group of Abies pungens glauca. A very fine hardy Conifer, with short, stout glaucous leaves.

To Messrs. W. Barron & Sons, Elvaston Nurseries, Borrowash, Derby, for a group of cut shoots of hardy ornamental trees and shrubs, among them being highly coloured pieces of Acer Reichenbachii, Quercus pedunculata atropurpurea, Berberis vulgaris purpurea, Retinosporas, Cupressus, &c.

To Messrs. E. D. Shuttleworth & Co., Fleet, for a handsome display of hardy cut flowers, noteworthy being Aster bessarabicus, Helenium pumilum, Lilium superbum rubrum, Dahlias, Gladioli, &c.

To Mr. E. F. Such, Maidenhead, for a collection of Dahlias.

First Class Certificate.

To Exacum macranthum (votes, 12 for), from Sir Trevor Lawrence, Bart., Burford Lodge, Dorking (gr. Mr. Bain). A stove plant of dwarf habit, with bright green leaves and beautiful blue flowers, which are carried well above the foliage, contrasting well with the golden yellow stamens.

To Agave Leopold II. (votes, unanimous), from Dr. Kellock, Stamford Hill. A cross between A. Schidigera princeps and

A. filifera. It has long, narrow, sharply pointed, dull green leaves, from the edges of which come white, curly, hair-like filaments. The growth of the plant is compact and handsome.

To *Agave univittata* var. (votes, 8 for, 2 against), from Dr. Kellock, Stamford Hill. A variety of sturdy habit of growth, with thick, sharply pointed, deep green leaves, each having a distinct yellow stripe down the centre, and edged with light bands.

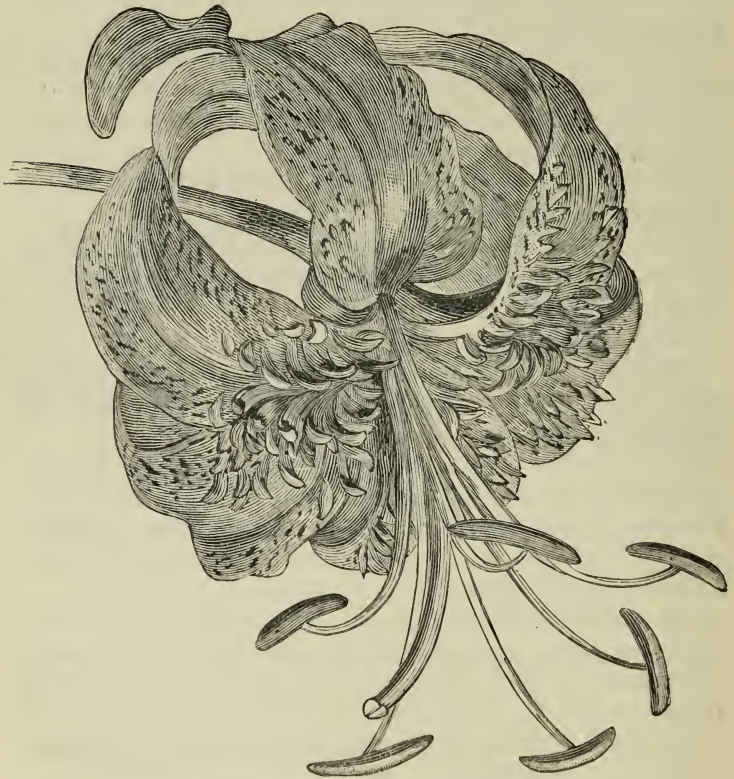


FIG. 35.—LILIAM HENRYI. (*Journal of Horticulture*.)

To *Diervilla* (*Weigela*) *Eva Rathke* (votes, 15 for, 2 against), from Mr. A. Waterer, Woking. A perpetual summer-blooming variety, with medium-sized flowers of a bright red colour, with white stamens.

To *Lilium Henryi* (votes, unanimous), from Messrs. Wallace

& Co., Colchester. A new and distinct Japanese Lily, with flowers of a beautiful orange-brown colour, spotted with deep orange. Its lanceolate leaves are of a bright green colour (fig. 35).

To *Cornus brachypoda variegata* (votes, unanimous), from Messrs. J. Veitch & Sons, Chelsea. A handsome variety, with lanceolate-elliptic leaves, highly coloured, with irregular silver and pale green blotches.

To *Clerodendron trichotomum* (votes, unanimous), from Messrs. J. Veitch & Sons. A distinct hardy Japanese shrub, with creamy-white flowers and red calyces. The leaves are broadly ovate and deep green.

Award of Merit.

To Carnation Mrs. Leopold de Rothschild (votes, 11 for, 1 against), from Messrs. de Rothschild, Gunnersbury Park, Acton (gr. Mr. Reynolds). A large, useful, free-blooming variety, of a beautiful salmon-pink colour.

To *Pentstemon Clevelandi* (votes, 12 for, 1 against), from Sir Trevor Lawrence, Bart., Burford, Dorking. Flowers bright crimson-scarlet, borne on long spikes.

To *Helianthus rigidus* Miss Mellish (votes, unanimous), from Rev. W. Wilks, Shirley, Croydon. The flowers of this variety are very large, semi-double, and of a rich golden-yellow colour. Leaves very large and broad.

To China Rose Duke of York (votes, unanimous), from Messrs. W. Paul & Son. An autumn-blooming variety, with flowers of a deep crimson, shading to rose.

To *Gladiolus Bernice* (votes, unanimous), from Messrs. J. Burrell & Co., Cambridge. Flowers distinct, pale yellow in colour, with a deeper throat.

To *Gladiolus Gertrude* (votes, 9 for), from Messrs. J. Burrell & Co. Flowers very handsome, with broad segments of a beautiful blush colour, tinged with pink.

To *Gladiolus Orlando* (votes, 6 for, 3 against), from Messrs. J. Burrell & Co. Flowers large, deep salmon-red, flaked with purple towards the edges.

To *Gladiolus Cassandra* (votes, unanimous), from Messrs. J. Burrell & Co. Large, handsome flowers, of a soft creamy yellow, with a red throat.

To Cactus Dahlia Lady Penzance (votes, unanimous), from

Messrs. Keynes, Williams & Co., Salisbury. Flowers distinct, with long petals ; the colour a pretty shade of yellow.

To Cactus Dahlia Gloriosa (votes, 8 for, 2 against), from Messrs. Keynes, Williams & Co. Flowers large, with wavy petals ; colour orange-scarlet.

To Cactus Dahlia Chancellor (votes, unanimous), from Messrs. Keynes, Williams & Co. A handsome and distinct variety ; colour crimson, flushed with purple.

To Fancy Dahlia Mrs. Mortimer (votes, 13 for, 1 against), from Mr. S. Mortimer, Farnham. A large-flowered variety, measuring four inches across ; the colour is rich canary-yellow, each petal being tipped with pale pink.

To Cactus Dahlia Ernest Cheal (votes, 10 for), from Messrs. J. Cheal & Sons, Crawley. A very free-flowering variety, with long petals of a deep orange-red colour.

To Pompon Dahlia Rowena (votes, unanimous), from Mr. C. Turner, Slough. Flowers bright yellow, edges of the petals shaded crimson.

To perpetual-flowering Pink Ernest Ladhams (votes, unanimous), from Mr. B. Ladhams, Shirley Nurseries, Southampton. An unusually large-flowered variety, of a delicate pink, with dark purple blotches at the base of each petal.

Other Exhibits.

Mr. A. Rawlings, Old Church, Romford, Essex, sent a group of Show and Fancy Dahlias.

From Messrs. Wallace & Co., Colchester, came a plant of *Lilium angustifolium*, which the Committee asked to see again.

Messrs. Hurst & Sons, Houndsditch, exhibited several plants of *Pyrethrum aureum cristatum*.

Sir Trevor Lawrence, Bart., Burford, Dorking, exhibited *Tweedia oxypetalum cærulea*, which the Committee requested might be tried at Chiswick.

From Messrs. R. Veitch & Sons, Exeter, came *Godetia Princess May*, *Lupinus arboreus*, &c.

Mr. Prichard, Christchurch, Hants, sent *Scabiosa caucasica* fl. albo. The Committee asked to see this again.

AGRICULTURAL HALL SHOW.

Prizes.

Class 1.—Group of Palms and Foliage Plants, to occupy a space not exceeding 800 sq. ft. Open. *First Prize*, £15, to Mr. H. B. May, Dyson's Lane Nurseries, Upper Edmonton. Presented by Messrs. E. D. Shuttleworth & Co., Ltd., The Albert Nurseries, Peckham Rye, London, S.E., and Fleet, Hants.

Class 2.—Two large Palms, distinct. Open. *First Prize*, £3, to Henry Tate, Esq., Park Hill, Streatham Common (gr. Mr. W. Howe). *Second Prize*, £2, to Messrs. B. S. Williams & Son, Victoria and Paradise Nurseries, Upper Holloway, N.

Class 3.—Two large Tree Ferns, distinct. Open. *Second Prize*, £2, to Messrs. B. S. Williams & Son.

Class 4.—Two large Cycads. Open. *Third Prize*, £1, to Messrs. B. S. Williams & Son.

Class 5.—Eight Codiaëums (Crotons). Open. *Second Prize*, £3, to Messrs. B. S. Williams & Son.

Class 6.—Twelve Palms, in pots not exceeding 10 inches not more than two of a kind. Open. *First Prize*, £3, to Messrs. B. S. Williams & Son.

Class 7.—Group of Foliage and Flowering Plants, arranged for effect, to occupy a space not exceeding 300 sq. ft. Open. *Second Prize*, £5, to Messrs. de Rothschild, Gunnersbury House, Acton, W. (gr. Mr. James Hudson).

Class 8.—Group of Foliage and Flowering Plants, arranged for effect, to occupy a space not exceeding 150 sq. ft. Amateurs. *Second Prize*, £3, to J. W. Melles, Esq., Sewardstone Lodge, Chingford (gr. Mr. J. Nicholson).

Class 9.—Twelve Stove and Greenhouse Ferns, distinct. Open. *First Prize*, £6, to H. Tate, Esq. *Second Prize*, £4, to Mr. P. McArthur, 4 Maida Vale, W.

Class 14.—Group of Liliiums, in pots, or cut spikes, or both, to occupy a space not exceeding 150 sq. ft., arranged with Foliage Plants. Open. *First Prize*, £5, to Messrs. Bunting & Sons, Lexden Road, Colchester.

Class 15.—Twelve Coleus, distinct, in pots. Open. *First Prize*, £3, to J. W. Melles, Esq.

Class 16.—Group of Pelargoniums, of any class, or of various classes, to occupy a space not exceeding 150 sq. ft. Open. *First Prize*, £5, to Messrs. de Rothschild (gr. Mr. James Hudson).

Class 23.—Twelve bunches of Stove and Greenhouse Flowers, distinct. Amateurs. *First Prize*, £2, to T. F. Burnaby Atkins, Esq., Halsted Place, Sevenoaks, Kent (gr. Mr. J. Gibson). *Second Prize*, £1. 10s., to Miss R. Debenham, St. Peter's, St. Albans. *Third Prize*, £1, to Henry Tate, Esq.

Class 24.—Collection of Gladioli. Open. *First Prize*, £3, to Messrs. J. Burrell & Co., Howe House Nurseries, Cambridge. *Second Prize*, £2, to Messrs. Harkness & Son, Bedale, Yorks.

Class 25.—Collection of Dahlias, arranged for effect. Open. *First Prize*, £4, to Messrs. J. Cheal & Sons, Lowfield Nurseries, Crawley. *Second Prize*, £3, to Messrs. Keynes, Williams & Co., The Nurseries, Salisbury.

Class 26.—Sixty Show and Fancy Dahlias (single blossoms), in not less than 30 varieties. Open. *First Prize*, £4, to Mr. John Walker, The Nurseries, Thame, Oxon. *Second Prize*, £3, to Mr. S. Mortimer, Swiss Nursery, Farnham, Surrey. *Third Prize*, £2, to Mr. Charles Turner, Royal Nurseries, Slough.

Class 27.—Eighteen bunches of Cactus or Decorative Dahlias, distinct, 6 blooms to a bunch. Open. *First Prize*, £3, to Messrs. Keynes, Williams & Co. *Second Prize*, £2, to Messrs. J. Cheal & Sons. *Third Prize*, £1, to Mr. Charles Turner.

Class 28.—Eighteen bunches of Pompon Dahlias, distinct, 10 blooms to a bunch. Open. *First Prize*, £3, to Messrs. Keynes, Williams & Co. *Second Prize*, £2, to Messrs. J. Cheal & Sons. *Third Prize*, £1, to Mr. Charles Turner.

Class 29.—Eighteen bunches of Single Dahlias, distinct, 10 blooms to a bunch. Open. *First Prize*, £2, to Messrs. J. Cheal & Sons. *Second Prize*, £1. 10s., to Mr. E. F. Such, The Nurseries, Maidenhead.

Class 30.—Twenty-four Show and Fancy Dahlias (single blossoms), in not less than 12 varieties. Amateurs. *First Prize*, £3, to W. Keith, Esq., Cornwalls, Brentwood (gr. Mr. J. T. West). *Second Prize*, £2, to James Theobald, Esq., M.P., Bedfords, Havering, Romford (gr. Mr. T. Vagg). *Third Prize*, £1, to J. Gurney Fowler, Esq., Woodford, Essex.

Class 31.—Twelve bunches of Cactus or Decorative Dahlias, distinct, 6 blooms to a bunch. Amateurs. *First Prize*, £2, to W. Keith, Esq. *Second Prize*, £1. 10s., to J. Gurney Fowler, Esq. *Third Prize*, £1, to Messrs. de Rothschild (gr. Mr. James Hudson).

Class 31a.—Twelve bunches of Cactus Dahlias. Amateurs. Only such Dahlias admissible as are recognised as Cactus Dahlias in the National Dahlia Society's List. *Second Prize*, 15s., presented by Messrs. Keynes, Williams & Co., Salisbury. To A. Waterhouse, Esq., Yattendon Court, Newbury (gr. Mr. R. Maher).

Class 32.—Twelve bunches of Pompon Dahlias, distinct, 10 blooms to a bunch. Amateurs. *First Prize*, £2, to W. Keith, Esq. *Second Prize*, £1. 10s., to Messrs. de Rothschild (gr. Mr. James Hudson).

Class 33.—Collection of Hardy Herbaceous Perennials, distinct, in bunches. Bulbs admissible. Open. *First Prize*, £5 (presented by Messrs. E. D. Shuttleworth & Co., Ltd.), to Mr. B. Ladhams, Shirley Nurseries, Southampton. *Second Prize*, £3, to Messrs. Paul & Son, The Old Nurseries, Cheshunt. *Third Prize*, £2, to Messrs. J. Cocker & Sons, Aberdeen.

Class 34.—Twenty-four bunches of Hardy Herbaceous Perennials, distinct. Bulbs admissible. Amateurs. *First Prize*, £3, to the Earl of Dysart, Ham House, Richmond, Surrey (gr. Mr. G. H. Sage). *Second Prize*, £2, to the Rev. F. Page Roberts, The Rectory, Scole, Norfolk. *Third Prize*, £1, to Miss Debenham.

Class 35.—Twelve bunches of Hardy Herbaceous Perennials, distinct. Bulbs admissible. Amateurs. *First Prize*, £2, to Messrs. de Rothschild (gr. Mr. James Hudson). *Second Prize*, £1. 10s., to A. Waterhouse, Esq.

Class 36.—Twelve Phloxes, 3 spikes of each in not less than 9 varieties. Open. *First Prize*, £2, to Messrs. Paul & Son. *Second Prize*, £1. 10s., to Messrs. Harkness & Son.

Class 37.—Collection of Sunflowers, Annual and Perennial (*Helianthus*, *Helenium*, *Harpalium*, and *Heliopsis*), to which *Rudbeckias* may be added. Open. *First Prize*, £1. 10s., to Messrs. J. Burrell & Co. *Second Prize*, £1, to the Earl of Dysart (gr. Mr. G. H. Sage). *Third Prize*, 10s., to Messrs. Paul & Son.

Class 37a.—Twelve sprays of *Violas*, distinct, 6 blooms to each spray. Open. *First Prize*, Silver Medal (presented by the London Pansy Society), to Mr. A. J. Rowberry, 2 The Crescent, South Woodford. *Second Prize*, Bronze Medal (presented by the London Pansy Society), to Messrs. J. Cocker & Sons, Aberdeen.

Class 38.—Collection of Roses, arranged for effect. Open. *First Prize*, £3, to Messrs. Paul & Son. *Second Prize*, £2, to Messrs. J. Cocker & Sons. *Third Prize*, £1, to Mr. George Mount, Exotic and Rose Nursery, Canterbury.

Class 40.—Twelve distinct kinds of Fruit, Black and White Grapes admissible. Amateurs. *First Prize*, Veitch Memorial Medal and £5 (presented by the Veitch Memorial Trustees), to Sir J. W. Pease, Bart., M.P., Hutton Hall, Guisboro' (gr. Mr. J. McIndoe).

Class 41.—Six distinct kinds of Fruit, Black and White Grapes admissible. Open. *First Prize*, £3, to Mrs. McIntosh, Havering Park, Romford, Essex (gr. Mr. A. Ocock). *Second Prize*, £2, to the Countess of Camperdown, Weston House, Shipston-on-Stour (gr. Mr. J. Masterson). *Third Prize*, £1, to R. Sneyd, Esq., Keele Hall, Newcastle, Staffordshire (gr. Mr. John Wallis).

Class 42.—Three bunches of Muscat of Alexandria Grapes. Amateurs. *First Prize*, Silver Cup, value £5 (presented by the Turner Memorial Trustees), to Messrs. de Rothschild, Gunnersbury Park, Acton (gr. Mr. G. Reynolds). *Second Prize*, £2, to W. Maw, Esq., Walk House, Barrow-on-Humber (gr. Mr. Winter). *Third Prize*, £1, to W. K. D'Arcy, Esq., Stanmore Hall, Great Stanmore, Middlesex (gr. Mr. Wm. Tidy). *Third Prize*, £1, to Lewis Jordon, Esq., Holdenby House Gardens, Northampton.

Class 43.—Three bunches of Black Hambro' Grapes. Amateurs. *First Prize*, Silver Cup, value £5 (presented by the Turner Memorial Trustees), to E. M. Mundy, Esq., Shipley Hall, Derby (gr. Mr. W. Elphinstone). *Second Prize*, £2, to Messrs. de Rothschild, Gunnersbury Park, Acton (gr. Mr. G. Reynolds). *Third Prize*, £1, to W. Messenger, Esq., Woolverstone Park, Ipswich.

Class 44.—Three bunches of any one variety of White Grapes (Muscat of Alexandria excluded). Amateurs. *First Prize*, £2, to Messrs. de Rothschild, Gunnersbury Park, Acton (gr. Mr. G. Reynolds). *Second Prize*, £1. 10s., to L. J. Baker, Esq., Ottershaw Park, Chertsey (gr. Mr. T. Osman).

Class 45.—Three bunches of any one variety of Black Grapes (Hambro's excluded). Amateurs. *First Prize*, £2, to C. Lee Campbell, Esq., Glewston Court, Ross, Herefordshire (gr. Mr. S. T. Wright). *Second Prize*, £1. 10s., to Henry Tate,

Esq. *Third Prize*, £1, to Messrs. de Rothschild, Gunnersbury House, Acton (gr. Mr. G. Reynolds).

Class 46.—Four dishes of Peaches, distinct, 6 fruits to a dish. Open. *First Prize*, £2, to J. T. Hopwood, Esq., Ketton Hall, Stamford (gr. Mr. W. H. Divers). *Second Prize*, £1. 10s., to R. Leigh, Esq., Barham Court, Maidstone (gr. Mr. G. Woodward). *Third Prize*, £1, to Sir Mark Collet, Bart., St. Clere, Kemsing, Sevenoaks (gr. Mr. R. Potter).

Class 47.—Two dishes of Peaches, distinct, 6 fruits to a dish. Amateurs. *First Prize*, £1, to W. K. D'Arcy, Esq., Stanmore Hall, Great Stanmore, Middlesex (gr. Mr. Wm. Tidy). *Second Prize*, 15s., to Mrs. McIntosh, Havering Park, Romford, Essex (gr. Mr. A. Ocock). *Third Prize*, 10s., to Mrs. Elphinstone, Henley Park, Surrey.

Class 48.—Eight varieties of Grapes, 2 bunches of each. Open. *First Prize*, £5, to Messrs. de Rothschild (gr. Mr. G. Reynolds). *Second Prize*, £4, to C. Bayer, Esq., Forest Hill. *Third Prize*, £3, to R. Sneyd, Esq., Keele Hall, Newcastle, Staffs. (gr. Mr. John Wallis).

Class 49.—Four dishes of Nectarines, distinct, 6 fruits to a dish. Open. *First Prize*, £2, to Sir J. W. Pease, Bart., M.P., Hutton Hall, Guisborough (gr. Mr. J. McIndoe). *Second Prize*, £1. 10s., to R. Leigh, Esq., Barham Court, Maidstone (gr. Mr. G. Woodward). *Third Prize*, £1, to Sir Mark Collet, Bart., St. Clere, Kemsing, Sevenoaks (gr. Mr. R. Potter).

Class 50.—Two dishes of Nectarines, distinct, 6 fruits to a dish. Amateurs. *First Prize*, £1, to J. T. Hopwood, Esq. (gr. Mr. W. H. Divers). *Second Prize*, 15s., to Mr. J. Collins, Llanvair Gardens, Ascot.

Class 51.—Two Melons, distinct. Amateurs. *First Prize*, £1, to Mrs. McIntosh (gr. Mr. A. Ocock). *Second Prize*, 15s., to W. Messenger, Esq., Woolverstone Park, Ipswich. *Third Prize*, 10s., to the Countess of Camperdown (gr. Mr. J. Masterson).

Class 52.—Four dishes of Plums, distinct, 9 fruits to a dish. Amateurs. *First Prize*, £1. 10s., to Sir J. W. Pease, Bart., M.P. (gr. Mr. J. McIndoe). *Second Prize*, £1, to John Hargreaves, Esq., Maiden Erlegh, Reading (gr. Mr. T. Turton). *Third Prize*, 15s., to W. Messenger, Esq.

Class 53.—Collection of Plums. Open. *First Prize*, £3, to Sir J. W. Pease, Bart., M.P. (gr. Mr. J. McIndoe).

Class 54.—Six dishes of Apples, 6 fruits to a dish. Open. *First Prize*, £1. 10s., to R. Leigh, Esq. (gr. Mr. G. Woodward). *Second Prize*, £1, to George Chambers, Esq., Beech Farm, Mereworth, Maidstone. *Third Prize*, 15s., to J. Hargreaves, Esq. (gr. Mr. T. Turton). *Equal Third*, 15s., to Viscountess Portmar, Buxted Park, Uckfield, Sussex (gr. Mr. H. C. Prinsep).

Class 55.—Three dishes of Pears, distinct, 6 fruits to a dish. Amateurs. *First Prize*, 15s., to Earl Cowley, Draycott House, Chippenham, Wilts (gr. Mr. Jacob Gibson). *Second Prize*, 10s., to Mr. G. Woodward. *Third Prize*, 5s., to the Countess of Camperdown (gr. Mr. J. Masterton). *Equal Third*, 5s., to Mrs. Crawford, Gatton, Reigate (gr. Mr. Slowgrove).

Class 55A.—Collection of Hardy Fruits. Amateurs. Prizes presented by Mr. J. Watkins, Pomona Farm Nurseries, Withington, Hereford. *First Prize*, £1. 10s., to R. Leigh, Esq. (gr. Mr. G. Woodward). *Second Prize*, £1, to Sir J. W. Pease, Bart., M.P. (gr. Mr. J. McIndoe). *Third Prize*, 10s., to C. Lee Campbell, Esq., Glewston Court, Ross (gr. Mr. S. T. Wright).

Class 56.—Collection of Apples. Open. *First Prize*, £3, to Messrs. G. Bunyard & Co., The Nurseries, Maidstone. *Second Prize*, £2, to the English Fruit and Rose Co. (Cranston's), Hereford. *Third Prize*, £1, to Messrs. Paul & Son.

Class 56A.—Three dishes of Dessert Apples, distinct, to include "Lady Sudeley," 6 fruits to a dish. Amateurs. *First Prize*, £1 (presented by Messrs. Geo. Bunyard & Co.), to R. Leigh, Esq. (gr. Mr. G. Woodward).

Class 56B.—Three dishes of Kitchen Apples, distinct, for size, 6 fruits to a dish. Amateurs. *First Prize*, £1 (presented by Messrs. G. Bunyard & Co.), to R. Leigh, Esq. (gr. Mr. G. Woodward). *Second Prize*, 15s. (presented by Messrs. G. Bunyard & Co.), to George Chambers, Esq. *Third Prize*, 10s. (presented by Messrs. G. Bunyard & Co.), to J. Hargreaves, Esq. (gr. Mr. T. Turton).

Class 57.—Nine Orchard-house Trees, in fruit, distinct varieties. Open. *First Prize*, £4, to Messrs. G. Bunyard & Co.

Class 58.—Collection of Orchard-house Fruit (Peaches and Nectarines excluded). Amateurs. *First Prize*, £3, to Sir J. W. Pease, Bart., M.P. (gr. Mr. J. McIndoe). *Second Prize*, £2, to Sir Mark Collet, Bart. (gr. Mr. R. Potter). *Third Prize*, £1, to

J. W. Melles, Esq., Sewardstone Lodge, Chingford (gr. Mr. J. Nicholson).

Class 59.—Twelve distinct kinds of Vegetables, arranged in baskets or “rounds.” Amateurs. *First Prize*, Silver Cup, value £5 (presented by the Turner Memorial Trustees), to Col. the Hon. W. P. Talbot, Glenhurst, Esher, Surrey (gr. Mr. C. J. Waite). *Second Prize*, £3, to Lady Guest, Inwood House, Henstridge, near Blandford, Dorset (gr. Mr. T. Wilkins). *Third Prize*, £2, to Mr. Robert Watson, senr., Crossford, Lanark, N.B.

Class 60.—Six distinct kinds of Vegetables, arranged in baskets or “rounds.” Amateurs. *First Prize*, £1. 10s., to W. A. South, Esq., Neasden House, Neasden (gr. Mr. Payne).

Class 60A.—Six distinct kinds of Vegetables, chosen out of the following, viz. Beans, Tomatos, Cauliflowers, Carrots, Lettuces, White Turnips, and Onions. Amateurs. *Second Prize*, 15s. (presented by Messrs. James Carter & Co., seedsmen, High Holborn, London), to W. A. South, Esq. (gr. Mr. Payne).

Class 61.—Twelve dishes of Potatos, distinct, 9 tubers of each. Amateurs. *First Prize*, Silver Cup, value £5 (presented by the Turner Memorial Trustees), to Mr. E. Chopping, Periwinkle Mills, Milton, Sittingbourne. *Second Prize*, £1. 10s., to Col. the Hon. W. P. Talbot (gr. Mr. C. J. Waite). *Third Prize*, £1, to Captain Winthrop, Barton Court, Kintbury, Berks (gr. Mr. W. Young).

Class 61A.—Six dishes of Potatos, distinct, 9 tubers of each, to include Carter’s “King of the Russets” or “Holborn Abundance.” Amateurs. *First Prize*, £1 (presented by Messrs. James Carter & Co.), to Mr. E. Chopping. *Second Prize*, 15s. (presented by Messrs. Carter & Co.), to Col. the Hon. W. P. Talbot (gr. Mr. C. J. Waite).

Class 62.—Collections of Saladings. Open. *First Prize*, £1. 10s., to Col. the Hon. W. P. Talbot (gr. Mr. C. J. Waite).

Class 63.—Three dishes of Tomatos, distinct, 12 fruits to a dish. Open. *First Prize*, 15s., to H. Tate, Esq., Park Hill, Streatham Common (gr. Mr. W. Howe). *Second Prize*, 10s., to Mr. E. Ryder, Northumberland Nursery, Orpington, Kent. *Third Prize*, 5s., to W. K. D’Arcy, Esq. (gr. Mr. Wm. Tidy).

Class 64.—Six largest and handsomest specimens of any one kind of “Deverill’s Pedigree Onions,” to be shown in dishes. Amateurs. *First Prize*, £1. 10s. (presented by Mr. H. Deverill),

to Lady Theodor Guest (gr. Mr. T. Wilkins). *Second Prize*, £1 (presented by Mr. H. Deverill, Banbury, Oxon), to Col. the Hon. W. P. Talbot (gr. Mr. C. J. Waite).

Class 65.—Six specimens of “Dobbie’s Champion Leek,” to be staged on velvet-covered boards, which will be provided for the purpose. The prize exhibits to become the property of Messrs. Dobbie. Amateurs. *First Prize*, £3, to C. R. Dubbs, Esq., Corraith House, Symington, Ayrshire (gr. Mr. David Gibson). *Second Prize*, £2, to Mr. Robert Watson, sen., Crossford, Lanark, N.B. *Third Prize*, £1, to Mr. John Findlay, Keeping Farm, Beaulieu, Hants. Prizes presented by Messrs. Dobbie & Co., Rothesay, N.B.

Silver Gilt Flora Medal.

To Messrs. Foster & Pearson, Beeston, Nottingham, for the Beeston Greenhouse and Boiler, Span Frames, Sections of Peach Lever and of Span Plant House, Ventilators, Boilers, Pipes, &c. The Greenhouse was “Commended” and the Span Frames “Highly Commended.”

To Messrs. Messenger & Co., 163 Palmerston Buildings, Old Broad Street, London, E.C., for Span Greenhouse (which was “Highly Commended”), Staging, Flooring, Iron Walks, Plant Protector, Heating Apparatus, Radiators, Ventilating Tackle, &c.

Silver Flora Medal.

To the Standard Manufacturing Co., St. Alkmund’s Churchyard, Derby, for Tree Pruners, Branch Cutters, Fruit Gatherers, Automatic Clippers.

Silver Banksian Medal.

To Messrs. Sam. Deards & Co., 21 Eldon Street, London, E.C., for a Curvilinear Conservatory, “Coil” Boilers, Specimen of Dry Glazing, &c.

To Messrs. Fenlon & Son, Tudor Street, Whitefriars, London, E.C., for Gas or Oil Heating Apparatus.

To Mr. C. Lascelles, 97 Fleet Street, London, E.C., for an Automatic Damper for Greenhouse Boilers.

To Messrs. Osman & Co., 132 and 134 Commercial Street, London, E., for a collection of Horticultural Appliances and Accessories.

To Mr. G. W. Riley, 21 Fawnbrake Avenue, Herne Hill, S.E., for Rustic Summer Houses, Garden Barrows, &c.

To Messrs. C. Toope & Co., 1 Stepney Square, London, E., for Gas, Oil, and Patent Food Boilers; Fumigators, Propagators, Model of Fog-annihilating Plant House, &c.

Other Exhibits.

Messrs. H. & E. Albert, 17 Gracechurch Street, London, E.C., exhibited Chemical Manures, and Photographs showing effects of them on plants.

Messrs. J. & T. Anderson, 135 and 137 Commercial Street, London, E., exhibited Mats, Bast, Raffia, Shading Materials, Garden Tools, Insecticides, Manures, &c.

Messrs. S. Clark & Co., Park Street, Islington, London, N., exhibited Gas and Oil Heating Stoves, which were "Commended."

Mr. F. E. Clotten, 258 High Holborn, London, W.C., exhibited the "Waas" and "Grimm" Fruit Evaporators.

Messrs. Coates & Everett, Brunswick Works, Tanner's Hill, London, S.E., exhibited the Furline Anti-Incrustator, &c.

Mr. W. Colechester, Ipswich, exhibited samples of pure Ichthemic Guano, which was recommended for Vines, Hops, Roses, Chrysanthemums, Tomatos, Cucumbers, and Soft-wooded Plants.

Mr. W. Cooper, 755 Old Kent Road, London, S.E., exhibited Greenhouses, Frames, Heating Apparatus, &c.

Messrs. Cooper, Dennison & Walkden, 7 and 9 St. Bride Street, London, E.C., exhibited Improved Paper Fruit and Flower Baskets.

Messrs. Corry & Co., 13, 15 and 16 Finsbury Street, London, E.C., had a collection of Horticultural Requisites.

Messrs. Alex. Cross & Sons, 19 Hope Street, Glasgow, and 79 Mark Lane, London, E.C., had an interesting display of Fertilisers, Insecticides, Spray Syringes, &c.

Mr. G. W. Davis, 104 High Holborn, London, W.C., exhibited a varied assortment of Chemical and other Manures.

The Publisher of the *Gardeners' Chronicle*, 41 Wellington Street, Strand, London, W.C., sent a collection of Illustrations and Specimen Volumes.

Messrs. W. Gaymer & Son, Banham, Attleboro', Norfolk, had an exhibition of Norfolk Apples and Cider.

Mr. J. George, 14 Redgrave Road, Putney, London, S.W., exhibited specimens of Mushroom Spawn, Manures, Soils, &c.; Fumigators, Orchid Requisites, and Horticultural Sundries.

Messrs. Harrison & Sons, Market Place, Leicester, contributed Garden Seeds, New Vegetables, Dried Peas and Beans, Coloured Diagrams, &c.

Messrs. E. Newton & Co., Horticultural Works, Hitchin, exhibited a Lean-to and Three-quarter Span Greenhouse, and Steel Roof Bars, Blinds and Shading.

Messrs. Sly, Dibble & Co., 2 Colonial Avenue, Minories, E.C., had a collection of Horticultural Sundries of all kinds.

The Stott Fertiliser and Insecticide Distributor Co., Barton House, Deansgate, Manchester, exhibited Syringes, Fruit-tree Sprayers, Insecticides, &c.

Messrs. W. Wood & Son, Wood Green, London, N., had a large exhibit of Manures, Insecticides, Soils, Mats, Raffia, &c.

FLORAL COMMITTEE, SEPTEMBER 12, 1893.

W. MARSHALL, Esq., in the Chair, and thirteen members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Paul & Son, Cheshunt, for a large exhibit of cut Roses and Hardy Flowers. Amongst the hardy flowers were some excellent examples of *Physostegia speciosa*; *Clematis Davidiana*, carrying small flowers of a beautiful dark blue in the axils of the leaves; *Phlox Granville*, a good free-bloomer, having a large truss of blush-white flowers; *Gaillardias*, *Asters*, *Tritonias*, *Funkias*, &c.

To Messrs. W. Paul & Sons, Waltham Cross, for a fine display of cut Roses, which included blooms of *La France*, *Ella Gordon*, &c. Among the Tea section were *Marie Van Houtte* and *The Bride*. Of the *Polyantha* group *Gloire des Polyantha* was in good condition. Also the *New China Rose*, *Duke of York*, &c.

Silver Banksian Medal.

To Messrs. Dobbie & Co., Rothesay, for an interesting group

of cut flowers, consisting chiefly of Tufted Pansies, noteworthy being Ravenswood, a very dark variety ; Duchess of Edinburgh ; Bridesmaid, pretty sulphur-yellow ; Blue Cloud, &c. Also a very fine strain of new Cactus Dahlias.

To Messrs. H. Cannell & Sons, Swanley, for a very fine group of Dahlias arranged in bunches, noteworthy being Black Prince, a very dark variety ; Wiltshire Lass, white, suffused with pink ; Robert Maher, deep canary-yellow ; and Harry Freeman, white with yellow centre.

Bronze Banksian Medal.

To Messrs. T. H. Crasp & Co., Clyne Valley Nurseries, Sketty, Swansea, for a group of Asters, Celosias, Vallota purpurea, &c.

Award of Merit.

To Single Dahlia M.C.C. (votes, 8 for), from T. W. Girdlestone, Esq., Sunningdale. A large-flowered variety, streaked and blotched with scarlet on a yellow ground, some of the petals being almost wholly orange-yellow.

To Dahlia Goldenlocks (votes, 8 for), from T. W. Girdlestone, Esq. Flowers single, colour clear yellow.

To Dahlia Demon (votes, unanimous), from T. W. Girdlestone, Esq. A very fine dark single variety, of a velvety crimson colour, petals reflexed.

To Single Dahlia Phyllis (votes, 9 for), from T. W. Girdlestone, Esq. Flowers medium sized, having deep red blotches and stripes on a light ground, base of petals rosy pink.

To Phlox Molière (votes, 9 for), from Messrs. Paul & Son, Cheshunt. Flowers salmon-red, creamy white towards the base of the petals, rosy pink eye.

To Rose Adelina V. Morel (votes, unanimous), from Messrs. Paul & Son, Cheshunt. A pretty free-blooming Noisette, the flowers borne in clusters, of a rich yellow, shaded with salmon and red.

To Canna Quasimodo (votes, unanimous), from M. Vilmorin, Paris (*see* page 247).

To Pompon Cactus Dahlia Cannell's Gem (votes, 9 for), from Messrs. H. Cannell & Sons, Swanley. Beautiful orange-scarlet ; petals reflexed and tapering to a point.

Other Exhibits.

Dr. P. H. Emerson, Claringbold, Broadstairs, sent Tuberoses

which had been planted in the open in April; they flowered in September, without protection.

From T. W. Girdlestone, Esq., Sunningdale, came a number of Single Dahlias.

Captain Le Blanc, Potter's Bar, sent a box of double white Dahlias named Mrs. Le Blanc.

Mr. G. P. Darby, Watford, exhibited a new single Dahlia, Watford Beauty.

Messrs. J. Veitch & Sons, Chelsea, staged a very interesting group of *Streptocarpus* hybrids in various shades of colour. Also blooms of *Rhododendron javanico-jasminiflorum* hybrids, noteworthy being Lord Wolseley, having a very fine truss of a rich orange-yellow colour.

FLORAL COMMITTEE, SEPTEMBER 26, 1893.

W. MARSHALL, Esq., in the Chair, and thirteen members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. J. Cheal & Sons, Crawley, for a splendid exhibit of Dahlias, arranged with great taste, Asparagus and Fern being freely used. Harry Freeman, a good white; Honoraria, rich canary-yellow; Delicata, creamy yellow, with pink guard-petals; and Kaiserin were especially noticeable.

To Messrs. Keynes, Williams & Co., Salisbury, for an equally fine display of Dahlias; conspicuous varieties being Lady Grosvenor, orange-yellow; Bertha Mawley, violet-crimson; Countess of Radnor, Countess of Gosford, &c.

To Mr. B. Ladhams, Shirley Nurseries, Southampton, for an excellent collection of hardy flowers, amongst which were some very good examples of *Liatris pycnostachya*, *Anthemis pallida*, *Rudbeckias*, *Delphiniums*, *Gaillardias*, *Echinops ruthenicus*, and a splendid lot of the new Pink Ernest Ladhams.

To Mr. A. Waterer, Knap Hill Nursery, Woking, for a group of *Abies pungens argentea* and *Cedrus atlantica glauca*, two of the handsomest and most beautiful Conifers we have, with leaves of a pleasing glaucous hue. Also a few large specimens of *Pieris japonica*.

To Messrs. J. Laing & Sons, Forest Hill, S.E., for a very fine group of foliage and flowering plants, noteworthy being *Dracæna*

Doucetti; *Codiaeum* Miss Lucien Linden, a handsome variety, with broad, light green leaves, with golden-yellow midrib and veins; *Nicotiana colossea*, double *Begonias*, *Caladiums*, Ferns, *Strobilanthes Dyerianus*, &c.

Silver Banksian Medal.

To Mr. A. Rawlings, Old Church, Romford, for a large group of Show and Fancy Dahlias.

To Messrs. H. Cannell & Sons, Swanley, for a group of the new *Begonia* "Fashion," a tuberous variety, with single flowers of a novel orange-yellow colour. They were prettily set up in bunches arranged with Fern.

First Class Certificate.

To *Nepenthes mixta* (votes, unanimous), from Messrs. J. Veitch & Sons, Chelsea. This is a cross between *N. Northiana* and *N. Curtisii*. It produces magnificent pitchers about nine inches long; ground colour pale red, irregularly blotched with brownish red. The lower surface of the lid is marked with purple spots, the upper portion having dark spots (fig. 36).

To *Aglaonema pumilum* (votes, 3 for), from Messrs. J. Veitch & Sons. This is a fine-foliaged stove plant of dwarf and compact habit, with oblong-ovate pea-green coloured leaves, and distinctly marked with irregular silvery-grey blotches. It was erroneously named *A. rotundum*.

To *Datura cornucopia* (votes, 11 for), from Messrs. Pitcher & Manda, Hextable, Swanley. A handsome plant of bushy habit, with large, broad, dull green leaves. The flowers, which measure six inches in length, are funnel-shaped, semi-double, white suffused with small reddish-violet dots, and delightfully scented.

Award of Merit.

To Show Dahlia *Cherub* (votes, 9 for), from G. Pierre Harris, Esq., Sead Hill House, Orpington, Kent. Flowers large; colour deep amber.

To *Veronica hybrida* *Purple Queen* (votes, 8 for), from Messrs. J. Veitch & Sons. A cross between *V. Andersoni* and *V. Traversii*. Plant of dwarf habit, with shining green Box-like leaves, and purplish-violet flowers, borne on spikes in the axils of the leaves.

To *Heliopsis scabra major* (votes, unanimous), from Mr. B. Ladhams, Shirley, Southampton. Flowers very fine, of a deep

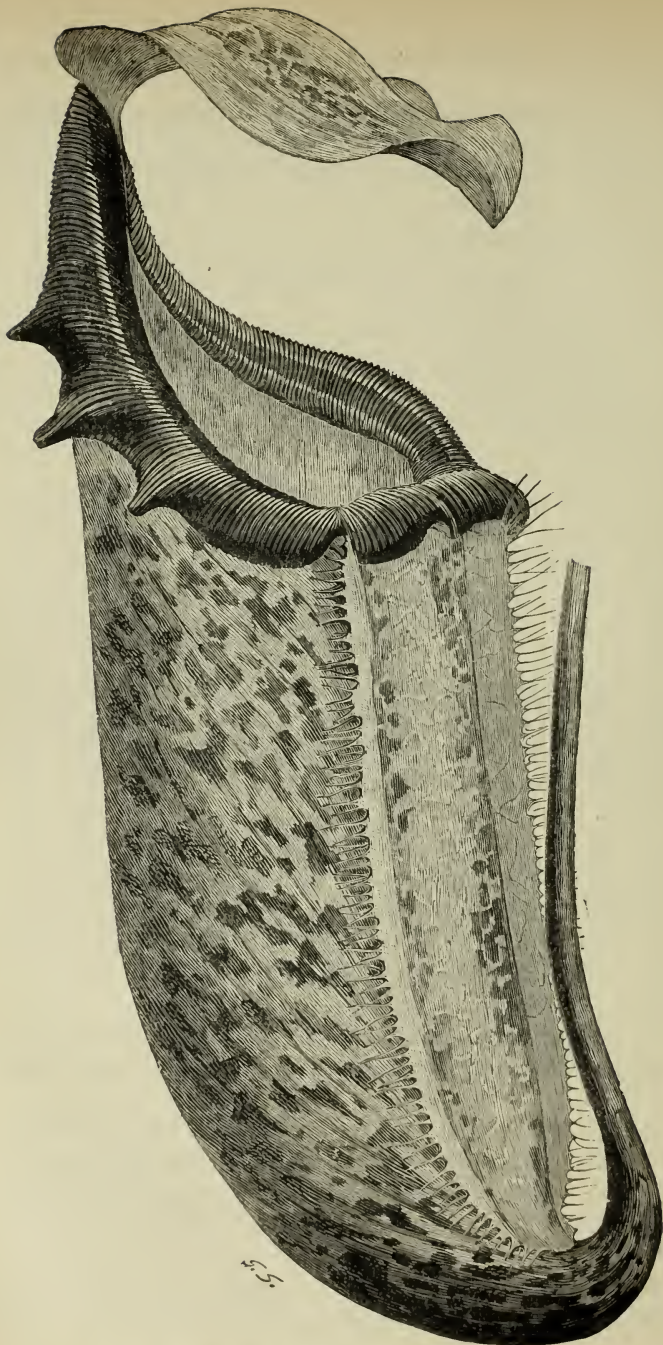


FIG. 36.—NEPENTHES MIXTA. (*Journal of Horticulture.*)

golden yellow. The Committee expressed the wish that a plant might be sent to Chiswick (fig. 37).



FIG. 37.—*HELIOPSIS SCABRA MAJOR*. (*Journal of Horticulture*.)

To *Alocasia Chantrieri* (votes, 4 for, 1 against), from Messrs. J. Laing & Sons, Forest Hill. A variety with large hastate leaves of a deep shining green, with prominent veins and midrib.

To *Begonia Duchess of York* (votes, 8 for), from Messrs. J. Laing & Sons. A splendid double-flowered variety, of a rich crimson colour.

To *Cactus Dahlia Mrs. A. Peart* (votes, unanimous), from Mr. T. S. Ware, Tottenham. A beautiful sulphur-yellow flower.

To *Pompon Dahlia Florence Woodland* (votes, 8 for), from Mr. T. S. Ware. Flowers small, pale yellow, tipped with crimson.

To *Show Dahlia Duchess of York* (votes, unanimous), from Messrs. Keynes, Williams & Co., Salisbury. Flowers terra-cotta, shaded magenta.

To *Pompon Dahlia Ceres* (votes, 10 for), from Messrs. Keynes, Williams & Co. Small, soft primrose flowers.

To *Decorative Dahlia Grand Duke Alexis* (votes, 6 for, 4 against), from Messrs. Keynes, Williams & Co. Very large, pure white flowers with quilled petals.

To *Pompon Dahlia Royal Sovereign* (votes, unanimous), from Messrs. Keynes, Williams & Co. Flowers bright yellow.

To *Pompon Dahlia Captain Boyton* (votes, 5 for), from Mr. C. Turner, Slough. Deep crimson; very distinct.

To *Pompon Dahlia Miranda* (votes, unanimous), from Mr. C. Turner. Yellow, tipped with crimson-purple.

To *Cactus Dahlia Edith Turner* (votes, unanimous), from Mr. C. Turner. Very handsome flowers, with long petals, of the most brilliant scarlet. A grand variety.

To *Show Dahlia Mrs. Morgan* (votes, 7 for), from Mr. C. Turner. Flowers of large size, rich pink, the centre white tinged with purple.

To *Show Dahlia Norma* (votes, 8 for), from Mr. C. Turner. Golden yellow, shaded orange towards centre.

To *Show Dahlia Octavia* (votes, 9 for), from Mr. C. Turner. Large, handsome canary-yellow flowers, tipped with brownish red.

To *Dahlia Watford Beauty* (votes, 6 for, 3 against), from Mr. Darby, Watford. A distinct single variety; colour yellow, with a brownish-red ring round the disc.

Other Exhibits.

From H. Hainsworth, Esq., St. John's Park, Blackheath, came a plant supposed to be *Hoya Griffithii*, which the Committee asked to see again.

Mr. S. Kidley, The Gardens, Coker Court, sent blooms of *Bougainvillea glabra*, Coker Court var. The flowers are of deeper colour than the type. The Committee also asked to see this again.

Mr. R. Dean, Ranelagh Road, Ealing, exhibited a plant of *Venidium calendulaceum* var. *multiflorum*, which had been lifted from the open ground.

Mr. J. Aldridge, Petersham, Richmond, exhibited *Aster J. Harris*. The Committee requested that it might be tried in the Society's Gardens at Chiswick.

Messrs. B. S. Williams & Sons, Upper Holloway, sent a plant of *Anthurium londinense*.

Mr. R. Owen, Maidenhead, exhibited cut flowers of *Canna Comtesse de Lestoile*. The Committee asked to see the plant.

Mr. H. J. Jones, Hither Green, Lewisham, sent a small group of *Fuchsia tryphylla carminata alba*. Plants of dwarf habit, with small blush-coloured flowers.

Mr. B. Ladhams, Shirley Nurseries, Southampton, exhibited a very fine Perpetual Pink named *Lizzie Duval*. The Committee requested that it might be tried at Chiswick.

Prizes.

Class 1.—Twelve *Gladioli*, distinct. Amateurs. *First Prize*, Silver Flora Medal and £1, to J. C. Fordy, Esq., Warkworth Northumberland.

Class 2.—Twelve *Gladioli*, British raised, *Gandavensis* vars., distinct. Amateurs. *Prize*, Kelway *Gladiolus* Medal, to J. C. Fordy, Esq., Warkworth, Northumberland.

FLORAL COMMITTEE, OCTOBER 10, 1893.

W. MARSHALL, Esq., in the Chair, and twenty members present.

Awards Recommended:—

Silver Gilt Flora Medal.

To Mr. H. D. May, Dyson's Lane Nurseries, Upper Edmonton, for a very large and varied collection of *Adiantums*, in

splendid condition, amongst which were some fine plants of *A. Veitchii*, *Victoriae*, *farleyense*, *amabilis*, &c.

Silver Flora Medal.

To Alfred de Rothschild, Esq., Halton, Tring (gr. Mr. Sanders), for a collection of fibrous-rooted *Begonias*, which had been grown in the open during the summer. Especially noticeable were some well-flowered plants of *Semperflorens La France*; *S. Illustration*, bright red; *floribunda rosea*, *Afterglow*, &c.

Bronze Banksian Medal.

To Messrs. H. Cannell & Sons, Swanley, for a group of *Chrysanthemums*, *Pelargoniums*, *Cactus* and *Decorative Dahlias*, &c. *Chrysanthemum Mdm. E. Rey* the Committee asked to see again.

To Messrs. G. Bunyard & Co., Maidstone, for a collection of autumn foliage, containing some exceptionally highly coloured sprays of *Maples*, *Sumach*, *Scarlet Oaks*, &c.

To Mr. S. Mortimer, Swiss Nursery, Rowledge, Farnham, for a group of *Show*, *Fancy*, and other *Dahlias*. Also for very fine blooms of *Stephanotis floribunda*, arranged in long shallow boxes.

First Class Certificate.

To *Solanum Wendlandii* (votes, unanimous), from the Royal Gardens, Kew. A most beautiful, free-flowering, and vigorous stove climber, carrying immense clusters of pale-blue flowers.

To *Tecoma Smithii* (votes, unanimous), from the Royal Gardens, Kew. A cross between *T. capensis* and *T. velutina*. It has deep green pinnate leaves and tubular orange-yellow flowers borne in terminal clusters. A useful cool greenhouse plant.

To *Bomaria patacoensis* (*B. conferta*) (votes, unanimous), from the Royal Gardens, Kew. A greenhouse climber of great merit, the orange-scarlet flowers of which are produced in dense clusters.

To *Ptychoraphis angusta* (votes, unanimous), from the Royal Gardens, Kew. A stove Palm from the Nicobar Islands. It is of graceful habit, with pinnate leaves of a soft green shade.

To *Hæmanthus Lindenii* (votes, unanimous), from Messrs. Lucien Linden, Brussels. Rich orange-red flowers, shading to pink, produced in trusses of large size.

To *Anthurium Wambeckianum* (votes, unanimous), from Messrs. Lucien Linden. A grand variety with large heart-shaped leaves of a bright green colour, with a pure ivory-white spathe.

To *Nerine elegans alba* (votes, unanimous), from Mr. T. S. Ware, Tottenham. A dwarf variety, with pure white undulate flowers borne on spikes eight inches high (fig. 38).



FIG. 38.—NERINE ELEGANS ALBA. (*Journal of Horticulture.*)

To *Quercus americana splendens* (votes, unanimous), from Mr. Anthony Waterer, Knap Hill, Woking. A magnificent plant with large, very highly coloured foliage in autumn, varying from bright yellow to reddish bronze and vivid scarlet.

Award of Merit.

To Cactus Dahlia Purple Prince (votes, unanimous), from Messrs. Perkins & Sons, Coventry. A broad-petalled variety; colour rich crimson, shaded violet.

To Carnation Reginald Godfrey (votes, 13 for), from Mr. W. J. Godfrey, Exmouth. A sweetly scented salmon-coloured variety; petals deeply fringed.

To Carnation Mrs. Godfrey (votes, 10 for, 1 against), from Mr. Godfrey, Exmouth. Flowers pure white, highly perfumed; petals fringed.

To Carnation Mdlle. Thérèse Franco (votes, unanimous), from Messrs. J. Veitch & Sons, Chelsea. Flowers large, rosy-carmine; a free bloomer, of dwarf habit.

To Pompon Dahlia Emily Hopper (votes, 9 for), from Mr. T. S. Ware, Tottenham. Flowers small, rich yellow.

To Single Dahlia Ettie Swan (votes, 12 for), from Mr. T. S. Ware, Tottenham. Brownish yellow, with a crimson ring round the centre.

To Chrysanthemum Mrs. P. Blair (votes, 9 for), from Mr. R. Owen, Maidenhead. A Japanese incurved variety, with broad petals; colour pink, shaded with carmine.

To Dahlia Old Gold (votes, unanimous), from Messrs. H. Cannell & Sons. A distinct and pretty golden-yellow variety.

To Decorative Dahlia Mrs. John Arnold (votes, 6 for, 4 against), from Mr. J. Arnold, Stoke, Devonport. Flowers bright rosy pink, shaded with purple towards centre.

Other Exhibits.

The Right Hon. J. Chamberlain, M.P., Birmingham, sent several examples of seedling Anthuriums.

From the Dowager Lady Freake, Fulwell Park, Twickenham (gr. Mr. Rickwood), came a group of single and double Begonias, prettily arranged with Asparagus, Ferns, &c.

G. A. Farini, Esq., Dartmouth Lodge, Forest Hill, exhibited a batch of the new scented Begonias, which had been grown out of doors.

The Duke of Northumberland, Syon House, Brentford (gr. Mr. Wythes), sent shoots of *Vitis heterophylla humulifolia*, covered with pretty blue-coloured berries; also examples of *Jambosa australis* and *Catalpa Kæmpferi*.

De Barri Crawshay, Esq., Rosefield, Sevenoaks, exhibited several new single Dahlias.

The Director, Royal Gardens, Kew, sent a group of *Streptocarpus*, *Kniphofia modesta*, *Melianthus Trimenianus*, and *Clematis Stanleyi*; also examples of the Inca Potato, *Solanum tuberosum* var. (Baker). The tubers are yellow-fleshed, and retain the yellow colour when cooked.

Mr. J. Lansdell, Barkby Hall Gardens, Leicester, sent a seedling Dahlia named Beauty of Barkby,

Messrs. Pitcher & Manda, Hextable, Swanley, exhibited a group of new Chrysanthemums. The Committee desired to see the following again: G. W. Childs, Golden Wreath, and Mrs. F. L. Ames.

From Messrs. J. Veitch & Sons, Chelsea, came a small group of *Rhododendron* plants and cut flowers of the Javanicum section; also *Pteris Victoria*, *Amasonia punicea* (calycina), *Streptocarpus*, and a large plant of *Caryopteris mastacanthus* laden with light blue flowers.

Mr. T. S. Ware, Tottenham, sent a small group of Cactus, Show, and Fancy Dahlias, *Iris alata*, *Aster grandiflorus*, &c.

Mr. Wells, Earlswood Nurseries, Redhill, exhibited a group of Chrysanthemums, including a very fine variety named Duchess of York, with rich golden flowers.

From Mr. R. Owen, Castle Hill, Maidenhead, came a group of Chrysanthemums. One variety, named Rose Wynne, the Committee asked to see again.

Messrs. R. Veitch & Son, Exeter, sent shoots of *Colutea arborescens purpurea*.

Mr. G. Phippen, Reading, exhibited Cactus Dahlia George Phippen.

Prizes.

Class 1.—Twelve bunches of Hardy Herbaceous Perennials, bulbs admissible. Amateurs. *First Prize*, Silver Flora Medal and £1. 10s., to the Earl of Dysart, Ham House, Richmond (gr. Mr. G. H. Sage). *Second Prize*, £1, to Miss Debenham, St. Peter's, St. Albans.

FLORAL COMMITTEE, OCTOBER 24, 1893.

W. MARSHALL, Esq., in the Chair, and twenty-two members present.

Awards Recommended:—*Silver Gilt Flora Medal.*

To Messrs. J. Cheal & Sons, Crawley, for a remarkably fine exhibit of Cactus, Fancy, Show, and Single Dahlias. Amongst the Cactus section were Crawley Gem, a bright scarlet-flowered variety; Robert Cannell, bright pink; and of the Fancy type Norma was very noticeable.

Silver Flora Medal.

To Messrs. J. Laing & Sons, Forest Hill, for a group of flowering and foliage plants, amongst which were Tuberos Begonias, Orchids, variegated Ficus, Dracæna Doucetti, Alocasias, Nepenthes, Codiaëums, good Chrysanthemums, &c.

To Messrs. B. S. Williams & Sons, Upper Holloway, for a large group of Codiaëums, amongst which were some splendid examples, very well coloured, of such tried varieties as Majesticum, long, narrow green leaves, with red midrib and veins; Warrenii, beautifully twisted yellow and green leaves, varying to crimson; Queen Victoria, leaves broad, and blotched with yellow shading to red on a bronzy-green ground; Prince of Wales, Williamsii, &c.

To Mr. Anthony Waterer, Knap Hill Nursery, Woking, for a group of Andromeda arborea, and a very fine example of Scarlet Oak, the foliage being of an intensely brilliant colour.

To Messrs. J. Veitch & Sons, Chelsea, for a very well grown group of Chrysanthemums in pots. There were some remarkably fine and large blooms of Miss Anna Hartshorn, pure white; Col. W. B. Smith; W. H. Lincoln, yellow; Louis Bœhmer; W. G. Child, deep crimson, &c.

To Mr. T. S. Ware, Tottenham, for a splendid group of Decorative, Show, and Cactus Dahlias, arranged in large bunches with foliage. Among them were Viscountess Folkestone, rich sulphur-yellow; Duke of Clarence, brilliant crimson; and Mary Pictor, grand canary-yellow. Also Lilium neilgherrense.

Silver Banksian Medal.

To Messrs. W. Cutbush & Sons, Highgate Nurseries, N., for a group of very well berried Pernettyas, the prettiest being *P. alba*, *P. rosea macrocarpa* (fine rosy-red berries), *P. nigra* (very dark), *P. atropurpurea elegans*, &c.

Bronze Banksian Medal.

To Mr. C. Holden, Warwick Road, Ealing, for a large specimen plant of *Chrysanthemum Sœur Melanie*, carrying upwards of two thousand flowers and buds.

To Messrs. Cannell & Sons, Swanley, for a group of *Chrysanthemums*, *Dahlias*, and a very fine strain of seedling *Tuberous Begonias*, lifted from the open ground.

First Class Certificate.

To *Anthurium Lindenii* flore carmine (votes, unanimous), from Sir Trevor Lawrence, Bart., Dorking (gr. Mr. Bain). A splendid variety, with large heart-shaped spathes of a rich crimson-scarlet.

To *Begonia Gloire de Lorraine* (votes, unanimous), from Leopold de Rothschild, Esq., Ascot (gr. Mr. Jennings). A very pretty winter-flowering variety, of dwarf habit, producing an abundance of bright rosy-pink flowers, which are thrown well above the soft green foliage.

Award of Merit.

To *Chrysanthemum The Tribune* (votes, 17 for), from C. E. Shea, Esq., Foots Cray, and H. J. Jones, Esq., Lewisham. A beautiful Japanese variety, with large flowers and broad reflexed petals, the colour being clear yellow.

To *Chrysanthemum Herbert Fowler* (votes, 8 for), from Mr. R. Owen, Maidenhead. A magnificent large Japanese variety, with broad petals; colour deep yellow.

To *Chrysanthemum Miss M. Simpkins* (votes, 14 for), from Mr. R. Owen. A remarkably fine Incurved Japanese variety; colour a delicate sulphur-yellow.

To *Chrysanthemum Ryecroft Glory* (votes, unanimous), from Messrs. Cannell & Sons, Swanley. A decorative Japanese flower of medium size; colour deep yellow.

To *Chrysanthemum Mdme. M. Ricaud* (votes, 10 for, 4 against), from Mr. G. Stevens, Putney. A fine Japanese variety, with bright rose-pink flowers.

To Cactus Dahlia Sir Francis Montefiore (votes, 16 for), from Messrs. J. Cheal & Sons, Crawley. Flowers deep crimson, flushed with maroon towards the centre.

To Single Dahlia Mrs. Parrot (votes, 14 for), from Messrs. J. Cheal & Sons. A very showy purple and white variety.

To Cactus Dahlia Cannell's Brilliant (votes, unanimous), from Messrs. Cannell & Sons. A bright crimson flower of medium size.

Other Exhibits.

Sir Trevor Lawrence, Bart., Dorking (gr. Mr. Bain), exhibited some very fine spathes of *Anthurium sanguineum*, deep red; and *A. Langii*, pure white, &c.

C. Nicholls, Esq., Charlwood House, Crawley, exhibited a Decorative Dahlia named Mabel Nicholls.

Mr. W. Pearce, Floore House Gardens, Weedon, exhibited a small group of *Davallia fijiensis plumosus* in magnificent condition.

Mr. C. G. Van Tubergen, junr., Haarlem, sent blooms of *Kniphofia hybrida Triumph*.

Mr. W. Wells, Redhill, exhibited a group of choice *Chrysanthemums*, which included well-grown examples of *Elsie*, white shaded with sulphur-yellow; *W. Seward*, *Miss Watson*, &c.

Mr. Owen, Maidenhead, sent a nice collection of *Chrysanthemums*, containing good blooms of *Sunlight*, a variety with rich yellow flowers; *Ernest Irroy*, *James Myers*, Vice-President, and *Jules Barigny*. The Committee desired to see the last two again.

P. Crowley, Esq., Waddon House, Croydon, exhibited *Carludovica palmata*.

Mr. W. B. Small, Torquay, sent Decorative Dahlia *Dawn*.

Messrs. Keynes, Williams & Co., Salisbury, staged a nice group of Single, Cactus, and Decorative Dahlias.

Messrs. J. Laing & Sons, Forest Hill, sent *Alocasia argyrea*. The Committee asked to see this again.

FLORAL COMMITTEE, NOVEMBER 14, 1893.

W. MARSHALL, Esq., in the Chair, and twenty-two members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. H. Cannell & Sons, Swanley, for an exhibit of cut flowers, including some excellent examples of Chrysanthemums Vivian and Morel, Mdle. Thérèse Rey, and A. H. Neve, of a delicate blush colour; also Zonal Pelargoniums New Life, Lord Tennyson (rich salmon), White Lady, &c.; Palms and Ferns.

To Messrs. J. Veitch & Sons, Chelsea, for a large group of Chrysanthemums in pots, the most noteworthy varieties being Robert Owen, Charles Davis, Charles Blick, and Lady Brooke.

Silver Banksian Medal.

To the Duke of Northumberland, Syon House, Brentford (gr. Mr. Wythes), for a group of Chrysanthemums beautifully arranged with small Palms and Ferns.

To Mr. R. Parker, Impney Gardens, Droitwich, for a very fine group of Chrysanthemums tastefully arranged with Ferns, Ficus repens, and richly coloured sprays of Ampelopsis Veitchii.

Bronze Banksian Medal.

To C. E. Shea, Esq., The Elms, Foots Cray, for a group of Japanese and other Chrysanthemums.

To Mrs. Crawford, Gatton Cottage, Reigate (gr. Mr. W. Slowgrove), for a small group of Chrysanthemums.

To Mr. W. Salmon, 2 Ivy Cottages, Elder Road, West Norwood, for a collection of Bouquets, Wreaths, and Crosses also a very pretty basket of Autumn Foliage and Berries.

To Mr. W. Wells, Earlswood, Redhill, for a group of single and double Chrysanthemums.

First Class Certificate.

To *Primula Forbesii* (votes, 14 for, 2 against), from Sir Trevor Lawrence, Dorking. A pretty species from Central China. Flowers small, borne on slender spikes about sixteen inches high; the colour rich rosy lilac, with a yellow eye (fig. 39).

To *Dracæna Jamesii* (votes, unanimous), from Messrs. J. Veitch & Sons. This is a distinct, dwarf, and neat-growing



FIG. 39.—PRIMULA FORBESII. (*Journal of Horticulture.*)

variety, with long, narrow, arching, deep bronzy-green leaves, with bright red margins.

To *Codiaeum* (*Croton*) *Russelli* (votes, unanimous), from Messrs. Hugh Low & Co., Clapton. Large green leaves, spotted with yellow and crimson, and with bright red midrib and veins. A grand variety.

Award of Merit.

To *Chrysanthemum* *Mdlle. Thérèse Rey* (votes, unanimous), from C. E. Shea, Esq., and Messrs. J. Veitch & Sons. A magnificent large-flowered white variety, with sulphur-yellow centre.

To *Chrysanthemum* *Mrs. C. J. Salter* (votes, 10 for, 5 against), from Mr. W. Wells, Earlswood Nurseries, Redhill. This belongs to the *Anemone* section, and has terra-cotta coloured flowers of medium size.

To *Chrysanthemum* *John Bunyan* (votes, unanimous), from Mr. R. Owen, Maidenhead. Large, rich yellow flowers, with long narrow guard-petals.

To *Chrysanthemum* *Lord Rosebery* (votes, 14 for), from Mr. Owen. A beautiful narrow-petalled *Incurved* variety, of a purple-rose shade.

To *Chrysanthemum* *Robert Petfield* (votes, 15 for), from Mr. Owen. A pretty *Incurved* variety, with flowers of a reddish-purple colour.

To *Chrysanthemum* *Wilfred Marshall* (votes, 11 for, 2 against), from Mr. Owen. An *Incurved* *Japanese*, with flowers of a very fine rich golden yellow.

To *Chrysanthemum* *Niveus* (votes, 14 for), from Mr. Owen. A white *Japanese*, with a shade of delicate pink.

To *Chrysanthemum* *Rose Wynne* (votes, 14 for), from Mr. Owen. A large-flowered *Japanese*. Colour white, tinged with pink.

To *Chrysanthemum* *Golden Wedding* (votes, unanimous), from Mr. R. Owen, Messrs. J. Veitch & Sons, Mr. G. Stevens, and Messrs. H. Cannell & Sons. This is an American seedling, with flowers of a beautiful yellow, measuring about 7 inches across.

To *Chrysanthemum* *Charles Davis* (votes, 8 for, 3 against), from Messrs. J. Veitch & Sons and Mr. G. Stevens. A sport from *Viviand Morel*. Flowers buff, shading to brownish yellow.

To *Chrysanthemum* *Duke of York* (votes, unanimous), from Messrs. H. Cannell & Sons. Flowers large, violet-purple.

Cultural Commendation.

To Mrs. Crawford, Gatton Cottage, Reigate (gr. Mr. Slowgrove), for *Chrysanthemum Thunberg*.

Other Exhibits.

W. H. Evans, Esq., Ford Abbey, Chard (gr. Mr. J. Crook), sent cut blooms of a seedling from *Primula obconica*. The Committee asked to see the plant.

Lady A. de Trafford, Jewell Bank, Eccles, sent *Chrysanthemum Lady Annette*, a sport from Vivian Morel.

Messrs. de Rothschild, Gunnersbury Park, Acton (gr. Mr. G. Reynolds), exhibited a variegated form of *Poinsettia pulcherrima*.

C. Chalmers, Esq., Romford Road, Forest Gate, sent cut blooms of a double *Camellia*.

Mr. R. Owen, Maidenhead, exhibited a group of English and American seedling *Chrysanthemums*.

From Messrs. J. Veitch & Sons, Chelsea, came a box of *Begonia John Heal*, a variety with bright rosy-pink flowers; also a plant of *B. Mrs. John Heal*, a tuberous winter-flowering hybrid with carmine flowers. The Committee asked to see the last named again.

Mr. G. Stevens, St. John's Nursery, Putney, sent *Chrysanthemum White Plume*. The Committee desired to see this again.

Messrs. J. Carter & Co., High Holborn, exhibited *Chrysanthemums Mrs. Christopher Moore* and *Rosy Giant*.

Messrs. Hugh Low & Co., Clapton, exhibited *Codiaeum Thynei*. The Committee asked to see this again.

Messrs. H. Cannell & Sons, Swanley, sent a number of new *Chrysanthemums*, of which the Committee asked to see the following again: *Mrs. W. T. Drier*, *Amy Chantler*, and *L'Ami Etienne*.

Mr. W. C. Rossiter, Paignton, sent shoots of a new golden variegated *Rosemary*.

Prizes.

Class 1.—*Chrysanthemums*, collection of cut blooms, distinct. Each bloom to be shown as cut from the plant, without any dressing, and to stand well above the moss covering the box. Sticks

or wires for support admissible. Amateurs. *First Prize*, Silver Flora Medal and £2, to Mr. G. Wythes, gardener to the Duke of Northumberland, Syon House, Brentford. *Second Prize*, £1. 10s., to Mr. Thomas Osman, Ottershaw Park, Chertsey. *Extra Prize*, 15s., to Miss R. Debenham, St. Peter's, St. Albans.

Class 2.—Eight new Chrysanthemums, cut blooms, distinct, sent out in the years 1890, 1891, or 1892. Amateurs. *First Prize*, Silver Flora Medal and £1, to Mr. W. Slowgrove, gardener to Mrs. Crawford, Gatton Cottage, Reigate. *Second Prize*, 15s., to Mr. Wythes, Syon Gardens, Brentford.

FLORAL COMMITTEE, NOVEMBER 28, 1893.

W. MARSHALL, Esq., in the Chair, and sixteen members present.

Awards Recommended:—

Silver Flora Medal.

To the Duke of Northumberland, Syon House, Brentford (gr. Mr. Wythes), for a very pretty group of flowering and foliage plants, amongst them being some very well flowered Calanthes and Cypripediums; also some good examples of Codiaëums, Palms, Dracænas, and Ferns.

Silver Banksian Medal.

To Messrs. H. Cannell & Sons, Swanley, for a group of most brilliantly coloured Zonal Pelargoniums, and some very fine Chrysanthemums.

To Messrs. Hugh Low & Co., Clapton, for a group of Cyclamen and greenhouse plants, amongst which were some small but well-flowered plants of Correas, Chorizemas, Croweas, Grevilleas, and standard Solanums.

First Class Certificate.

To *Acalypha Macafeeana* (votes, unanimous), from Mr. H. B. May, Upper Edmonton. A very bright, ornamental foliage plant. Leaves of a bronzy green; in some cases half of the leaf was bright red, whilst others were almost entirely crimson, with irregular bronzy-green spots and blotches.

To *Polypodium* (*Aglaomorpha*) *Meyenianum* (votes, unanimous), from Mr. H. B. May. A beautiful Fern from the Philippine Islands, having large bold fronds about $2\frac{1}{2}$ feet long, of a bright green colour.

Award of Merit.

To *Chrysanthemum* *Ebner* D. Smith (votes, 8 for, 5 against), from T. B. Haywood, Esq., Reigate (gr. Mr. Salter). A grand Japanese variety, with large crimson-coloured flowers.

To *Chrysanthemum* *Elsie* Walker (votes, 11 for, 1 against), from Mr. Owen, Maidenhead. A pretty Pompon variety, with orange-red flowers tipped with yellow.

To *Chrysanthemum* *Little Pet* (Pompon) (votes, unanimous), from Mr. Owen. Flowers small, deep orange-red.

To *Chrysanthemum* *Mrs. J. Mitchell* (votes, 6 for, 5 against), from Mr. Owen. A sport from *Empress Eugenie*. Flowers of medium size, fawn colour, tinged with dark terra-cotta.

To *Chrysanthemum* *Mrs. John Gardiner* (votes, 12 for), from Mr. Owen. An Incurved variety, with golden-yellow flowers tinged with brown.

To *Chrysanthemum* *H. M. Pollett* (votes, 6 for, 1 against), from Mr. Owen. A large bright pink Japanese variety.

To *Chrysanthemum* *Le Prince du Bois* (votes, 6 for), from Mr. Owen. Large bright canary-yellow flowers.

To *Chrysanthemum* *Golden Gate* (votes, 9 for, 2 against), from Messrs. H. Cannell & Sons, Swanley. A Japanese variety with large rich golden-yellow flowers.

To *Chrysanthemum* *Judge Hoit* (*Anemone*) (votes, 6 for, 4 against), from Messrs. H. Cannell & Sons. Large rich pink flowers.

Cultural Commendation.

To Mrs. Haselfoot, Moon Hill, Westend, Southampton (gr. Mr. Blandford), for two plants of *Chrysanthemums* grown for table decoration.

To Mr. Latham, Botanic Garden, Birmingham, for some splendid examples of *Callicarpa purpurea*, measuring 6 feet in length and carrying an abundance of violet-coloured berries.

Other Exhibits.

The Duke of Northumberland, Syon House, Brentford (gr. Mr. Wythes), exhibited a shoot of *Sterculia nobilis* in fruit.

C. J. Lucas, Esq., Warnham Court, Horsham, sent cut blooms of *Chrysanthemum Eric*.

Martin R. Smith, Esq., The Warren, Hayes, Kent, sent *Chrysanthemum Helen Crawford*.

H. Tate, Esq., jun., Allerton, Liverpool, exhibited *Chrysanthemum Mrs. Henry Tate, jun.*

D. Bromilow, Esq., Bitteswell Hall, Lutterworth (gr. Mr. F. Knight), sent a small group of *Chrysanthemums*.

Mr. T. Croxford, The Gardens, Hillcrest, Market Harboro', exhibited *Carnation J. Gardiner Muir*.

Mr. John Doughty, The Gardens, Angley Park, Cranbrook, sent *Chrysanthemums May Tomlin and Violet Tomlin*.

Mr. J. Reynolds, Netley Castle, Netley Abbey, sent *Chrysanthemum Lady Emma*.

Mr. G. Evans, The Gardens, Coton Hall, Bridgnorth, sent blooms of a *Chrysanthemum sport from Princess Teck*.

Mr. James Henderson, The Gardens, Meltham Hall, Huddersfield, sent *Chrysanthemum Mrs. Hirst*.

Mr. G. Stevens, St. John's Nursery, Putney, exhibited *Chrysanthemum Pearl Beauty*. The Committee desired to see this again.

Mr. J. Smith, St. Leonard's Road, Windsor, sent *Chrysanthemum Royal Windsor*. A Japanese variety, with large rosy-chestnut and gold flowers.

From Mr. T. S. Ware, Tottenham, came examples of *Narcissus monophyllus*, *Lachenalia pendula*, *Leontice Leontopetalum*, &c.

Prizes.

Class 1.—Group of *Chrysanthemums*, distinct (Pompons and Singles excluded), each plant to carry not less than twenty-four blooms. No artificial training allowed other than simple staking out of the branches to avoid crowding. Pinching or cutting back the plants in a young stage optional. Amateurs. *First Prize*, Silver Gilt Flora Medal and £3, to Mr. E. Vince, head gardener, Highgate Cemetery. *Second Prize*, £2. 10s., to Mr. Wythes, gardener to the Duke of Northumberland, Syon House, Brentford.

FLORAL COMMITTEE, DECEMBER 12, 1893.

W. MARSHALL, Esq., in the Chair, and twenty-four members present.

Awards Recommended:—*Silver Flora Medal.*

To Messrs. J. Laing & Sons, Forest Hill, for a very fine group of foliage and flowering plants, consisting of Crotons, Palms, Orchids, Anthuriums, Begonias, Cyclamen, Ericas, and Ferns.

To Messrs. J. Veitch & Sons, Chelsea, for a splendid exhibit of Nepenthes, the plants of clean growth and carrying very fine pitchers of great size. The plants were raised on stands, the pitchers being thus shown to advantage. Conspicuous varieties were *N. Curtisii superba*, *Chelsoni*, *Mixta*, *Dicksoniana*, and *Wrigleyana superba*.

To Messrs. Hugh Low & Co., Clapton, for a remarkably fine group of Cyclamen, the colours ranging from white to the deepest shades of crimson.

To Mr. May, Dyson's Lane Nurseries, Edmonton, for a choice collection of Ferns arranged with effect, noticeable being some very well grown *Platycteriums*, *Pleopeltis Xiphias*, *Pteris Victoriae*, *P. tremula densa*, and *Nephrolepis*.

To Mr. R. Owen, Maidenhead, for a very large collection of cut Chrysanthemums, especially noticeable being Mount Shasta, flowers pure white with creamy-yellow centre; Mrs. E. D. Adams, pink; Mrs. A. Rogers, rich golden yellow; Walter Surman, Robert Owen, and Mrs. Smith Ryland. The Committee asked to see the last-named again.

First Class Certificate.

To *Costus igneus* (votes, 14 for), from Sir Trevor Lawrence, Bart., Dorking (gr. Mr. Bain). Plant of dwarf habit. Flowers freely produced; colour rich orange-yellow.

To *Nepenthes* × *Amesiana* (*N. Hookeriana* ♀ × *N. Rafflesiana* ♂) (votes, unanimous), from Messrs. J. Veitch & Sons. A grand variety, with large round-shaped pitchers; colour light brown and pea-green.

To *Platycterium* (*Stemmaria*) *æthiopicum* (votes, 10 for), from

Mr. H. B. May, Edmonton. A beautiful and noble-looking Fern, with broad fronds deeply lobed ; colour deep green.

Award of Merit.

To Chrysanthemum Mrs. Marian Bourne (votes, 9 for), from Mr. Owen, Maidenhead. Flowers large ; colour a pretty shade of pink.

To Chrysanthemum Good Gracious (votes, 10 for, 2 against), from Mr. Owen. A large-flowered variety, with long and very narrow petals, pink suffused white towards the centre.

Botanical Certificate.

To *Massonia amygdalina*, Baker, n. sp. (votes, unanimous), from Sir Trevor Lawrence, Bart. Plant very dwarf ; flowers white, sweetly scented.

Other Exhibits.

H. Balderson, Esq., Corner Hall, Hemel Hempstead, exhibited cut blooms of *Primula sinensis* Henry Balderson. Flowers rich red. The Committee wished to see the plant.

R. B. L. Monk, Esq., Falshaw Hall, Wilmslow, Cheshire (gr. Mr. Trail), sent blooms of a white Chrysanthemum named R. B. L. Monk.

From the Director, Royal Gardens, Kew, came specimens of *Brownea* × *Crawfordii* (*B. grandiceps* × *B. macrophylla*), *Senecio macroglossus* (Cape Ivy), *Calpurnia aurea* (Natal Laburnum), and a very fine plant of *Manettia bicolor*, carrying an abundance of scarlet and yellow-coloured flowers.

Mr. J. R. Tranter, Henley-on-Thames, exhibited a basket of the variegated *Nicotiana affinis*.

Messrs. B. S. Williams & Sons, Upper Holloway, sent Japanese *Camellia* Lady Mackinnon. Flowers red and white.

Mr. W. Wells, Earlswood Nurseries, Redhill, sent a small group of Chrysanthemums.

Mr. C. H. Ratsch, 1 St. Peter's Buildings, Bournemouth, exhibited a Chrysanthemum sport from Comte de Germiny.

ORCHID COMMITTEE.

CHISWICK, JULY 11, 1893.

HARRY J. VEITCH, Esq., in the Chair, and four members present.

Awards Recommended:—

Award of Merit.

To *Cypripedium* × *Massaianum* (*C.* × *superciliare* ♀ × *C.* *Rothschildianum* ♂) (votes, unanimous), from Messrs. F. Sander & Co., St. Albans. The leaves were marbled with dark green on a light green ground. Scape stout, and covered with dark purple hairs; bract striped as in *C.* *Rothschildianum*. Flowers large, the upper sepal whitish, with numerous dark purple lines; the broad, deflected, ciliolate petals white, tinged with green on the veining, and evenly spotted with dark purplish crimson; lip faced with dull rose.

To *Cypripedium* *Stonei* var. *Cannaertianum* (votes, unanimous), from Thos. Statter, Esq., Stand Hall, Whitefield, near Manchester (gr. Mr. R. Johnson). Next to *C.* *S. platytanium* this is the most showy form of *C.* *Stonei*. The large dorsal sepal was white, with the rich crimson of the outer surface showing through; the broad petals yellowish, with a single line of dark crimson spots up the middle, the middle of the extreme halves being brownish crimson.

Other Exhibits.

Messrs. F. Sander & Co. showed *Brassia* sp., *Aërides* *Picotianum*, *Cypripedium* × *Youngianum*, *C.* × *Umlaufianum* (*C.* *insigne* *Chantinii* ♀ × *C.* *Lawrenceanum* ♂); two plants of *Rodriguezia pubescens*, each with about twenty spikes; *Cattleya* *Gaskelliana*, Cooke's var., almost entirely rose colour; *Lælio-Cattleya* × *Schilleriana*; four plants of *Trichocentrum tigrinum*, with dissimilar flowers; the fine *Epidendrum vitellinum auratum*, *Sobralia xantholeuca*, *Renanthera matutina*, *Cattleya granulosa* var., &c.

Messrs. Hugh Low & Co., Clapton, N.E., staged a group of Orchids, among which were the pure white *Stanhopea Amesiana*, *Aërides* *l'Ansonii*, *Cattleya* *Eldorado splendens*, *C.* *E. alba*, some fine *C.* *labiata* *Gaskelliana*, *Oncidium* *Lanceanum*, *Rhyncostylis*

(*Saccolabium*) *guttata*, *Angræcum articulatum*, *Vanda Kimballiana*, and *Disa grandiflora*.

Thos. Statter, Esq., Stand Hall, Whitefield, Manchester (gr. Mr. R. Johnson), showed a plant of the orange-scarlet *Lælia monophylla*, and cut spikes of *Cattleya Brymeriana* and *Lælio-Cattleya* × *Amesiana*.

Walter C. Clark, Esq., Orleans House, Sefton Park, Liverpool (gr. Mr. T. Jones), sent a three-flowered inflorescence of *Cattleya Rex*.

Messrs. W. L. Lewis & Co., Chase Side, Southgate, N., showed as *Cypripedium* × *Bradshawianum* a variety which appeared to be *C.* × *radiosum* (*C. Lawrenceanum* ♀ × *C. Spicerianum* ♂); and a light form of *Cattleya labiata Gaskelliana* as *C. l. G. southgatense*.

ORCHID COMMITTEE, JULY 25, 1893.

HARRY J. VEITCH, Esq., in the Chair, and eight members present.

Awards Recommended:—

Silver Banksian Medal.

To Messrs. B. S. Williams & Son, Upper Holloway, N., for a good group of showy Orchids, of special interest being *Epidendrum Imperator*, Reich. f., *Anguloa Ruckeri sanguinea*, *Oncidium litum*, *Paphinia cristata grandis*, and *Trichocentrum tigrinum*.

To Messrs. F. Sander & Co., St. Albans, for a group of rare Orchids, among which were *Habenaria militaris*, *Aërides Sanderianum*, *Cypripedium* × *Massaianum* (*C. superciliare* ♀ × *C. Rothschildianum* ♂), *C.* × *Fausianum* (*C.* × *Dauthieri* ♀ × *C.* × *calophyllum superbum* ♂), *C.* × *Venus* (*C.* × *albanense* ♀ × *C. Boissierianum* ♂), very similar to *C.* × *Cleola*; *Cattleya Batalini*, &c.

First Class Certificate.

To *Miltonia vexillaria* "Daisy Haywood" (votes, unanimous), from T. B. Haywood, Esq., Woodhatch, Reigate (gr. Mr. J. Salter). This is the largest and best pure white form which has yet appeared.

To *Lælia crispa superba* (votes, unanimous), from Thos. Statter, Esq., Stand Hall, Whitefield, Manchester (gr. Mr. R. Johnson). This was the fine form to which an Award of Merit was given on August 9, 1892, but which had greatly improved.

Award of Merit.

To *Cypripedium* × *Edwardii* (*C. Fairieanum* ♀ × *C. superbiens* ♂) (votes, unanimous), from Messrs. Pitcher & Manda, Hextable, Swanley, Kent. The flower has the form of *C. × vexillarium*. Upper sepal white with numerous purple lines, petals whitish with purple spots.

To *Cattleya Hardyana*, Tate's variety (votes, unanimous), from H. Tate, jun., Esq., Allerton Beeches, near Liverpool (gr. Mr. J. Edwards). A very finely coloured form.

Cultural Commendation.

To T. A. Gledstones, Esq., Manor House, Gunnersbury (gr. Mr. H. Denison) (votes, unanimous), for three well-flowered plants of *Cattleya superba splendens*, which were said to have been grown suspended in a warm, sunny house, where they flowered twice a year.

To Thos. Statter, Esq., Stand Hall, Whitefield, Manchester (gr. Mr. R. Johnson) (votes, unanimous), for a small collection of fine cut spikes of *Cattleyas* and *Lælias*.

Other Exhibits.

H. Tate, jun., Esq., Allerton Beeches, showed *Cypripedium* × *Tryonianum* (*C. × Harrisianum* ♀ × *C. superbiens* ♂).

W. R. Lee, Esq., Beech Lawn, Audenshaw, Manchester (gr. Mr. T. Billington), sent *Cattleya Gaskelliana*, Audenshaw var.

Messrs. W. L. Lewis & Co., Chase Side, Southgate, N., showed a light form of *Cattleya Warszewiczii* as *C. gigas Turnbulliana*, and a flower of *Cattleya Dowiana*.

Messrs. Pitcher & Manda, Hextable, Swanley, Kent, showed *Sobralia macrantha* "Princess May," with white sepals and petals and pale yellow lip, having a lilac tinge on the front lobe.

Messrs. P. McArthur & Co., Maida Vale, exhibited a group including *Cypripedium superbiens*, a fine deep form of *C. Volontanum*, *Oncidium Jonesianum*, *O. prætextum*, &c.

ORCHID COMMITTEE, AUGUST 8, 1893.

Dr. MAXWELL T. MASTERS, F.R.S., in the Chair, and nine members present.

Awards Recommended:—*Silver Banksian Medal.*

To Sir Trevor Lawrence, Bart., Burford, Dorking (gr. Mr. W. H. White), for a select group of Orchids, comprising *Lælio-Cattleya* × *Philbrickiana* (*C. Aclandiae* ♀ × *L. elegans* ♂); *L.-C.* × *blesensis* (*L. pumila* ♀ × *C. Loddigesii* ♂); *Miltonia spectabilis*, with several large flowers; *Cypripedium* × *Harrisifroyæ* (*C.* × *Harrisianum* ♀ × *C. Godefroyæ* ♂); cut spikes of *Schomburgkia Lyonsii*, *Aërides Sanderianum*, &c.

To Messrs. F. Sander & Co., St. Albans, for a group of Orchids, among which were *Calanthe Sanderiana*, *Grammatophyllum Fenzlianum*, *Aërides Ballantinei aureum*, several fine *Cattleya labiata Gaskelliana*, *Vanda Sanderiana*, *Grobya Amherstiae*, several new hybrid *Cypripediums*, &c.

First Class Certificate.

To *Lælia tenebrosa*, Walton Grange var. (votes, unanimous), from W. Thompson, Esq., Walton Grange, Stone, Staffordshire (gr. Mr. W. Stevens). A very distinct and handsome variety, with sepals and petals of a clear citron-yellow; lip white, with purple lines radiating from the base, and rich crimson-purple front lobe, tipped with white.

To *Miltonia* × *Joiceyana* (votes, unanimous), from Major Joicey, Sunningdale Park, Sunningdale (gr. Mr. Fred. J. Thorne). This, like *M.* × *Bluntii*, is evidently a natural hybrid, the parentage in this case being *M. Clowesii* × *M. candida*. The general habit of the plant is near to that of *M. Clowesii*, but the flowers are larger, the segments broader, and the large labellum, which is one and a half inches across and exhibiting a tendency to become convolute in its fringed upturned edges, has distinct traces of both the reputed parents.

Award of Merit.

To *Lælia* × *Novelty* (*L. pumila Dayana* ♀ × *L. elegans* ♂) (votes, unanimous), from Messrs. Jas. Veitch & Sons, King's Road, Chelsea. Flowers larger, but not differing greatly from those of the pollen parent.

To *Cypripedium* × *Thayerianum* (*C. Lawrenceanum* ♀ ×

C. Boxalli atratum ♂) (votes, unanimous), from Messrs. F. Sander & Co.

To Cypripedium × ceno-superbiens (C. × cœnanthum ♀ × C. superbiens ♂) (votes, unanimous), from Sir Trevor Lawrence, Bart. (gr. Mr. W. H. White). A very showy hybrid, with some resemblance to C. × Pollettianum.

Botanical Certificate.

To Aganisia ionoptera (votes, unanimous), from Sir Trevor Lawrence, Bart. (gr. Mr. W. H. White). A pretty introduction of Messrs. Linden, with tall scapes of white and lilac flowers.

To Earina suaveolens (votes, unanimous), from F. W. Moore, Esq., Royal Botanic Gardens, Glasnevin, Dublin. This singular New Zealand Orchid has growth like a dwarf Bamboo, with terminal panicles of small white fragrant flowers.

Cultural Commendation.

To Major Joicey, Sunningdale Park (gr. Mr. F. J. Thorne), for a finely grown specimen of Vanda Sanderiana (votes, unanimous).

Other Exhibits.

Mr. Owen Thomas, Royal Gardens, Windsor, exhibited a fine plant of the best variety of Rhyncostylis (Saccolabium) guttata.

W. Thompson, Esq., Walton Grange, Stone (gr. Mr. W. Stevens), sent a fine spike of Oncidium spilopterum, purchased under the erroneous name O. Saintlegerianum, Rolfe.

R. I. Measures, Esq., Cambridge Lodge, Flodden Road, Camberwell (gr. Mr. H. Chapman), showed Masdevallia Lowii, Cypripedium × Numa, and C. × Youngianum.

Thos. Statter, Esq., Stand Hall, Whitefield, Manchester (gr. Mr. R. Johnson), exhibited a spike of Lælio-Cattleya × Schilleriana Johnsonii, and forms of L.-C. × elegans.

ORCHID COMMITTEE, AUGUST 29, 1893.

Sir TREVOR LAWRENCE, Bart., in the Chair, and eight members present.

Awards Recommended:—

Silver Banksian Medal.

To Messrs. F. Sander & Co., St. Albans, for a group of rare Orchids.

To Messrs. W. L. Lewis & Co., Southgate, N., for a group of Cattleyas, Cypripediums, Dendrobiums, &c.

First Class Certificate.

To *Habenaria carnea*, from Messrs. F. Sander & Co., St. Albans. This is a worthy companion to *H. militaris*, and has



FIG. 40.—*HABENARIA CARNEA*. (*Journal of Horticulture*.)

bronzy leaves covered with whitish spots. The flowers are large and flesh-coloured (fig. 40.)



FIG. 41.—*CYPRIPEDIUM* × *SANDERO-SUPERBIENS*.
(*Journal of Horticulture*.)

Award of Merit.

To *Cypripedium* × *Sandero-superbiens* (*C. Sanderianum* ♀ × *C. superbiens* ♂) (votes, unanimous), from Norman C. Cookson, Esq., Oakwood, Wylam-on-Tyne (gr. Mr. Murray). The cross was made by Captain Vipan, who presented the seeds to Mr. Cookson. The leaves have dark green markings on a light green ground. The flowers resemble the best form of *C. × Morgania*, but they are darker in tint, and the petals are broader than in that variety (fig. 41).

To *Cypripedium* × *Edwardii* (*C. Fairieanum* ♀ × *C. superbiens* ♂) (votes unanimous), from Thomas Statter, Esq., Stand Hall, Whitefield, Manchester (gr. Mr. R. Johnson). The flower exhibited was superior to that exhibited previously by Messrs. Pitcher & Manda. In general appearance it approached *C. × vexillarium*, but the ground colour was whiter.

To *Aërides Ballantineanum aureum* (votes, unanimous), from Messrs. F. Sander & Co., St. Albans. A pretty variety, in which the centre of the flower is of a bright yellow colour.

Other Exhibits.

Messrs. F. Sander & Co., St. Albans, again sent the richly coloured *Calanthe Sanderiana*, the new *Cypripedium* × *Marshianum* (*C. Lawrenceanum* ♀ × *C. × cenanthum superbum* ♂), and *C. × Thayerianum*.

The Hon. Mrs. Foley, Packham, Fordingbridge (gr. Mr. W. G. Moxham), sent *Cattleya Leopoldii*, Pernambuco var.

Mr. P. McArthur, The London Nurseries, Maida Vale, London, showed a form of *Cypripedium niveum*.

Major Joicey, Sunningdale Park, Sunningdale (gr. Mr. Fred. J. Thorne), showed a good form of *Cattleya Alexandræ* and *Cypripedium* × (*C. barbatum* ♀ × *C. × selligerum* ♂).

Thomas Statter, Esq., Stand Hall, Whitefield, Manchester, showed spikes of two good forms of *Cattleya granulosa* and *Cypripedium* × Charles Canham.

ORCHID COMMITTEE, SEPTEMBER 12, 1893.

SYDNEY COURTAULD, Esq., in the Chair, and nine members present.

Awards Recommended:—*Silver Flora Medal.*

To Messrs. F. Sander & Co., for a group of Orchids, among which were the nearly white *Lycaste Skinnerii pulcherrima*, *Oncidium incurvum album*, several *Miltonia spectabilis Moreliana*, three *Habenaria militaris*, three *H. carnea*, *Oncidium Jonesianum*, *Aërides Lawrenceanum*, *Angræcum articulatum*, *Cattleya Gaskelliana alba*, and many varieties of *Cypripedium*.

Silver Banksian Medal.

To Messrs. Hugh Low & Co., Clapton, for a group of Orchids, including *Cypripedium Victoria Mariæ*, *C. × Brayanum*, *C. × marmarophyllum*, *C. × picturatum*, *C. × œnanthum superbum*, three plants of the pure white *Stanhopea Amesiana*, *Miltonia Roezlii*, *Trichopilia Wagneri*, &c.

Bronze Banksian Medal.

To R. I. Measures, Esq., Cambridge Lodge, Camberwell (gr. Mr. H. Chapman), for a small group of hybrid *Cypripediums*.

First Class Certificate.

To *Cypripedium × Aphrodite* (*C. niveum* ♀ × *C. Lawrenceanum* ♂) (votes, 8 for, 2 against), from Messrs. James Veitch & Sons, Chelsea. A fine white flower spotted with purple, and the reverse cross to *C. × Antigone*.

Award of Merit.

To *Cypripedium × Clothilde Moens* (*C. Haynaldianum* ♀ × *C. × Lecanum* ♂) (votes, unanimous), from Messrs. Linden, l'Horticulture Internationale, Parc Leopold, Brussels. The individual flowers showed evident traces of *C. × Lecanum*, but they were borne three on a spike. It is doubtful whether this plant is distinct from the hybrid known as *C. × De Witt Smith*.

To *Lælio-Cattleya × Epicasta* (*L. pumila* ♀ × *C. Warszewiczii* ♂) (votes, 4 for), from Messrs. James Veitch & Sons, Chelsea. A pretty dwarf variety with rose-coloured sepals and petals, and crimson-veined labellum.

To *Lælio-Cattleya* × *Nysa* (*L. crispa* ♀ × *C. Warscewiczii* ♂) (votes, unanimous), from Messrs. James Veitch & Sons, Chelsea. This fine hybrid bore some resemblance to *L.-C.* × *exoniensis*, but the front of the lip was broader and darker in colour.

To *Cypripedium* × *Leonæ* (*C. insigne Chantinii* ♀ × *C. callosum* ♂) (votes, unanimous), from H. G. Leon, Esq., M.P., Bletchley Park, Bucks (gr. Mr. A. Hislop). The plant bore a two-flowered scape, the flowers somewhat resembling those of *C.* × *Ashburtoniæ*, but they were larger and more beautiful.

Other Exhibits.

Sir Trevor Lawrence, Bart., Burford, Dorking (gr. Mr. W. H. White), showed the beautiful *Cypripedium* × *conco-Lawre* (*C. concolor* ♀ × *C. Lawrenceanum* ♂), the showy *C. xeno-superbiens*, which received an Award of Merit on August 8, *L. præstans* (syn. *C. glanduliferum*), and a cut spike of *C.* × *Morganæ burfordiense*.

Thomas Statter, Esq., Stand Hall, Whitefield, Manchester (gr. Mr. R. Johnson), sent a fine collection of rare cut Orchids, comprising the unique *Cattleya Statteriana*, *C.* × *Minucia*, *C.* × *Parthenia*, *C. Leopoldii* and *C. L. Stand Hall* var., *C. Victoria Regina*, and *Lælio-Cattleya elegans blenheimensis*.

S. G. Lutwyche, Esq., Oakfield, Beckenham (gr. Mr. J. May), showed *Lycaste Skinnerii* with several flowers, one of the scapes bearing two blooms.

Messrs. James Veitch & Sons, Chelsea, showed *Dendrobium neoguineense*, like a cream-white *D. macrophyllum* (*Veitchianum*).

Norman C. Cookson, Esq., Oakwood, Wylam-on-Tyne (gr. Mr. Murray), sent *Lælio-Cattleya* × (*C. Dowiana* ♀ × *L. pumila præstans* ♂), the reverse cross to *L.-C.* × *Ingrami*, but too near to that variety to warrant its being separated from it.

C. L. N. Ingram, Esq., Elstead House, Godalming (gr. Mr. T. W. Bond), sent two hybrid *Cypripediums*.

Mr. James O'Brien, Harrow-on-the-Hill, showed cut spikes of *Satyrium membranaceum*, Sw.

Mr. H. Elliott, Sturvale Nurseries, Christchurch, Hants, showed *Cattleya labiata Gaskelliana*.

The Hon. Mrs. Foley, Fordingbridge, Hants (gr. Mr. Moxham), also showed a well-flowered plant of a pretty light-coloured form of the same species.

ORCHID COMMITTEE, SEPTEMBER 26, 1893.

HARRY J. VEITCH, Esq., F.L.S., in the Chair, and nine members present.

Awards Recommended :—

First Class Certificate.

To *Cypripedium Charlesworthii*, Rolfe, n. sp. (votes, unanimous), from Messrs. Charlesworth, Shuttleworth & Co., Heaton,



FIG. 42.—*CYPRIPEDIUM CHARLESWORTHII*. (*Journal of Horticulture*.)

Bradford. A very fine and distinct species imported from the East Indies. The plant somewhat resembles *C. Spicerianum* in habit. The flowers, which are borne singly on purplish scapes 3 inches high, have the upper sepal $2\frac{1}{2}$ inches wide, broadly orbicular, flat, tinged and veined with light rosy-purple over the greater part of its surface. The lower sepals, which are greenish

white, are 1 inch in width. The petals and lip have some resemblance to the Sylhet variety of *C. insigne*, and are coloured like that species. The staminode has the appearance of white porcelain, and bears a prominent conical protuberance in the centre (fig. 42).

Award of Merit.

To *Lælio-Cattleya* × *blesensis* (*C. Loddigesii* ♀ × *L. pumila* ♂) (votes, unanimous), from Messrs. B. S. Williams & Son, Upper Holloway, N. A very pretty and free-growing hybrid of the stature of *C. Loddigesii*, and with flowers of a similar size borne in threes and fours, the front and edges of the convolute side lobes of the lip being of a rich purplish crimson.

To *Lælio-Cattleya elegans*, Ingram's var. (votes, unanimous), from C. L. N. Ingram, Esq., Elstead House, Godalming (gr. Mr. T. W. Bond). This is of the *Turneri* section, but with larger flowers and broader segments than in varieties previously exhibited. The colour also is very brilliant.

Botanical Certificate.

To *Catasetum Gnomus* (votes, unanimous), from Walter Cobb, Esq., Dulcote, Tunbridge Wells (gr. Mr. J. Howes).

To *Brownleea cærulea* (votes, unanimous), from Mr. James O'Brien, Harrow-on-the-Hill, who also exhibited a very strongly grown *Satyrium eriocarpum* and *S. membranaceum*.

Cultural Commendation.

To E. Ashworth, Esq., Harefield Hall, Wilmslow, Cheshire (gr. Mr. H. Holbrook), for a fine plant of *Dendrobium Phalænoopsis Schröderianum*, one of four plants all well grown (votes, unanimous).

Other Exhibits.

Messrs. F. Sander & Co. exhibited a group of Orchids, in which were *Lælia* × *Sanderæ* (*L. xanthina* ♀ × *L. Dormaniana* ♂), *Oncidium bracteatum*, *O. trulliferum*, *Calanthe curculigoides*, &c.

Messrs. Hugh Low & Co. staged a group of showy Orchids.

Mr. P. McArthur, Maida Vale, contributed a group of Orchids.

Messrs. Charlesworth, Shuttleworth & Co., Heaton, Bradford, sent a group of Orchids.

Thos. Statter, Esq., Stand Hall, Whitefield, Manchester

(gr. Mr. R. Johnson), sent many rare Orchids, among which were *Cattleya* × *Parthenia*, *C. bicolor cærulea*, *C. Alexandræ*, and *Cypripedium* × *Arthurianum superbum*.

W. Thompson, Esq., Walton Grange, Stone, Staffordshire (gr. Mr. Stevens), sent good cut spikes of *Cattleya Alexandræ*.

Messrs. W. L. Lewis & Co., Chase Side, Southgate, showed two hybrid *Cattleyas*, both obtained from the same seed-capsule (*C. Harrisoniæ* ♀ × *C. Warszewiczii* ♂). That named *C.* × *Johnsoniana* had flowers resembling those of *C. Schröderæ*; the other, named *C.* × *Ashtoniana*, had flowers similar to it in shape, but with a rich crimson front lobe to the labellum. A variety of *Cattleya Loddigesii* was also shown.

Messrs. B. S. Williams & Son, Holloway, N., exhibited *Cypripedium* × *Amandum* and *C.* × *Cythera*.

Messrs. Pitcher & Manda, Hextable, Swanley, Kent, sent *Cypripedium* × *radiosum*, Short Hills var.

W. E. Brymer, Esq., M.P., Ilsington House, Dorchester (gr. Mr. J. Powell), showed a fine spike of *Cattleya* × *Brymeriana*.

ORCHID COMMITTEE, OCTOBER 10, 1893.

HARRY J. VEITCH, Esq., F.L.S., in the Chair, and ten members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Linden, l'Horticulture Internationale, Parc Leopold, Brussels, for a group of rare and showy Orchids, comprising *Warszewiczella Lindenii* (F.C.C. June 1892), five distinct forms of a new strain of *Lælio-Cattleya elegans*, several type of *Cattleya labiata*, three distinct forms of *C. Eldorado*, *Cypripedium Rothschildianum*, Linden's var., with four flowers on a spike, *Odontoglossums*, *Cypripediums*, &c.

To Sir Trevor Lawrence, Bart., Burford, Dorking (gr. Mr. W. H. White), for a fine group of the beautiful vermilion *Habenaria militaris*, which has frequently been shown from Burford Gardens.

Silver Banksian Medal.

To Messrs. F. Sander & Co., St. Albans, for a group of

Orchids, among which were a fine specimen of *Phalænopsis Lowii*, *Zygopetalum Klabochorum*, *Z. Burtii*, *Cypripedium* × *Coppinianum*, *C. × Cecilæ*, *C. × Eyermanii*, *C. × ænanthum*, *Oncidium incurvum*, *O. Cebolleta*, *O. Kramerii*; *Cattleya labiata* varieties, and *C. × Kranzlinii*.

To Messrs. B. S. Williams & Son, Upper Holloway, N., for a group of Orchids, in which the varieties of *Dendrobium Phalænopsis Schröderianum*, *D. superbiens* (*D. Goldiei*), and *D. bigibbum* were well shown. Also several rare hybrid *Cypripediums*, *Pachystoma Thomsonianum*, *Lycaste lanipes*, *Miltonia Roetzlii*, &c.

To Messrs. Hugh Low & Co., Clapton, for a group of Orchids, in which were included *Stanhopea Amesiana*, *Vanda Sanderiana*, *V. tricolor*, *Dendrobium Lowii*, *Cattleya Alexandræ*, and *Cypripedium bellatulum*.

Bronze Banksian Medal.

To S. G. Lutwyche, Esq., Eden Park, Beckenham (gr. Mr. J. May), for an arrangement of Orchids, in which the centre was a fine specimen of *Zygopetalum Mackaii* with six spikes, around being *Miltonia candida*, *M. Regnelli*, *M. Clowesii*, *Trichopilia (Pilumna) fragrans*, *Lycastes*, *Cypripediums*, &c.

First Class Certificate.

To *Disa* × *Premier* (*D. × Veitchii* ♀ × *D. tripetaloides* ♂) (votes, unanimous), from the Royal Gardens, Kew. A very fine garden hybrid, with the free growth and numerous flowers of *D. tripetaloides*, and with the rich crimson colour of *D. × Veitchii* (*D. racemosa* ♀ × *D. grandiflora* ♂).

To *Cattleya* × *Chloris* (*C. Bowringiana* ♀ × *C. maxima* ♂) (votes, unanimous), from Messrs. Jas. Veitch & Sons, King's Road, Chelsea. A fine hybrid, with the growth, shape, and colour of flower as in *C. Bowringiana*, but with flowers 5 inches across.

Award of Merit.

To *Lælio-Cattleya* × *elegans Luciani* (votes, unanimous), from Messrs. Linden, l'Horticulture Internationale, Parc Leopold, Brussels. A distinct variety, with rich purple sepals and petals with an emerald-green shade, and vivid crimson front to the labellum.

To *Cattleya labiata Warocqueana fascinata* (votes, unani-

mous), from Messrs. Linden, Brussels. Flowers large and very richly coloured.

To *Cattleya Eldorado Owenii* (votes, unanimous), from Messrs. Linden, Brussels. Flowers large, sepals and petals white, front of lip rich purplish crimson, throat orange.

To *Cypripedium* × *Spicero-Lowianum* (*C. Spicerianum* ♀ × *C. Lowianum* ♂) (votes, unanimous), from Messrs. Linden, Brussels.

To *Odontoglossum Uro-Skinnerii album* (votes, unanimous), from Major-Gen. E. S. Berkeley, Spetchley, Southampton. A form in which the labellum is white, and the sepals and petals lighter and greener than in the type.

To *Cattleya* × *Pheidona* (*C. intermedia* ♀ × *C. maxima* ♂) (votes, unanimous), from Messrs. Jas. Veitch & Sons, King's Road, Chelsea, S.W. A worthy hybrid, with flowers shaped like those of *C. maxima*, but of an exquisitely delicate salmon-blush tint, the base of the lip being yellow, and the front veined with purple.

Botanical Certificate.

To *Habenaria cinnabarina* (votes, unanimous), from Messrs. W. L. Lewis & Co., Southgate, N.

Other Exhibits.

W. E. Brymer, Esq., M.P., Ilsington House, near Dorchester (gr. Mr. John Powell), showed flowers of his *Lælio-Cattleya* × *Brymeriana* (*L.-C. Amanda* × *C. Warscewiczii*), which the Committee requested to see again.

A. J. Hollington, Esq., Forty Hill, Enfield (gr. Mr. Ayling), showed two hybrid *Cypripediums* and one *Cattleya*.

J. Forster Alcock, Esq., Northchurch, Berkhamstead, showed *Cattleya bicolor*, *C. labiata*, and *Odontoglossum grande* with seven flowers on a spike.

F. Hardy, Esq., Tyntesfield, Ashton-on-Mersey (gr. Mr. Thos. Stafford), sent flowers of a very large form of *Lælia pumila præstans*.

Walter C. Clark, Esq., Orleans House, Sefton Park, Liverpool, sent a form of *Lycaste Skinneri*.

ORCHID COMMITTEE, OCTOBER 24, 1893.

HARRY J. VEITCH, Esq., in the Chair, and twelve members present.

Awards Recommended:—*Silver Gilt Banksian Medal.*

To Messrs. James Veitch & Sons, King's Road, Chelsea, for an extensive and well-arranged collection of Orchids, among which were many of their new hybrids.

To Messrs. Charlesworth, Shuttleworth & Co., Heaton, Bradford, for a very fine group of Orchids, composed chiefly of varieties of autumn-flowering *Cattleya labiata*.

Silver Flora Medal.

To Messrs. F. Sander & Co., St. Albans, for a group of Orchids, in which most of the showy species of the season were represented.

Silver Banksian Medal.

To Messrs. W. L. Lewis & Co., Chase Side, Southgate, for a group of Orchids.

To Messrs. Hugh Low & Co., Clapton, for a collection of Orchids, including *Cypripedium bellatulum*, *C. tonsun*, *Lælia Dormaniana*, *Miltonia Roezlii*, *Vanda Amesiana*, *Saccolabium bellinum*, &c.

First Class Certificate.

To *Cirrhopetalum ornatissimum* (votes, unanimous), from Sir Trevor Lawrence, Bart., Burford, Dorking (gr. Mr. W. H. White). The plant had four spikes of its singular cream-white and crimson-fringed flowers.

To *Cattleya* × Lord Rothschild (*C. labiata* Gaskelliana ♀ × *C. Dowiana aurea* ♂) (votes, unanimous), from Messrs. F. Sander & Co., St. Albans. A very fine hybrid, with the free habit of the seed-bearing parent, and flowers resembling *C. × Massaiana*.

To *Cattleya labiata* Sanderiana (votes, 6 for, 4 against), from Messrs. F. Sander & Co. Flowers very richly coloured, the labellum being especially fine.

To *Cypripedium* × *Clonius* (*C. × conchiferum* ♀ × *C. caudatum Lindenii* ♂) (votes, unanimous), from Messrs. Jas. Veitch & Sons, Chelsea. A most elegant hybrid, with some resemblance to *C. × conchiferum*. Flowers ivory-white, the sepals veined with green, and the petals tinged with rose (fig. 43).

To *Lælio-Cattleya* × *Pisandra* (*L. crispa* ♀ × *C. Eldorado* ♂)

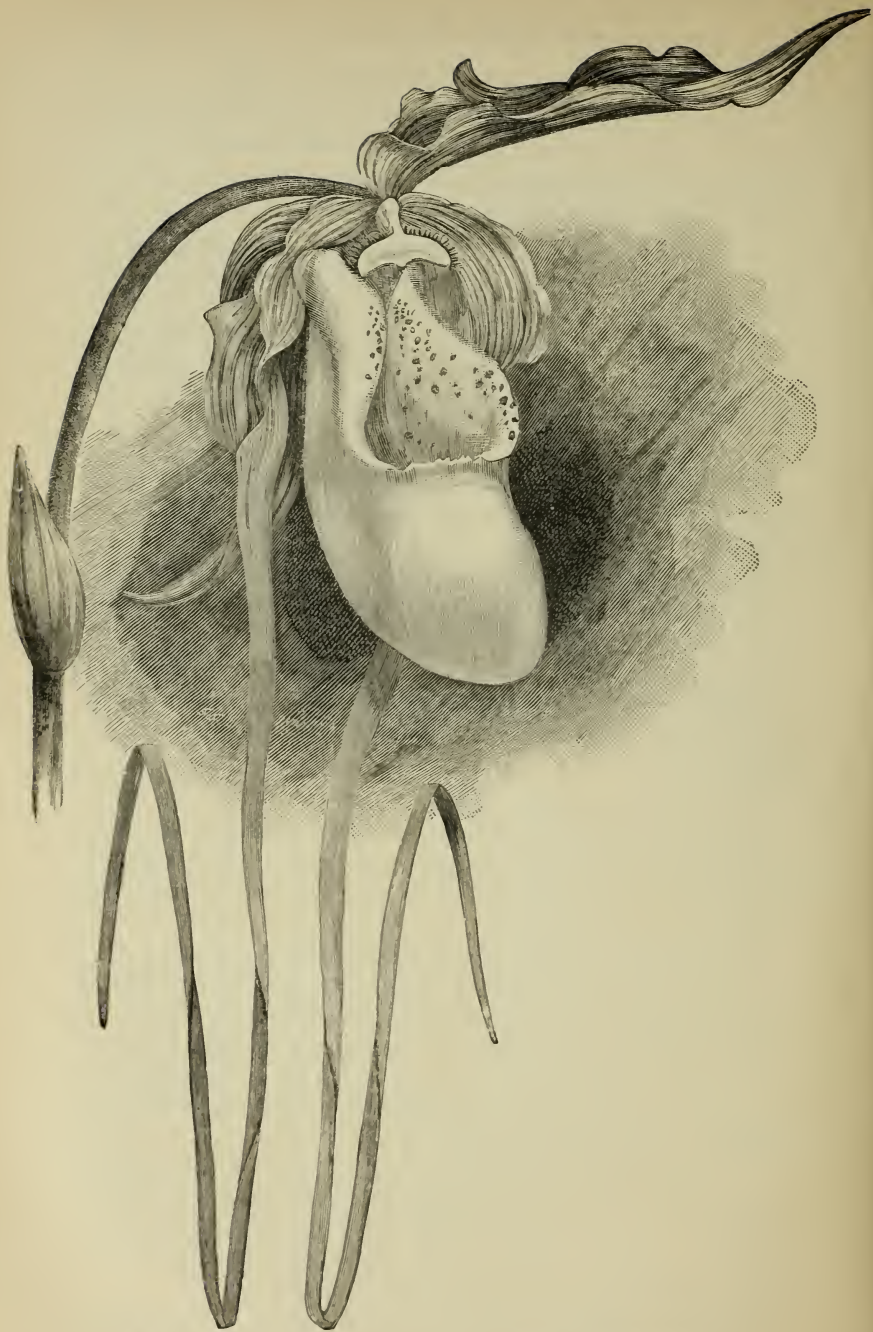


FIG. 43.—CYPRIPEDIUM × CLONIUS. (*Journal of Horticulture.*)

(votes, unanimous), from Messrs. James Veitch & Sons. Flowers formed like those of *L.-C. × exoniensis*, but smaller sepals and petals rosy lilac; front of lip maroon-crimson.

To *Cypripedium × Statterianum* (*C. Spicerianum* magnifi-

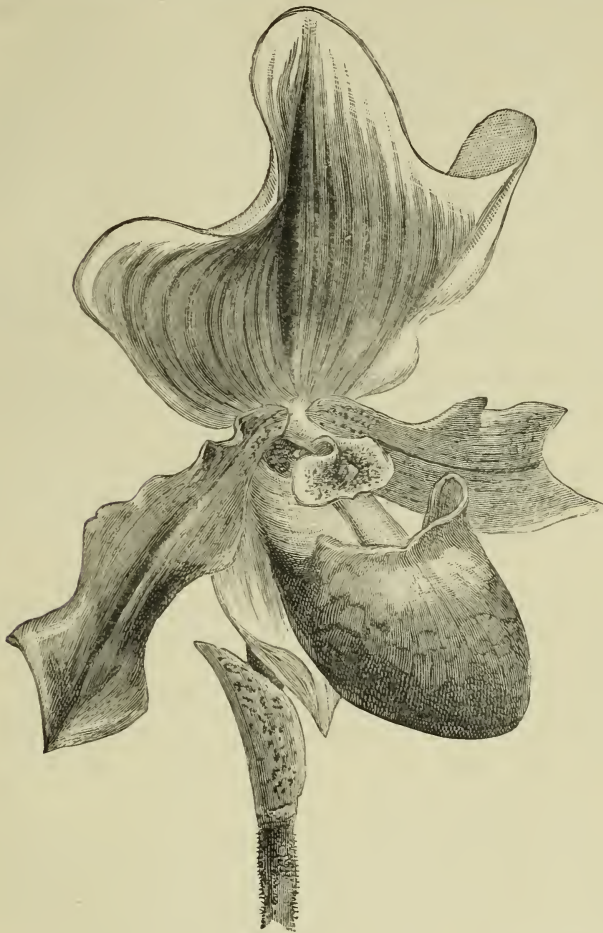


FIG. 44.—*CYPRIPEDIUM × STATTERIANUM*. (*Journal of Horticulture*.)

cum ♀ × *C. × vexillarium superbum* ♂) (votes, 5 for, 2 against), from Thomas Statter, Esq., Stand Hall, Whitefield, Manchester (gr. Mr. R. Johnson). The petals and lip were yellowish, tinged with brown; the large upper sepal rose-purple, edged with white (fig. 44).

Award of Merit.

To *Cattleya labiata* Imschootiana (votes, unanimous), from Messrs. Linden, l'Horticulture Internationale, Parc Leopold, Brussels. A very large and richly coloured variety.

To *Paphinia grandis* (votes, unanimous), from Messrs. Linden, l'Horticulture Internationale, Parc Leopold, Brussels. The largest variety yet exhibited. Flowers claret and white.

To *Cattleya* × *Hardyana*, Selwood var. (votes, 5 for, 4 against), from G. D. Owen, Esq., Selwood, Rotherham (gr. Mr. Watts).

To *Cypripedium insigne* Clarkei (votes, 7 for, 4 against), from W. C. Clark, Esq., Sefton Park, Liverpool (gr. Mr. T. Jones). A variety in the way of *C. nitens*.

To *Cypripedium insigne* albens (votes, unanimous) from Messrs. Heath & Son, Cheltenham. This variety resembles *C. insigne* Sanderæ, but shows more of the brown markings of the ordinary *C. insigne*.

To *Cattleya labiata*, Appleton's var. (votes, unanimous), from W. M. Appleton, Esq., Tyn-y-Coed, Weston-super-Mare. A distinct variety, with large fringed labellum.

To *Dendrobium Phalænopsis*, Appleton's var. (votes, unanimous), from W. M. Appleton, Esq. Flowers white, the outer halves of the segments bright rose-purple.

Botanical Certificate.

To *Dendrobium lamellatum* (votes, unanimous), from Messrs. Linden, l'Horticulture Internationale, Parc Leopold, Brussels. A species allied to *D. sulcatum*.

To *Pholidota convallarioides* (votes, unanimous), from Messrs. Linden, Brussels. The flowers were borne on upright spikes, and were pure white.

Cultural Commendation.

To Messrs. Linden, l'Horticulture Internationale, Parc Leopold, Brussels, for *Odontoglossum luteo-purpureum* intermedium, and for *Cynoches chlorochilon* (votes, unanimous).

Other Exhibits.

Sir Trevor Lawrence, Bart., Burford, Dorking, showed *Cypripedium* × *conco*-Lawre with three flowers on a spike.

G. D. Owen, Esq., Selwood, Rotherham (gr. Mr. Watts), sent *Cattleya labiata* alba.

Thomas Statter, Esq., Stand Hall, Whitefield, Manchester, sent *Lælia* × *Euterpe* (*L. crispa* × *L. pumila* Dayana).

Messrs. Heath & Son, Cheltenham, showed *Lælia* × *Euterpe*, *Cypripedium* × (*C. insigne* ♀ × *siamense*), and *C.* × *Swinburnei*.

W. M. Appleton, Esq., Weston-super-Mare, exhibited a fine *Oncidium Jonesianum*, a distinct *Cattleya* × *Hardyana*, forms of *Cypripedium insigne*, and *Cattleya labiata*.

G. J. Poston, Esq., Bishopsford, Mitcham, sent two varieties of *Cattleya Bowringiana*.

H. Little, Esq., The Barons, Twickenham, showed *Cattleya labiata* var., *Cypripedium Rothschildianum*, and *C.* × *calurum Lemonierii*.

H. Grinling, Esq., Harrow Weald House, Stanmore (gr. Mr. W. Rapley), sent four distinct but indifferent forms of *Cypripedium insigne*.

J. T. Bennett-Poë, Esq., Holmewood, Cheshunt, showed *Odontoglossum Rossii*, *Holmewood* var., with large flowers on a very tall scape.

Sir W. Marriott, Down House, Blandford (gr. Mr. T. Denny), sent for name cut spikes of *Lælia furfuracea* and *L. autumnalis Arnoldiana*.

ORCHID COMMITTEE, NOVEMBER 14, 1893.

HARRY J. VEITCH, Esq., in the Chair, and eight members present.

Awards Recommended:—

Silver Flora Medal.

To R. I. Measures, Esq., Cambridge Lodge, Flodden Road, Camberwell (gr. Mr. Chapman), for a select group of Orchids, composed principally of rare *Cypripediums*, together with *Cattleya labiata*, *Sophronitis grandiflora*, &c. Among the former were *C. insigne* *Sanderæ* and its near ally *C. i. Ernesti*, *C.* × *Bellona* (*C. villosum* ♀ × *C. Spicerianum* ♂), *C.* × *Diana* (*C. barbatum superbum* ♀ × *C. Spicerianum* ♂), *C.* × *Celeus* (*C. insigne* *Chantinii* ♀ × *C. villosum* ♂) *C.* × *Carrierii* (*C. venustum* ♀ × *C. superbiens* ♂), *C. Spicerianum* with ten flowers, and *C.* × *Leeanum* with seven flowers.

To Messrs. F. Sander & Co., St. Albans, for a group of rare Orchids, including many Cypripediums, thirty-two plants of *Cattleya labiata* exhibiting great variation, the new *Cymbidium pulcherrimum*, *Calanthes*, *Odontoglossums*, &c.

To Messrs. B. S. Williams & Son, Upper Holloway, N., for a fine group of Orchids, in which, arranged among *Cattleyas*, *Lycastes*, &c., were *Cypripedium tonsum*, *C. × vexillarium rubrum*, *C. javanicum*, *C. × Dauthierii* and *C. × D. striatum*, *C. × Arthurianum*, *C. Spicerianum*, *C. × Osbornei*, *C. × Huybrechtianum*, *C. × vexillarium superbum*, *C. × enfieldiense*, *C. × Pitcherianum*, Williams' var., and varieties of *C. insigne*.

Silver Banksian Medal.

To Messrs. Hugh Low & Co., Clapton, N.E., for an interesting group of Orchids, in which were *Stanhopea Lowii*, *Cynorchis Lowii*, *Cattleya × Massaiana*, *Cypripedium bellatulum*, *Lælia purpurata Russeliana*, &c.

To Messrs. W. L. Lewis & Co., Chase Side, Southgate, N., for a group of Orchids containing good varieties of *Cattleya maxima*, *C. Warszewiczii*, *C. Bowringiana*, *Cynorchis grandiflora*, &c.

First Class Certificate.

To *Lælio-Cattleya × Statteriana* (*Lælia Perrinii* ♀ × *C. labiata* ♂) (votes, unanimous), from Messrs. James Veitch & Sons, King's Road, Chelsea. This fine hybrid has flowers resembling *L.-C. × exoniensis*, but without the elongation or fringing of the front lobe of the lip. The sepals and petals have the form and colour of *C. labiata*; the broad front lobe of the lip is shaped and coloured like *Lælia Perrinii*.

To *Cypripedium × southgatense superbum* (*C. bellatulum* × *C. × Harrisianum* ♂) (votes, unanimous), from Thos. Statter, Esq., Stand Hall, Whitefield, Manchester (gr. Mr. R. Johnson). This was a very great improvement on the variety originally exhibited. Flowers creamy white, richly spotted with purple.

Award of Merit.

To *Stanhopea Lowii* (votes, unanimous), from Messrs. Hugh Low & Co., Clapton. This, the type, of which *S. Amesiana* is the white form, is of the hornless, or *S. ecornuta* section. Sepals and petals buff colour; lip white, with purple markings in the interior of the hypochile.

To *Cœlogyne* (*Pleione*) *maculata alba* (votes, unanimous), from G. W. Law-Schofield, Esq., New Hall Hey, Rawtenstall, Manchester. This was a fine plant of the pure white form with a dozen flowers.

To *Cypripedium* × *Ashworthiæ* (*C.* × *Leeanum superbum* ♀ × *C.* × *selligerum majus* ♂) (votes, unanimous), from E. Ashworth, Esq., Harefield Hall, Wilmslow, Cheshire. This seemed to be a very fine and highly coloured form of *C.* × *Leeanum*, there being no trace of *C.* × *selligerum*, although it was doubtless used, for a similar result in another cross was shown by T. Statter, Esq.

To *Cypripedium* × *Leeanum* "James Hamilton" (votes, unanimous), from Messrs. F. Sander & Co., St. Albans. This is the largest of the dark forms of *C.* × *Leeanum*.

To *Cypripedium* × *Swinburnei*, Stand Hall var. (votes, unanimous), from Thos. Statter, Esq., Stand Hall, Whitefield, Manchester (gr. Mr. R. Johnson).

Other Exhibits.

Messrs. Jas. Veitch & Sons exhibited *Lælio-Cattleya* × *Pallas* (*C.* *Dowiana* ♀ × *L.* *crispa* ♂), *Cypripedium* × *Ænone* (*C.* *Hookeræ* ♀ × *C.* *superbiens* ♂), *C.* × *Euryades* (*C.* × *Leeanum* ♀ × *C.* *Boxalli* ♂), *C.* × *T. B. Haywood*, *C.* × *microchilum*, and varieties of *C.* × *Leeanum*.

J. Forster Alcock, Esq., Northchurch, Berkhamstead, sent *Odontoglossum* × *Wilckeanum*.

E. H. Woodall, Esq., St. Nicholas House, Scarborough, sent *Cypripedium* *insigne albo-purpureum*, which resembles *C. i. Chantinii*.

Frederick M. Burton, Esq., Highfield, Gainsborough, exhibited four hybrid *Cypripediums*.

Thomas Statter, Esq., Stand Hall, Whitefield, Manchester, exhibited *Cypripedium* × *rubescens* (*C.* × *œnanthum* ♀ × *C.* *Boxalli* ♂), and *C.* × *Ariadne* (*C.* *Spicerianum* ♀ × *C.* × *selligerum* ♂), which resembled *C.* × *Leeanum*, and showed no trace of *C.* × *selligerum*.

Earl Cowper, Panshanger, Herts (gr. Mr. Joseph Fitt), showed a plant of *C.* × *Leeanum*, and another from the same seed-capsule which had reverted to *C. Spicerianum*.

F. S. Moseley, Esq., Flaxby Lodge, Avenue Road, N.W., showed

Cypripedium \times Reginaldianum (C. insigne φ \times C. siamense) and Lælia Dormaniana.

Geo. Hardy, Esq., Pickering Lodge, Timperley (gr. Mr. W. Holmes), sent spikes of good forms of Cattleya labiata, and of a form of Lælia anceps near to L. a. Amesiana.

Walter C. Clark, Esq., Orleans House, Sefton Park, Liverpool, sent flowers of Cypripedium \times Harri-Leeanum (C. \times Leeanum φ \times C. Harrisianum σ) and C. \times Wallaertianum aureum.

Messrs. Linden, l'Horticulture Internationale, Parc Leopold, Brussels, placed before the Committee a coloured drawing of their new Lælio-Cattleya \times Cawenbergiana, which had some resemblance to a L.-C. elegans, but with sepals and petals coloured like Cattleya guttata Prinzii.

ORCHID COMMITTEE, NOVEMBER 28, 1893.

HARRY J. VEITCH, Esq., in the Chair, and nine members present.

Awards Recommended:--

First Class Certificate.

To Lælia anceps Amesiana (votes, unanimous), from Thomas Statter, Esq., Stand Hall, Whitefield, Manchester (gr. Mr. R. Johnson). This beautiful variety, a near ally of L. a. Schröderæ, has white sepals and petals tinged with rose and heavily tipped with crimson, the front and anterior parts of the side lobes being of a dark maroon-crimson.

Award of Merit.

To Calanthe \times Victoria Regina (? C. \times Veitchii \times C. rosea) (votes, unanimous), from Messrs. F. Sander & Co., St. Albans. This pretty hybrid, raised recently by Sir Trevor Lawrence, Bart., is like a blush-white C. \times Veitchii, no variation being seen in the twenty plants shown.

To Cypripedium \times Mary Lee (C. \times Leeanum φ \times C. \times Arthurianum σ) (votes, unanimous), shown by W. R. Lee, Esq., Beech Lawn, Audenshaw, Manchester. The flowers resemble in most particulars the seed-parent. The upper sepal was white, with a

green base and a few spots of purple. The petals were curved downward as in *C. × Arthurianum*, the petals and lip resembling that variety in colour.

To *Calanthe × Mylesii* (*C. nivalis* ♀ × *C. × Veitchii* ♂) (votes, 5 for, 2 against), from Messrs. B. S. Williams & Son, Upper Holloway, N. This may be likened to a white *C. × Veitchii*.

To *Cypripedium insigne* var. *illustre* (votes, unanimous), from R. I. Measures, Esq., Cambridge Lodge, Camberwell (gr. Mr. Chapman). A very handsome variety, with clear yellow ground, and profuse reddish-brown blotches on sepals, petals, and upper part of the lip.

To *Cypripedium × Fairieano-Lawrenceanum* (*C. Lawrenceanum* [? *C. callosum*] ♀ × *C. Fairieanum* ♂) (votes, unanimous), exhibited by Thomas Statter, Esq., Stand Hall, Whitefield, Manchester (gr. Mr. R. Johnson). This variety closely resembles *C. × vexillarium*, but the crimson stripes on the upper sepal are wider apart and more white is shown.

To *Cypripedium × Minos* (*C. Spicerianum* ♀ × *C. Arthurianum* ♂) (votes, unanimous), from Messrs. James Veitch & Sons, Chelsea, S.W. The upper sepal was white tinged with purple at the base; petals and lip honey-yellow tinged with brown.

Botanical Certificate.

To *Habenaria ciliaris*, from Messrs. James Veitch & Sons, Chelsea.

Other Exhibits.

Messrs. Jas. Veitch & Sons exhibited *Lælio-Cattleya × Cornelia* (*L. pumila* ♀ × *C. labiata* ♂), a pretty dwarf hybrid, with flowers like those of a small *Cattleya labiata*; the curious little *Cypripedium × Arete* (*C. concolor* ♀ × *C. Spicerianum* ♂), and *C. × Cleola*. *Catasetum Gnomus* was also shown, and inadvertently received an Award of Merit as *C. Darwinianum*, a totally different species.

Messrs. F. Sander & Co., St. Albans, showed *Cypripedium × Priorianum* (*C. × Lathamianum* ♀ × *C. × Harrisianum* ♂), a stately dark variety with dark chocolate base to the upper sepal; *C. × Lynchianum* (*C. Spicerianum* ♀ × *C. × selligerum majus* ♂), a variety resembling *C. × Leeanum*; and *Calanthe × Sandhurstiana*.

W. Thompson, Esq., Walton Grange, Stone, Staffordshire

(gr. Mr. W. Stevens), sent a two-flowered inflorescence of the true *Cattleya Victoria Regina*.

Messrs. Hugh Low & Co., Clapton, showed two plants of *Cypripedium* × *Pluto* (*C. Boxalli* ♀ × *C. calophyllum* ♂), and *Cypripedium* × *calurum Ainsworthii*.

Thos. Statter, Esq., Stand Hall, Whitefield, Manchester, sent as *Cypripedium* × *Engelhardtæ* a light form of *C. × Leeanum*.

Walter Cobb, Esq., Dulcote, 33 Broadwater Down, Tunbridge Wells (gr. Mr. Joseph Howes), staged a fine plant of *Cypripedium* × *Cobbianum* (*C. Lawrenceanum* ♀ × *C. × Sallierii* ♂). The handsome greyish-green foliage was barred by narrow transverse lines of dark green. The flowers were like *C. × Harrisianum nigrum*.

Mr. H. A. Tracy, Amyand Park Road, Twickenham, sent for name *Cyperorchis* (*Cymbidium*) *elegans*.

C. J. Lucas, Esq., Warnham Court, Horsham (gr. Mr. G. Duncan), showed two well-grown plants of *Dendrobium D'Albertsii*.

Mrs. Haselfoot, Moor Hill, Westend, Southampton (gr. Mr. N. Blandford), sent a dozen good spikes of *Cattleya labiata*.

ORCHID COMMITTEE, DECEMBER 12, 1893.

HARRY J. VEITCH, Esq., in the Chair, and eleven members present.

Awards Recommended:—

Silver Banksian Medal.

To Messrs. Linden, l'Horticulture Internationale, Parc Leopold, Brussels, for a group of very rare Orchids, among which were superbly grown examples of *Odontoglossum crispum*, two new *Lycastes*, *Lælio-Cattleya* × *Stehegoleffiana* (*L. grandis* ♀ × *C. lab. Warneri* ♂), *Cypripedium* × *Parisho-Lowianum*, a cut spike of *C. labiata* with six flowers, &c.

To Messrs. J. Veitch & Sons, King's Road, Chelsea, S.W., for a select group of Orchids, both species and hybrids. Among them were *Cattleya* × *Pheidona* (*C. intermedia* ♀ × *C. maxima* ♂),

C. × leucoglossa (*C. Loddigesii* ♀ × *C. × fausta* ♂), several new *Cypripediums*, *Sophronitis grandiflora* with thirty flowers, &c.

To Messrs. F. Sander & Co., St. Albans, for a group of Orchids, comprising several reputedly new things, which had as yet not sufficiently developed; some fine Mexican *Lælias*, hybrid *Cypripediums*, &c.

To Messrs. B. S. Williams & Son, Upper Holloway, N., for a group of Orchids, among which were fine plants of over twenty species and varieties of *Cypripediums*.

To Messrs. Hugh Low & Co., Clapton, N.E., for a group of Orchids in great variety.

To His Grace the Duke of Northumberland, Syon House, Brentford (gr. Mr. G. Wythes), for an extensive and effective display of fine spikes of *Calanthe × Veitchii* and *C. vestita*, effectively arranged with Maidenhair Ferns. The spikes were cut full length, and set up in vases, several together, and afterwards arranged as a group.

First Class Certificate.

To *Lælio-Cattleya × Nysa* (*L. crispa* ♀ × *C. Warscewiczii* ♂) (votes, unanimous), from Baron Schröder, The Dell, Egham (gr. Mr. H. Ballantine). This fine hybrid was raised by Messrs. James Veitch & Sons, who showed a small plant of it at the meeting on September 12, when it received an Award of Merit. The present well-grown example more fully displayed its excellent qualities.

To *Lælia × Finckeniana* (votes, unanimous), from C. W. Fincken, Esq., Hoyland Hall, Barnsley (gr. Mr. Milburn.) The plant was much finer than when last shown (December 13, 1892—Award of Merit), and bore six flowers on a spike.

To *Cypripedium × fascinatium* (*C. Spicerianum* ♀ × *C. hirsutissimum*) (votes, unanimous), from M. Jules Hye-Leysen, 8 Coupure, Gand, Belgium. An improved form of *C. × Ceres*, shown by its raiser, Drewett O. Drewett, Esq., Feb. 9, 1892.

Award of Merit.

To *Lycaste Imschootiana* (votes, unanimous), from Messrs. Linden, l'Horticulture Internationale, Parc Leopold, Brussels. A distinct variety of hybrid origin. The flowers were of the form and size of those of *L. Skinnerii*, but with the more slender stalk and yellow ground colour of *L. cruenta*. Sepals and petals

yellowish green, spotted with purple, except the tips; lip yellow, with orange marks at the base.

To *Odontoglossum crispum* Thompsonæ (votes, unanimous), from Messrs. Linden, l'Horticulture Internationale, Brussels. A grand form, with white flowers; the sepals spotted with chestnut-red.

To *Cypripedium* × *Clinkaberryanum*, var. *warnhamensis* (*C. Curtisii* ♀ × *C. philippinense* ♂) (votes, unanimous), from C. J. Lucas, Esq., Warnham Court, Horsham (gr. Mr. Duncan). It differed from the original (illustrated in *Gardeners' Chronicle*, July 22, 1893) in being lighter in colour, and with fewer spots on the petals.

To *Cypripedium* × *Sallieri aureum* (*C. insigne* ♀ × *C. villosum* ♂) (votes, unanimous), from J. F. Ebner, Esq., Woodlands, Beckenham (gr. Mr. A. Waite).

To *Cypripedium venustum* Measuresianum (votes, unanimous), from R. I. Measures, Esq., Cambridge Lodge, Camberwell (gr. Mr. Chapman). In this there is the same suppression of colour as in *C. Lawrenceanum* Hyeatum.

To *Zygopetalum rostratum* (votes, unanimous), from Messrs. F. Sander & Co., St. Albans.

To *Cypripedium* × *Ænone* (*C. Hookeræ* ♀ × *C. superbiens* ♂) (votes, 7 for, 1 against), from Messrs. James Veitch & Sons.

Botanical Certificate.

To *Lycaste Luciani* (votes, unanimous), from Messrs. Linden, l'Horticulture Internationale, Parc Leopold, Brussels. A singular Peruvian species, with the form and hairy labellum of *L. lasioglossa*, but with pink-tinted flowers.

To *Dendrobium glomeratum* (votes, unanimous), from Messrs. Jas. Veitch & Sons. A new species, with clusters of deep purple flowers.

To *Pleurothallis scapha* (votes, unanimous), from R. I. Measures, Esq., Camberwell (gr. Mr. Chapman).

Cultural Commendation.

To *Cymbidium Traceyanum*, from Baron Schröder, The Dell, Staines (gr. Mr. Ballantine).

Other Exhibits.

Baron Schröder also exhibited *Cypripedium* × *Leeanum superbum*, *C.* × *Galatea*, *C. insigne* Sanderæ, &c.

E. Ashworth, Esq., Harefield Hall, Wilmslow, Cheshire, sent *Lælia anceps* Amesiana.

M. Wells, Esq., sent *Lælio-Cattleya* × *exoniensis*.

Thos. Statter, Esq., Stand Hall, Whitefield, Manchester (gr. Mr. R. Johnson), showed *Cypripedium* × (*C. villosum* ♀ × *C. oenanthem superbum* ♂).

H. Hainworth, Esq., St. John's Park, Blackheath, exhibited *Cirrhopetalum ornatissimum*.

W. Vanner, Esq., Camden Wood, Chislehurst (gr. Mr. G. H. Robbins), showed *Cypripedium* × *pulchellum* (*C.* × *grande* ♀ × *C.* × *Sedeni candidulum* ♂) and *C.* × *Io-Spicerianum*.

F. Wigan, Esq., Clare Lawn, East Sheen, Richmond (gr. Mr. W. H. Young), showed *Cypripedium* × *Wiganianum* (? *C.* × *Harisianum* × *C.* × *Ashburtoniæ*).

C. J. Lucas, Esq., Warnham Court, Horsham, sent *Phaius maculatus*, *Dendrobium infundibulum*, and *Comporetia macroplectron*.

Books, &c., presented or purchased for the Lindley and Royal Horticultural Society's Library from Jan. 1 to Dec. 31, 1893.

"Agricultural Gazette of New South Wales." "Annales des Sciences Naturelles." "Art out of Doors"—Mrs. Schuyler van Rensselaer. "Atlas der Pflanzenkrankheiten"—Sorauer. "Beihefte zum botanischen Centralblatt." "Biographical Index of British and Irish Botanists"—Britten and Boulger. "Boletin da Sociedade Broteriana." "Botanical Magazine." "Botanische Jahrbücher für systematische Pflanzengeschichte." "Botanische Zeitung." "Handbook of Bromeliaceæ"—Baker. "Bulletin de la Société d'Horticulture de Genève." "Bulletin de l'Association pour la Protection des Plantes." "Bulletin du Cercle Horticole du Nord." "Bulletin Bibliographique de la Librairie Française." "Bollettino della R. Società Toscana di Orticultura." "Cacteen-Cultur"—Haage. "Conversations on Botany." "Contributions to Horticultural Literature"—W. Paul. "Die Bäume und Sträucher des Waldes"—Hempel und Wilhelm. "Die natürlichen Pflanzenfamilien." "Elements of Agriculture"—Fream. "Flora Batava." "Flora oder allgemeine botanische Zeitung." "Flora Italiana"—Filippo Parlatore. "Forstlich-naturwissenschaftliche Zeitschrift." "Flore Forestière de la Cochinchine"—Pierre. "Flora of British India"—Hooker. "Gardeners' Chronicle." "Gardeners' Magazine." "Gardening World." "Garden." "Garden and Forest." "Garden Work." "British Gardening." "Gartenbeete und Gruppen"—Hempel. "Geschlecht der Pflanzen"—Kölreuters. "Gartenflora." "Handbook to the Flora of Ceylon"—Trimen. "Handbuch der Laubholzkunde"—Dippel. "Hints on Vegetable and Fruit Farming"—Whitehead. "Index Kewensis"—Hooker and Jackson (Parts 1 and 2). "Icones Plantarum"—Hooker. "Insect Life"—Riley and Howard. "Irideæ"—Baker. "Journal of Horticulture." "Journal of the Royal Agricultural Society." "Journal of the Linnean Society." "Journal of

the Royal Society." "Journal of the Geological Society." "Journal of Botany." "Johnson's Gardener's Dictionary." Just's "Botanischer Jahresbericht." "Kew Bulletin." "Kryptogamen-Flora"—Rabenhorst. "Les Orchidées Rustiques"—Correvoon. "Les Maladies de la Vigne"—Viala. "La Pratique des Travaux de la Ferme"—Garola. "Les Orchidées"—De Bois. "Memoirs of the Manchester Literary and Philosophical Society." "Manual of Orchidaceous Plants"—Veitch. "Monographie des Mélastomacées"—Humboldt and Bonpland. "Notes on the Genera of Taxaceæ and Coniferæ"—Masters. "Nouvelles Archives du Muséum d'Histoire Naturelle." "Orchids of South Africa"—Bolus. "Pflanzenbiologische Schilderungen"—Goebel. "Plantae Tinneanae"—Tinné. "Potato Culture and Disease Prevention"—Wilts Technical Education Committee. "Plates in Illustration of the Handbook to the Flora of Ceylon"—Trimen. "Proceedings, Société Nationale d'Horticulture de France." "Proceedings of the American Pomological Society." "Proceedings of the Boston Society of Natural History." "Proceedings of the American Philosophical Society." "Proceedings of the Society of American Florists." "Primer of Horticulture"—Wright. "Report on Condition of Growing Crops"—Dept. of Agriculture, Sydney. "Reichenbachia"—Sander. "Revue Horticole." "Report of the Missouri Botanical Garden." "Report of Observations of Injurious Insects, with Methods of Prevention and Remedy"—Miss Ormerod. "Sowerby's English Botany" (36 vols.). "The Orchid Review." "The Fruit Grower's Guide"—Wright. "The Carnation Manual." "The Genus Masdevallia." "The Silva of North America"—Sargent. "The Canadian Record of Science." "The Modern Gardener"—Price. "The California Vine Disease"—Pierce. "Transactions of the Massachusetts Hort. Society." "Wiener illustrierte Gartenzeitung." "Zeitschrift für Pflanzenkrankheiten." "A Treatise on the Peach"—Smith.

The Council of the Royal Horticultural Society and the Trustees of the Lindley Library will be grateful for presents of works on Horticulture and Botany, receipt of which will be duly acknowledged.

Donors of Plants, Seeds, &c., to the Society's Gardens at Chiswick during the year 1893.

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 ALLAN, W., Gunton Park, Norwich. Onion seed.
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- CHEAL & SONS, J., Messrs., Crawley. Apple grafts.
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- CLARKE, Col., Daventry. Seeds of *Ptycoraphis augusta*.
- COCKER & SONS, Messrs., Aberdeen. Roses.
- COOPER, TABER & Co., Messrs., Witham. Seeds of Peas, Potatos, &c.
- COLE & Co., F., Messrs., Catford. Two bottles of Floressence.
- COLLINS, P., Malvern. Seed Potatos.
- CROSS & SON, Alex., Messrs., Glasgow. Murray's Electric Mildew Insecticide Destroyer.
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- HART, T., Woodside Green. New Zealand seeds.
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- HERBST, H., Richmond. *Struthiopteris germanica*, *Canna Madame Crozy*, &c.
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- HUBERT & MAUGER, Messrs., Guernsey. *Gladioli delicatissima superbissima*.
- HUGHES, E. G., Manchester. Hughes' Vapour Roll Fumigator.
- HURST & SON, Messrs., Houndsditch. Seeds of Tomatos, Onions, &c.
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- LONSDALE, Miss. *Auricula* seed.
- LOW & Co., Hugh, Messrs., Clapton. *Cytisus scoparius Andreanus*.
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- PAUL & SON, Cheshunt. Clematis.

- PICK & Co., J. H., Stamford. Pat. No. 1,088 Excelsior Hoe.
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- WHITEHOUSE, E. F., Kidderminster. Seedling Strawberries.
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INDEX.

The botanical names of plants are printed in italics.

Abies orientalis aurea, lxxii
 Abutilon Souvenir de Bonn, lviii
 Acacias on the Riviera, 83
Acalypha Macafeeana, cxcix
Aërides Ballantineanum aureum, ccxi
Aganisia ionoptera, ccviii
 Agave Leopold II., clxvii
 „ *univittata* var., clxviii
Aglaonema pumilum, clxxxiii
 Agricultural Hall Show, clxxi
Allium neapolitanum, 99
Alocasia Sandariana, lxiv
 Alpine Plants, 104, 161
 „ „ Collecting, 107
 „ „ Increasing, 123
 „ „ List of, 171
 „ „ Treatment of, 116
Alstræmeria aurantiaca, cl
 American Blight, 143
 Androsaces, 168
 Anemones on the Riviera, 101
Angræcum odoratissimum, xciv
 Annual General Meeting, 1893, i
Anthurium crystallinum var., lxiv
 „ *Dickii*, lvi
 „ *Lindeni fl. car.*, xcxcii
 „ *Parisiente*, lxiv
 „ *Wambeckianum*, clxxxviii
 Apple Byford Wonder, cxlvii
 „ Hambling's Seedling, cxlii
 „ Jacquin, xxxv
 „ Standard Bearer, xxxii
 „ Wealthy, cxl
 Aralias, Dimorphic, xxii
Arctotis aspera, 103
 "Art Out of Doors," 157
Asplenium marginatum, lxiv
 „ *setigerum grandiceps*, lxv
 Aucuba, Yellow-fruited, li
 Azalea Anthony Koster, liv
 „ Hardy, 140
 „ *mollis* Hilda, lviii
 „ Raphael de Smet, lxix
Azolla pinnata fruiting, xxx
 Balance Sheet, 1892, viii
 Begonia Baron Schröder, lxvi

Begonia Bexley Gem, lxvi
 „ B. Parsons, lxi
 „ *elegans*, lxvi
 „ Ernest Cook, lxxx
 „ *gigantea*, lxxv
 „ Gloire de Lorraine, cxciii
 „ Gloire de Sceaux, xlii
 „ Hector, lxi
 „ Lady Brooke, lxvi
 „ Lord Brooke, lxvi
 „ Lord Llangattock, lxvi
 „ Mrs. Reznart, lxvi
 „ Richard Dean, lxxxv
 „ Triomphe de Lemoine, xlvii
Billbergia sanguinea, lxi
Bomarea patacoensis,
 Books, Notices of, 156
Bougainvillea spectabilis, liv
Brownea ariza, li
Brownleea cærulea, ccxv
Bulbophyllum comosum, lxxxii
 „ *Lobbii siamense*, c
Calanthe × *gigas*, lxxxii
 „ × *Mylesii*, ccxxvii
 Caladium Ibis Rouge, lxvi
 „ Mrs. Harry Veitch, lxvi
Calochortus amœnus, lxi
 „ *venustus oculatus*, lxxvii
 „ „ *roseus*, lxxviii
 „ „ *vesta*, lxxviii
Calypso borealis, xciv
Campanula grandiflora Mariesi, clvii
 Canna, History of the Genus, 182
 „ Progression, lvi
 „ Sophie Buchner, lxiii
 Cannas, 178
 „ at Chiswick, 247, lxxx
Caraguata cardinalis, xlvi
 Carnation Annie Saunders, lxxii
 „ Hayes Scarlet, lxxvii
 „ King Arthur, lxxvii [lxiv
 „ Mrs. Seymour Bouverie,
 „ Princess May, lvi
 „ Sir Charles Fremantle, lxxii
 „ The Churchwarden, lxv
 „ Uriah Pike, lvi

- Carnations, clvi
Catasetum Gnomus, ccxv
Cattleya × *Chloris*, ccxvii
 „ *Eldorado Oweni*, ccxviii
 „ *guatemalensis Wischhusen-*
iana, xcvi
 „ *Hardyana*, Tate's var., ccvi
 „ × *Hardyana*, Selwood var.,
 ccxxii
 „ × *Harold*, cii
 „ *lab.*, Appleton's var., ccxxii
 „ „ *Imsehootiana*, ccxxii
 „ „ *Sanderiana*, ccxix
 „ „ *Warocq.fascinata*, ccxvii
 „ × *Lord Rothschild*, ccxix
 „ *Luddemanniana*, xciv
 „ × *Pheidona*, ccxviii
 „ *Trianae*, Hillingdon var., lxxxvi
 „ „ *Florence le Doux*, lxxxvi
 „ *Warsceviczii Sanderæ*, cix
 „ × *William Murray*, civ
Cereus Hoveyi, lii
 Chemistry and Soil, 128
 Chiswick Local Show, cli
 Chrysanthemum Beauty of Castle Hill,
 xlv
 „ *frutescens*, 92
 „ „ *Alma Brugge-*
mann, xlvii
 „ *Mrs.E.D.Adams*, xliii
 „ *New Year's Gift*, xliii
 Chrysanthemums, 220, cxcii, cxcvii, cc
Cineraria maritima aurea, lxvi
Cirrhopetalum ornatissimum, ccxix,
 ccxxx
 Citron, Antiquity in Egypt, 147
 Class List of Examination, 1893, 152
Clerodendron trichotomum, clxix
 Clivia Beechdale, li
 „ *Scarlet Gem*, xlvii
Cochlioda vulcanica grandiflora, lxxxvii
 „ *Noezliana*, xciv
Codium Thomsoni, lxvi
 „ *Russelli*, cxcvii
Cælogyne maculata alba, ccxxv
 „ *Sanderæ*, xc
 Coloured Glass, Effects of, on growth,
 59
Cornus brachypoda variegata, clxix
Corylopsis pauciflora, xlvii
Costus igneus, ccii
Crinum Ponelli album, lxxvii
Cupressus guadaloupensis, xxviii
 „ *macrocarpa lutea*, clvii
Cyanocheles pentadactylon, lxxx
Cydonia japonica cardinalis, lvi
Cymbidium Traeyanum, ccxxx
Cynorehis grandiflora, lxxx
Cypripedium × *Aphrodite*, ccxli
 „ × *Ashworthiæ*, ccxxv
 „ *Charlesworthi*, ccxiv
 „ × *Chas. Rickman*, ciii
 „ × *Clinkberryanum*
warnhamense, ccxxx
 „ × *Clonius*, ccxix
 „ × *Clothilde Moens*, ccxii
 „ × *conco-Lavre*, lxxxv
 „ × *Edwardi*, ccvi, ccxi
 „ × *Fairieano-Lawrence*
anum, ccxxvii
 „ × *fascinatum*, ccxxix
 „ *insigne albens*, ccxxii
 „ „ *Clarkei*, ccxxii
 „ „ *illustre*, ccxxvii
 „ × *Leeanum James Ham-*
ilton, ccxxv
 „ × *Leonæ*, ccxiii
 „ × *Mary Lee*, ccxxvi
 „ × *Massaianum*, ccv
 „ × *microchilum*, xciv
 „ × *Minos*, ccxxvii
 „ × *Ænone*, ccxxx
 „ × *æno-superbiens*, ccviii
 „ × *Penelaus*, lxxx
 „ × *Phædra*, lxxx
 „ × *Sallieri aureum*, ccxxx
 „ × *Sanderæ - superbiens*,
 ccxi
 „ × *southgatense superbum*,
 ccxxiv
 „ × *Spicero - Lowianum*,
 ccxviii
 „ × *Statterianum*, ccxxi
 „ *Stonei Cannartianum*,
 cciv
 „ × *Swinburnei*, StandHall
 var., ccxxv
 „ *synanthi* of, ccxiii
 „ × *Thayerianum*, ccvii
 „ × *T. W. Bond*, xciv
 „ × *venustum Measures-*
ianum, ccxxx
 „ *Volonteanum giganteum*.
 cv
 „ × *Winnianum*, lxxxv
Cyrtopodium punctatum splendens
 xcvi
 Daffodils and Mice, ccxiv
 „ *Decaying*, ccxiv
Datura cornucopia, clxxxiii
Davallia fijiensis elegans, lxv
 Delphinium John Thorpe, lxvi
Dendrobium Bensonæ album, cii
 „ × *Bryan*, cciii
 „ *glomeratum*, ccxxx
 „ *lamellatum*, ccxxii

- Dendrobium* × *Niobe*, xcvi
 „ *nobile Amesæ*, lxxxv
 „ „ *Ballianum*, xc
 „ × *Owenianum*, lxxxv
 „ *Phalænopsis*, Appleton's var.
 „ × *Sybil*, xciv
 „ *Wardianum album*, xciii
Dianthus caryophyllus vars., 94
Didymocarpus lacunosa, clviii
Diervilla *Eva* Ratke, clxviii
Disa × *Premier*, ccxvii
Diuris maculata, lxxxvii
Dracæna Jamesi, cxcv
 „ *Lord Wolseley*, lxvi
 „ *Sanderiana*, lxi
Earina suaveolens, ccviii
Epidendrum Claesianum, cv
 „ *Forgetianum*, cix
Eria barbata, lxxxvii
Eriosoma lanigera, 144
Eucalypts, 86
Eucalyptus Galls, xxiv
Eucharis Culture, Failure in, 194
 „ *Lowii*, lvi
Exacum macranthum, clxvii
 Examination in Horticulture, 151
 „ Questions set at, 154
Fern, Proliferous, cxxv
Ferraria antherosa, cl
 Fog, Possible Remedies, 52
 „ Report on Effects of, 1
Fritillaria aurea, xlvii
Gladiolus delicatissima superbissima, lxxii
 „ on the Riviera, 98
Gloxinia *Netted Queen*, lxv
Grapes, Late-keeping, 227
Grevillea Banksi, clxi
Habenaria carnea, ccix
 „ *ciliaris*, ccxxvii
 „ *cinnabarina*, ccxviii
Hæmanthus Lindenii, clxxxviii
Hakea laurina, 90
Heliophora nutans, lxxviii
Helianthus rigidus Miss Mellish, clxix
Heliopsis scabra major, clxxxiii
Hemerocallis *Apricot*, lxv
Hexisia bidentata, cix
Hippeastrum *Corinna*, xlvii
 „ *Eldorado*, xlvii
 „ *Excellent*, xlvii
 „ *Hon. W. F. D. Smith*, xlv
 „ *Lightning*, lii
 „ *Lord Roberts*, lxvi
 „ *Nimrod*, xlvii
Hippeastrum *Ophelia*, lii
 „ *Salvator Rosa*, xlvii
 „ *Socrates*, xlvii
 „ *Syren*, lii
Holothrix orthoceras, xci
 Hybrid of *Aquilegia* and *Clematis*, xxix
Ice, Flowers in, lxxviii
Iris *Lorteti*, lxxii
 „ *Sari nazarensis*, lvi
Irises at *Chiswick*, 248
 „ *Bulbous*, 159
Job's Tears, cxxvi
Johnson's Gardeners' Dictionary, 156
Lachenalias, 99
Lælia anceps Amcsiana, ccxxvi
 „ *crispa superba*, ccvi
 „ *crispilabia* var., cix
 „ *Finckeniana*, ccxxix
 „ × *Novelty*, ccvii
 „ *tenebrosa*, *Walton Grange* var., ccvii
 „ *vitellina*, lxxxviii
Lælio-Cattleya × *Ascania*, xcix
 „ „ × *Blesensis*, ccxv
 „ „ × *elegans*, *Ingram's* var., ccxv
 „ „ × *Epicasta*, ccxii
 „ „ × *Maynardi*, lxxxvi, cvii
 „ „ × *Nysa*, ccxiii, ccxxix
 „ „ × *Pisandra*, ccxix
 „ „ × *Statteriana*, ccxxiv
Lettuce *Veitch's Golden Queen*, xxxv
Liatris pycnostachya, clxi
Lilac *Alphonse Lavallée*, lii
Lilium Henryi, clxviii
 „ *Lowi*, cl
Linaria Hybrid, xxx
Luisia Amesiana, cix
 „ *volucris*, cix
Lycaste Imshootiana, ccxxix
 „ *Luciani*, ccxxx
 „ *Skinneri* *Hettie*, xci
Magnolia hypoleuca, lxi
 „ *stellata*, pink var., lii
Marguerites, *White and Yellow*, 92
Masdevallia Armini, xcix
 „ × *Gelengiana*, xcix
 „ *The Genus*, 159
Massonia amygdalina, ccii
Matricaria Chamomilla, *Rayless*, cxxiv
Maxillaria Sanderiana xanthoglossa, c
 „ *sanguinea*, xc
Melon *County Councillor*, cxxxiv
 „ *Frogmore Seedling*, xxxix
 „ *Hero of Isleworth*, cxxxiv
 „ *Ingestre Hybrid*, xxxvii

- Melon Lee's Perfection, cxxxii
 „ Royal Prince, cxxxiv
Miltonia × *Joicyana*, ccvii
 „ *veixillaria* Daisy Haywood,
 ccv
 Mimosa, 83
 Mites in Soil, xvi
 Myosotis, proliferous, many-petalled,
 xxv, xxvi
 Narcissi on the Riviera, 96
Nepenthes × *Amesiana*, ccii
 „ *mixta*, clxxxiii
Nerine elegans alba, clxxxix
Nicotiana colosseae variegata, cl
Nothochlœna mollis, lxv
 Oak Galls, cxxiv
Odontoglossum cirrhosum, Le Doux
 var., lxxxvii
 „ *crispum Thompsonæ*,
 ccxxx
 „ *peruvienne*, cix
 „ *Röbelinianum*, xcix
 „ *Ruckerianum splendens*, xci
 „ *Uro-Skinneri album*,
 ccxviii
 „ *Wattianum*, Hardy's
 var., civ
Olearia stellulata, lii
 Onion, The, 209
 Onions diseased, cxxiv, cxxv
 „ Report on, 253
 Oranges from Australia, cxxii
 Orchidaceous Plants, Manual of, 156
 Orchidées, Les, 158
 Orchid Review, The, 158
 Oxlips changing colour, xxiii, xxiv
 Pæony Jeanne d'Arc, lxxv
 „ Marie Lemoine, lxxv
 „ Mons. Boucharlet, lxxiv
Paphinia grandis, ccxxii
 Pea Duke of York, xxxix
 Peach Amsden June, xxxvi
 „ Disease, cxxi
 Pear Beurré Fouquieray, cxlii
 Pears, 200
 „ and Wasps, cxxiii
 „ diseased, cxxiii, cxxv, cxxvi
Pelargonium ignescens sterile, cxxi
 Pentstemons, 188
Peridermium Strobi, xxi
Phaius × *amabilis*, lxxxv
Phalenopsis Schilleriana vestalis,
 lxxxv
 Phloxes, 191
 „ at Chiswick, 242
Pholidota corvalliarioides, ccxxii
 Phyllocactus Plato, lxiii
 Pink Empress of India, lxxii
 Pinks, Perpetual, 93
Platyœrium œthiopicum, ccii
Pleurothallis scapha, ccxxx
 Plum Golden Transparent, cxxxviii
 Polyanthus Queen Victoria, lxvi
Polypodium Meyenianum, cc
 Potato Sharp's Victor, xxxvi
 Potatos, Report on, 257
 Preserving Fresh Fruit, cxx
Primula Forbesi, cxcv
 „ *Reidii*, lxiv
Pteris serrulata gigantea, xliii
Ptychorhapis angusta, clxxxviii
Pyrus japonica fruiting, cxxii
Quercus americana splendens, cxc
 Questions set at Examination, 154
 "Reichenbachia," 158
 Rhododendron Ariel, lxv
 „ Hardy, 133
 „ Hélène Schiffner, lxi
 „ Himalayan, 136
 „ Hybrid, cxxiv
 „ Yellow Gem, lii
Richardia aurata, lxxii
 Riviera, Flowers of the, 80
 Rose Allister Stella Gray, lxxvii
 „ Carmine Pillar, lxvi
 Roses of the Riviera, 90
Saccolabium cerinum, c
 Salisburia diseased, cxxiii
Sarracenia Mandaiana, liv
 Saxifrages, 168
Schizocodon soldanelloides, li
Scilla sibirica, white var., lii
Scopolia carniolica, xlvi
 Soil and Chemistry, 128
Solanum Wendlandi, clxxxviii [clvii
Spirœa Bumalda Anthony Waterer,
Stanhopea Amesiana, c
Strobilanthes Dyerianus, lviii
 Sugarcane Moth, xxvii
 Sweet Briar Amy Robsart, lxvi
 „ „ Matilda Marchmont, lxxiii
 „ „ Minna, lxxiii
Tecoma Smithi, clxxxviii
Tillandsia leodiensis, lxi
Tritonia crocosmæflora fl. pl., clxi
Ulmus Wreedi aurea, lxi
 Ustilago, xxi
Vallota purpurea delicata, lxvi
Veronica hybrida Purple Queen,
 clxxxiii
Viburnum plicatum, lxi
 Violas at Chiswick, 246
 Yew Parasite, xvii
Zygocolar × *Veitchii*, lxxxiii
Zygopetalum rostratum, ccxxx

52.

vol. XVII - XXII

In C. B. m. J. & Co.

