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CONTENTS OF VOL. XLVII.

NOTICE TO BINDER.

Volume XLVII. has been issued in two parts, each containing the "Journal" proper, paged with Arabic figures, and "Extracts from the Proceedings" paged with Roman figures. This title and contents sheet should be placed first, and be followed by pages 1 *to* 104, *then by pages* 105 *to* 232. *After that should come "Extracts from the Proceedings," pages i to lvi, lvii to cviii, concluding with the General Index.*


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IN·GRATEFUL·REMEMBRANCE
OF·THE·WISLEY·STUDENTS·WHO
LAID·DOWN·THEIR·LIVES·FOR
THEIR·COUNTRY·IN·THE·GREAT·WAR
1914–1919
JOHN·SELKIRK
ARTHUR·BERG
CECIL·ARNOLD
FRITZ·BOWYER
FERRIS·NELSON·GRANT
JOHN·FLETCHER·LEE
HUGH·FRANCIS·CLOUGH
DOUGLAS·JAMES·POWELL
SIDNEY·HARRISS·SMITH
HUBERT·JOSEPH·BARKER
HARRY·LANGTON·FOSTER
CECIL·WILLIAM·DANIELS
NORMAN·ARTHUR·PHILLIPS
WILLIAM·CHARLES·CROOM
EDWARD·SWATRIDGE·PRIVETT
WILLIAM·HAROLD·STREATFEILD
ERIC·CORDEROY·CHESHIRE
EDWARD·DUCAREL·PALMER
LAURENCE·CHARLES·DYER
GEORGE·OSBORN

[*To face p.* 1.

JOURNAL

OF THE

ROYAL HORTICULTURAL SOCIETY.

VOL. XLVII. PART 1, 1922.

WISLEY WAR MEMORIAL.

MANY members of the Society's staff both at Vincent Square and at Wisley served their King and Country in the Navy, Army, and Air Force during the great war. Some came unscathed through it all, others were taken prisoners, some were wounded, and twenty of our students fell on the Western Front, in Gallipoli, Mesopotamia, and Palestine.

In grateful remembrance of their readiness to serve their country in its need, and especially of those who gave their lives, the Council has placed a memorial on the wall of the beautiful Hall of the Laboratory at Wisley.

The memorial was unveiled on June 3, 1921. The ceremony, which followed a short service conducted by the Rev. W. Wilks, late Secretary of the Society, and the Rev. C. A. Hamilton, Rector of Wisley, was performed by the President, the Rt. Hon. Lord Lambourne, in the presence of members of the Council, the late President, F.M. Lord Grenfell, many Fellows, relatives of the old students, the staff at Wisley, and others. Lord Lambourne's address will long be remembered by all who heard it, not only for its eloquence, but for the hopeful note it sounded.

The memorial, which was designed by Sir Robert Lorrimer, is of Hoptonwood stone, enclosing a bronze panel bearing in bold lettering the names of those who were killed. The upper part is occupied by the crest of the Society in high relief, having on each side a shield, one carrying the three lions of England, the other the Passion Cross.

THE CLASSIFICATION OF GARDEN IRISES.

I. Introduction. By W. R. Dykes, M.A., L.-ès-L.

This classification deals only with Bearded Irises * grown in gardens, and is based on comparative trials of the various varieties which were begun at Wisley in 1915. At first it was hoped that it would be found possible to adopt a classification based on the wild species from which the various hybrids have sprung, but it soon became apparent that for garden purposes the colour of the flower and the height of the plant are of more importance than the botanical affinities of the latter, however interesting they may be in themselves.

The plants are therefore arranged in colour groups, and against each plant in the list will be found the average height of the stem in inches and the approximate time of flowering. In this connexion it must always be remembered that the same plants grow very differently in different soils and environments, and that variations of temperature and moisture in different seasons have also considerable influence on their growth. The measurements and dates given must therefore be understood to be relative rather than absolute, but it is hoped that the figures will show accurately whether one variety is taller or dwarfer than another, or flowers earlier or later.

The adoption of colour as the basis of arrangement led at once to the vexed question of the names of colours. The segments of the flowers of an Iris are seldom uniform in colour when closely examined, and it is therefore hopeless to attempt to describe the colours by reference to any known colour chart. The colours given in the classification must be taken to represent the general effect of the various varieties as seen growing in the border at a distance of a few feet. A further difficulty lay in the fact that there is no general consensus of opinion as to the exact meaning of such colour names as violet, lavender, mauve, or lilac, all of which are frequently used in describing Iris flowers. It seemed best, therefore, to adopt the less definite names, "red-purple" and "blue-purple," which could hardly be misleading, and merely to make subdivisions into "light" and "dark."

It may be a disappointment to some gardeners to find that such botanical names as *germanica, neglecta, plicata, squalens*, etc., which have long been familiar in nurserymen's catalogues at the head of various groups of Irises, have now been abandoned. Increasing knowledge of Irises, as they are found growing in the wild state, has, however, shown that these names were originally applied to forms of the various hybrids and to sports to which the wild species do

* It includes only the Pogoniris section of the genus, and excludes the Regelia and Oncocyclus sections, of which the flowers are also bearded.

undoubtedly give rise, and that they did not represent what are usually accepted as species. It seemed, therefore, that no useful purpose would be served by retaining these names.

It may, however, be not without interest to indicate some of the species from which our garden Irises have arisen, and to point out some of the characteristics which they have derived from them. In order to do this, it is, however, necessary to look somewhat closely into the structure of an Iris flower, and so to gain some appreciation of the value of the various parts of the inflorescence for purposes of classification, always remembering that for this purpose colour alone is entirely unreliable and should be neglected.

When the bud first appears it is seen to be enclosed in two more or less boat-shaped valves or spathes, which may remain wholly green (herbaceous) even when the flowers have expanded, or become entirely papery (scarious) long before the flowers open. or vary to any degree between these two extremes. Inside the spathes, the ovary or immature seed vessel is supported on a stalk or pedicel, though this may vary considerably in length. Above the ovary there is a perianth tube, which at its upper end gives rise to the six segments forming the main part of the flower. Of these the inner three stand erect and are called the standards, while the other three droop and are called falls. The perianth tube surrounds the base of the style, which connects the ovary with the three style branches. On the under side of each style-branch there is a projecting lip or stigma to which the pollen has to be conveyed in order to fertilize the flower. The style-branches also arch over and protect the anthers, which will be found lying close beneath them. The position of the anthers in the Bearded Irises is such that self-pollination is practically impossible. It can only be effected naturally by the agency of a bee, which, in its search for nectar at the base of the stamen, brushes the pollen off the anther on to its hairy back, from which it is scraped by the stigma of the next style-tunnel that the insect enters, either on the same flower or on another. To pollinate an Iris artificially it is necessary to extract an anther from a flower by means of forceps, and then draw it across the stigmatic lip in such a way that the pollen grains are deposited on it.

Among Bearded Irises there are few exceptions to the rule that the varieties increase in height as the season advances. Among the earliest to flower are the various forms of *I. pumila* and *I. chamaeiris*, and of their Balkan counterparts *I. mellita* and *I. Reichenbachii*. *I. pumila* is stemless, but has a long perianth tube ; while *I. chamaeiris* always shows a stem of some inches in length, but has a comparatively short tube. Precisely the same difference exists between the two Balkan species, which, however, both differ from the Western pair in the possession of a sharp ridge or keel running along the back of the spathe valves. *I. pumila* is comparatively rare in cultivation, and even the well-known *pumila coerulea* is almost certainly a hybrid of garden origin. Forms of *I. chamaeiris* are much more

common, and include nearly all the plants offered in catalogues as *pumila*. *I. mellita* is known in its form *rubromarginata*, from Mount Rhodope; while to *I. Reichenbachii* belong such forms as *balkana* and the dwarf yellow and purple Irises sent home from Salonika.

Of the origin of *I. germanica* all that we know for certain is that it is not a native of Germany. Indeed, it is in all probability a hybrid, derived from *I. aphylla*, which in various forms is widely distributed over Central Europe. If *I. germanica* were a German species, it would lose its leaves in winter, as do all Central European Irises, and would be just as likely to seed freely in this country as *I. aphylla*, *I. pumila*, *I. pallida*, and *I. variegata*. However, *I. germanica* retains its leaves in winter, often remains flowerless owing to the destruction of the buds by frost, and hardly ever produces more than one or two sound seeds in a capsule. Indeed, it usually refuses to set any seed at all, and the few that are obtained give rise to plants of entirely different habit. Many of them closely resemble *I. aphylla*, of which it is characteristic that the stem branches below the middle and often even at the ground line. It seems, therefore, that one parent of *I. germanica* was probably some form of *I. aphylla*, but it is not easy to suggest the other. Another point of interest is that when the first flowers of *I. aphylla* expand, the spathes are always wholly herbaceous, either green or more or less flushed with purple, whereas in *I. germanica* the spathes are herbaceous in the lower half and scarious in the upper.

The origin, therefore, of the various forms of *I. germanica* must for the present remain obscure, but there is less doubt about that of the later flowering varieties of garden Irises. The older among them seem all to have come from two species—*I. pallida* and *I. variegata*. Of these the former has entirely scarious spathes, a comparatively tall stem with very short lateral branches, and either glaucous or green leaves; while the latter has entirely herbaceous spathes, a much-branched stem, and strongly ribbed green leaves, which may or may not be flushed with purple at the base.

These two species are natives of southern Central Europe, and may be found growing in close proximity in the neighbourhood of Bozen, and also in the Sinokos region of the Velebit Mountains on the Dalmatian coast. Here the plants grow at an altitude of some 4,000 feet above the Adriatic, and are consequently dwarfed, but they comprise both pallidas and variegatas, and also miniature forms of what were once known as *sambucina* and *squalens*. The purple of *I. pallida* combines with the yellow of *I. variegata* to give murky, shot effects in the flowers of the hybrids, and there is no evidence that any other yellow-flowered species has any share in the composition of garden Irises. *I. flavescens* is not a wild species, but a garden hybrid of *variegata*, though it was long confused with a very distinct plant from the Caucasus, *I. imbricata*, which is easily distinguished by its huge, inflated green spathes.

I. pallida is an extremely variable species. In Southern Tyrol

we get large forms with glaucous foliage somewhat resembling *pallida dalmatica*. This latter is probably of garden origin, for no plant at all like it is known to occur in Dalmatia, where the prevailing forms are more slender and have narrower and often almost green foliage.

I. variegata has been known, even in the wild state, to give rise to sports such as the Hungarian *leucographa*, in which the yellow ground is replaced by white, and when such forms are crossed with the purples of *I. pallida*, it is easy to see how our garden forms have arisen. If confirmation of this theory is wanting, it is to be found in the fact that seeds of the well-known ' Black Prince ' self-fertilized gave rise to ' Richard II.,' with its pure white standards, and to other forms with the yellow standards of *I. variegata*. The so-called *plicata*, with white flowers edged with purple, is obviously some form of *I. pallida*, but seems to contain some inhibiting factor which prevents the purple from extending all over the segments.

So much for the older forms. In recent years *I. trojana* has been introduced, with its pointed buds and much-branched stem, and has proved a good seed parent. From it came such varieties as ' Isoline,' and it combines readily with *I. variegata* to give hybrids with the characteristic colourings of *sambucina* and *squalens*.

The other species that have more recently contributed to our garden Irises are less easy to define, for several plants have been used from the shores of the Eastern Mediterranean whose botanical affinities are difficult to determine.

One plant of unknown parentage is the well-known *Amas* or *macrantha* which Sir Michael Foster received from Amasia, in northern Asia Minor. This is probably not a wild species, for it does not set seed with any freedom, but it has undoubtedly been one of the parents of some fine varieties, *e.g.* ' Oriflamme.' Again, it is no longer easy to define the plant which Sir Michael Foster knew as *I. cypriana*, and we have probably lost from cultivation *I. mesopotamica*, which came originally from Mardin, and which was probably identical with the *I. Ricardi*, which forms the basis of many of Monsieur Denis' fine hybrids.

It is to the size and vigour of these Eastern species, in combination with the colours derived from *I. pallida* and *I. variegata*, and with the deeply-branched stem of *I. trojana*, that we owe the best of the more recently introduced varieties.

THE CLASSIFICATION OF GARDEN IRISES.

II. Outline of Classification. By the Iris Committee.

The Committee appointed by the Council to draw up a classification of Bearded Irises for garden purposes met several times at Wisley and elsewhere, and devised the following grouping. It is based on the general colour effect of each variety as seen in the garden, and provides in each colour class for grouping according to (1) season: early, mid-season, or late; and (2) height: dwarf, intermediate, or tall.

The varieties are arranged in each class in a sequence beginning with the palest and progressing towards the deepest shades in the group.

The Committee included Mr. E. A. Bowles (chairman), Sir Arthur Hort, Messrs. R. W. Wallace, J. W. Barr, W. R. Dykes, E. H. Jenkins, A. Perry, E. A. Bunyard, and the Director of Wisley.

The following is merely an outline of the colour classification, with typical examples of each class. It will be followed by a complete list, with notes of the more important varieties, in a future Journal.

Wherever the word purple occurs the term is used in the sense defined on p. 2, and includes all shades in which both blue and red are present.

Class I. White.

'Albicans,' 'Innocenza,' 'Mrs. H. Darwin.'

Class II. White feathered with Purple.

a. Colour confined to margin.

1. Blue-purple.
   'Madame Chéreau.'
2. Red-purple.
   'Mrs. Reuthe.'

b. Colour suffused.

'Parisiana.'

Class III. Standards White (or nearly so), Falls Purple

a. Colour confined to veins.

'Duc de Némours.'

b. Colour suffused over falls.

'Thorbecke,' 'Rheinnixe.'

Class IV. Purple Bicolors (standards paler than falls).

a. Standards pale blue-purple (lavender).

'Lady Foster,' 'Miss Maggie.'

b. Standards dark blue-purple.

'Perfection,' 'Black Prince.'

c. Standards pale red-purple.
'Tamar.'
d. Standards dark red-purple.
'Kharput,' 'Archévêque.'

Class V. PURPLE SELFS (standards and falls nearly alike in colour).
a. Pale blue-purple (lavender).
'Pallida dalmatica.'
b. Dark blue-purple.
'Cengialti Loppio,' 'Oporto.'
c. Pale red-purple (rose or pink).
'Queen of May,' 'Mrs. Alan Gray.'
d. Dark red-purple.
'Caprice,' 'Ed. Michel,' 'Kochii.'

Class VI. STANDARDS OF SHOT SHADES (*i.e.*, of any shade due to a mixture of two colours of which one is always yellow ; the yellow being always evident at the base of the standards).
a. Yellow scarcely perceptible.
1. Pale blue or lavender.
'Dalmarius,' 'Fay.'
2. Rose or pale pink.
'Isoline,' 'Sybil.'
b. Bronze.
'Alcazar.'
c. Yellow obvious.
1. Purple predominating.
'Prosper Laugier,' 'Jacquiniana.'
2. Yellow predominating.
'Iris King.'

Class VII. STANDARDS YELLOW, FALLS BLUE-, RED-, OR BROWN-PURPLE.
a. Standards pale yellow, falls with vein colour distinct.
'Gracchus.'
b. Standards pale yellow, falls with vein colour confluent.
'Lorelei.'
c. Standards dark yellow, falls with vein colour distinct.
'Prince of Orange.'
d. Standards dark yellow, falls with vein colour confluent.
'Honorable,' 'Maori King.'

Class VIII. YELLOW SELFS.
a. Dark.
'Aurea,' 'Mrs. Neubronner.'
b. Pale (including cream).
'Etta,' 'Flavescens.'

CONTRIBUTIONS FROM THE WISLEY LABORATORY.

XXXVII.—Pollination in Orchards (v.).

Summary of Apple Pollination Investigations.

By A. N. Rawes.

That varying degrees of self-sterility exist among the many varieties of apples in cultivation has already been recorded in this Journal,* in a preliminary report on the investigations being made at Wisley into the problem of self-fruitfulness and self-sterility of varieties of this fruit.

From many other sources also, particularly American, papers have been published relating to this phenomenon, and it is widely recognized as of the greatest economic importance to fruit-growers.

It is now common knowledge that in growing many varieties, facilities must be provided which will ensure the suitable pollination of the blossoms if good settings of fruit are to be obtained, no matter whether the trees be grown in large areas for commercial purposes, or in the small orchard or private garden.

This paper deals in the main with the economic bearing which the problem has upon the arrangement of the orchard or garden, and serves to summarize the work done at Wisley in this light since the publication of the report referred to above. The results obtained and conclusions which may be drawn should be of some value to prospective planters, and to growers in whose plantations adequate facilities for cross-pollination are lacking.

In spite of research along many lines, all attempts to discover why certain varieties are unable to set more than a very small percentage of their blossoms, or none at all, when dependent upon their own pollen for fertilization, have up to the present failed. Many interesting facts have been brought to light in the course of these investigations, but these may be conveniently withheld until the work is farther advanced.

The report referred to was concerned solely with work carried on outdoors, upon trees growing near the Meteorological Station, and under conditions that made extensive and reliable experimental work difficult.

For this reason the writer of the report advised caution in regarding the negative results obtained as conclusive evidence of sterility, since so many factors, other than that of lack of efficient pollination, were likely to prevent fruit setting.

* Chittenden, F. J., "Pollination in Orchards" (iii.), *Journal R.H.S.* xxxix. p. 615.

To overcome this difficulty, and to obtain evidence that might be regarded as conclusive as to the ability of varieties to set and mature fruit with their own pollen, the work has since been carried out on pot-grown trees in an orchard-house erected for this purpose, a description of which, together with the method adopted for the pollination of the flowers, was given in a recent report in this JOURNAL on the Pollination of Plums.*

As was expected, many of the varieties that gave negative results when self-pollinated outdoors were induced to set a few fruits when self-pollinated by hand under the more controllable conditions of the orchard house. Other varieties that set only a very few fruits when flowers were enclosed in bags outdoors set quite a fair crop when self-pollinated in the house; but on no occasion did a variety that set fruit in bags outdoors fail to do so, and to a larger extent, when similarly pollinated in the house.

Altogether about fifty varieties have been experimented with in the house, comprising all the commonly grown and market varieties, with almost all of which we have obtained conclusive evidence as to whether, and to what extent, they are self-fruitful or self-sterile.

Two or more trees of each variety were dealt with over a period of several years, the cultural management being that usually followed for pot-grown trees in the cool orchard-house.

Of the varieties tested under these conditions it was found that—

(1) Only eight could be classed as self-fertile, and capable of setting a fair crop with their own pollen.

(2) Thirty-nine were partly self-sterile, which means that they are able to set a few fruits with their own pollen, but certainly not enough to constitute what is generally known as a good crop.

(3) Whilst three varieties only have failed to set any fruits at all when flowers were self-pollinated.

Those varieties classed as self-fertile, and setting usually from 15 to 20 per cent. of their blossoms when self-pollinated in the house, were 'Rev. W. Wilks' (probably the most self-fertile variety we have), 'Lord Derby,' 'Potts' Seedling,' 'Devonshire Quarrenden,' 'Ribston Pippin,' 'Rival,' 'Duchess of Oldenburg,' and 'Early Victoria.' 'Stirling Castle' might almost be included in this group, but the amount of flowers that it appeared to be capable of setting with its own pollen varied greatly from year to year, and on the average of several years it is relegated to the class of partly self-fertile varieties.

Although in the house we failed to obtain fruit-setting, when blossoms were self-pollinated, with three varieties—namely 'Cox's Orange Pippin,' 'Royal Jubilee,' and 'King's Acre Pippin'—only two are really self-sterile so far as we can say at present, for the first-named of these set four fruits selfed outdoors in 1912, and I have since seen

* Rawes, A. N., "Pollination in Orchards" (iv.): "Self-Fertility and Self-Sterility of Plums," *Journal R.H.S.* xlvi. p. 353.

a pot tree of this variety carrying several selfed fruits at the John Innes Horticultural Institute ; but it is very rarely that this happens, and from the thousands of flowers we have self-pollinated by hand in the house we have obtained no fruit-setting at all.

It is curious that ' Royal Jubilee ' has so far failed to set with its own pollen, for this variety is one of the heaviest and most regular croppers, and yet is one of the latest commercial varieties to come into flower, at a time when facilities for cross-pollination would be most unfavourable.

With these three varieties that have given negative results suggestive of self-sterility, we had every blossom on entire trees self-pollinated without a fruit setting. On the other hand, we have repeatedly obtained numerous fruits from cross-pollinated flowers on the same branch, and frequently the same spur, as that on which self-pollinated flowers have failed to set.

The great majority of varieties were found to be partly self-fertile, but incapable of setting more than a very small percentage of their blossoms when entirely dependent upon their own pollen for fertilization.

Such varieties as ' Worcester Pearmain,' ' Norfolk Beauty,' ' Duchess Favourite,' ' Ecklinville Seedling,' and ' Beauty of Bath ' over a number of years seldom set more than 1 per cent. of the blossoms self-pollinated ; whilst ' Bismarck,' ' James Grieve,' ' Lane's Prince Albert,' ' Warner's King,' and ' Newton Wonder ' invariably set something like 3 per cent. when similarly pollinated.

The other varieties placed in this class are :

' Allington Pippin,' ' Barnack Beauty,' ' Baumann's Red Reinette,' ' Ben's Red,' ' Bramley's Seedling,' ' Chas. Ross,' ' Cox's Pomona,' ' Dumelow's Seedling,' ' Dutch Mignonne,' ' Fearn's Pippin,' ' Gascoyne's Scarlet,' ' Grenadier,' ' Keswick Codlin,' ' King of Tompkins County,' ' King of the Pippins,' ' Lady Sudeley,' ' Peasgood's Nonsuch,' ' White Transparent,' ' Annie Elizabeth,' ' Christmas Pearmain,' ' Golden Spire,' and ' Wm. Crump.'

The degree to which these varieties are self-fertile varies very considerably, some (such as ' Golden Spire,' ' Wm. Crump,' and ' Ben's Red ') being capable of setting occasionally as much as 10 per cent. of their blossoms self-pollinated in the house, whilst others set less than 1 per cent., but it is not of great importance to know the actual degree of self-fertility, since none can set even a fair crop under normal orchard conditions when they are entirely dependent upon their own pollen.

With all such varieties, when growing in the orchard, some provision for cross-pollination must be made if good settings of fruit are to be obtained.

Furthermore, our investigations have clearly shown that even all the self-fertile varieties set greater quantities of fruit when the flowers are *cross*-pollinated than when pollinated with their own pollen. For example, on one side of a tree of ' Rev. W. Wilks,' which is a very

self-fertile variety, numbers of flowers were self-pollinated, and on the other side many others cross-pollinated with pollen from a wide range of varieties, the selfed portion set 17 per cent. of the blossoms pollinated, whilst the crossed portion set 40 per cent.

Of course such large numbers of flowers setting fruit are not to be expected outdoors under ordinary orchard conditions, but in a somewhat like proportion cross-pollination may be expected to increase fruit-setting.

So that, not only is cross-pollination essential for good fruit-setting with the great majority of varieties, but it is beneficial and likely to induce larger settings of fruit with all.

With a view to determining the value of different varieties for providing pollen for the cross-pollination of others, a very great number of comparative tests have been made.

Although even yet we have been unable to carry out every combination possible between the numerous varieties we have under observation, a great deal of evidence has been obtained, from which valuable conclusions may be drawn.

So far we have not discovered any instances of inter-sterility existing among varieties of apples, as was found in plums and cherries, and from the wide range of varieties tested it seems unlikely that we shall.

The results of our experiments suggest that there is little or no ground for the supposition that such and such a variety is the only one to plant for the successful cross-pollination of any other, but rather point to the fact that pollen from any one variety is capable of inducing just as good a setting of fruit on a given variety as is any other.

So much depends upon the health of the tree, the amount of pollen the blossoms produce in a particular year, and the viability of the pollen—all of which appear to vary considerably in each variety—that extensive work on this point under orchard conditions is difficult; but from the trees which we have under observation in the orchard-house we have found no evidence to show that "pollen preference" exists among varieties.

Since no cross-incompatibility and no pollen preference apparently exist among varieties of apples, the choice of varieties to plant for efficient cross-pollination depends almost entirely upon the flowering period, for it will be obvious that the closer the coincidence of the flowering periods of the varieties to be planted together, the more efficient is the cross-pollination likely to be between them.

In a previous paper on "Pollination in Orchards"* a list was given of some 170 varieties, with the relative time of flowering of each. This list was made from records obtained over a period of four years, but we have now records of the flowering periods of all these varieties for thirteen years. Comparisons recently made show that the order of flowering, although varying slightly in one or two instances, is

* Chittenden, F. J., "Pollination in Orchards" (i.), *Journal R.H.S.*, vol. xxxvii. p. 350.

much the same on an average for the thirteen years as for the four. This list, therefore, may be used as a guide to the choice of varieties to plant together for cross-pollination purposes, since the relative order of flowering varies but little from year to year.

The number of days in which varieties remain in bloom varies according to the season, and undoubtedly some varieties, like 'Lane's Prince Albert' and 'Newton Wonder,' remain in bloom in any season some few days longer than varieties like 'Lord Derby' and 'Beauty of Bath,' which usually have a comparatively short period of flowering. On an average, eighteen days may be regarded as the normal flowering period of varieties, this being from the time of the first flowers opening until most of the flowers are over.

Individual flowers have an average life of about a week. In cold or very boisterous weather this would be appreciably lessened, whilst in fine dry weather it might be extended by several days.

The flowering periods of the comparatively few commonly grown varieties seldom coincide exactly, and, indeed, from the time of the first blossoms opening on the earliest flowering variety to the falling of the blossoms of the latest there is a period of some six weeks or so; and since the average length of time over which any variety is in flower is eighteen days, it will be seen that the haphazard choosing of varieties for "intermixing" may prove of little use.

For really effective cross-pollination between any two varieties, the time of flowering—from two days before full bloom until seven days after full bloom—of each should overlap; anything less than this may mean that in a particular year it would not be possible for effective cross-pollination to take place.

The relative order of flowering varies so little each year, however, that if two varieties are planted together, the flowering periods of which overlap within two days before full bloom and seven days after, cross-pollination should take place in any year.

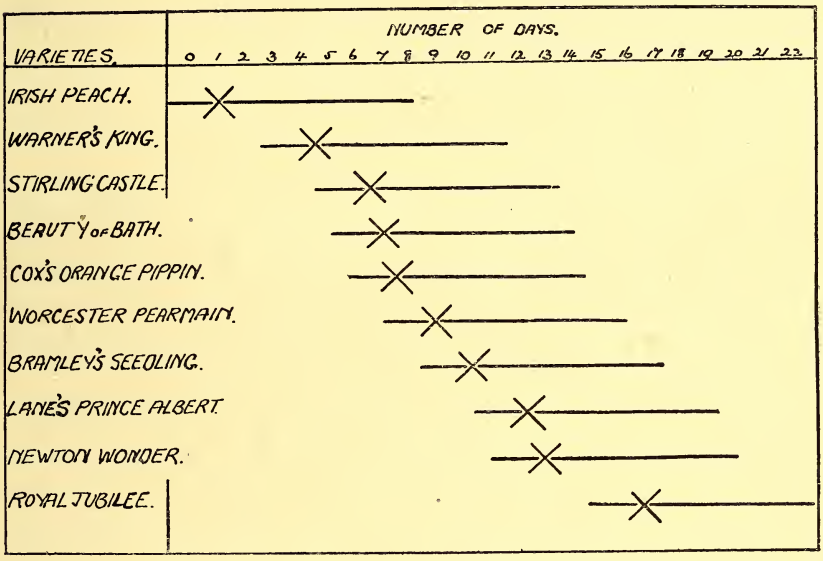
In the chart on the opposite page the order and effective flowering period of ten well-known and commonly grown varieties is given, to illustrate this point.

The crosses show the time at which each variety may be expected to come into full flower in relation to any other, the days' difference being noted on the top line; the lines opposite each variety represent their effective flowering period—two days before full bloom and seven days after,—the table being made from figures obtained over a period of thirteen years at Wisley.

From this chart it may be seen that if two varieties, such as 'Warner's King' and 'Newton Wonder,' were planted together, by the time the 'Newtons' were in full flower the blossoms of 'Warner's' would be some nine days past full bloom, and although even then cross-pollination would take place to some extent, it would not be so effective nor likely to induce such good settings of fruit as if a row or two of 'Worcester's,' 'Cox's,' or 'Bramley's' were interplanted, which would ensure the effective cross-pollination of both.

Similarly, any of the first five varieties on the chart would be of little use planted as cross-pollinizers for 'Royal Jubilee,' or vice versa.

From the previous list already referred to, giving the flowering period of a great number of varieties, similar calculations should be made. In using it as a guide in choosing varieties suitable for planting together, the number of days at which any variety may be expected to come into flower in relation to any other is given, and if the effective flowering period is reckoned at two days before and seven days after full bloom (to allow for possible variations in time of flowering, unfavourable weather at flowering time, and the like),



varieties in which overlapping of blossoming occurs during the period may be safely interplanted.

It is inadvisable to plant larger blocks of any one variety than four rows, without a row of another variety to provide pollen, since in larger blocks than this it is possible that the centre trees may be insufficiently cross-pollinated, especially if high winds prevail during the time of flowering, when wild insects and bees prefer to confine their attentions to small areas.

Wind plays no part in the transfer of pollen from tree to tree, so that the assertion sometimes made that varieties to be planted as " pollen providers " should be placed on the windward side, in order that pollen may be carried on to the main varieties, is incorrect.

In plantations or orchards where efficient means for the cross-pollination of the blossoms do not at present exist, a useful method of supplying the deficiency is by the top-working of trees in every fourth row or so, with scions from a variety, or varieties, capable of effecting the desired purpose.

This method is more economical than that of grubbing trees here and there, or whole rows, and replanting with suitable varieties, since pollen is normally provided at an earlier date, and the work of top-working is less costly than that of grubbing and replanting.

When the fault lies in a solitary tree, or a few trees of only one variety having been planted, as is often the case in small gardens, it is usually convenient to plant another variety, having a similar flowering period, near by. If this be impossible, one or two branches may be grafted with another variety.

The remedy, then, for the faulty pollination of apples and its consequent loss of crops is in the hands of the grower, and lies in the intelligent intermixing of varieties, the choice of which must depend upon the normal time of flowering and the grower's own preferences or economic requirements.

CONTRIBUTIONS FROM THE WISLEY LABORATORY.

XXXVIII.—Pollination in Orchards (vi.).

Pollen-Carrying Agents.

By A. N. Rawes, Fruit Experiments Officer, and G. Fox Wilson, F.E.S., N.D.H., Entomologist.

It has been shown on p. 8 that all varieties of apple "set" best when pollinated from other varieties. The same is true for most British fruits. In planting fruits it is therefore desirable to intermix varieties, in order to render the transference of pollen from one variety to another easy.

The carrying of pollen from flower to flower is sometimes attributed to the wind, sometimes to insects, and among the latter hive bees are often looked upon as the only active agents. Our own observations at Wisley, begun by the Director in 1912, and in the past few years carried on by us, lead us to believe that the wind plays no part in pollination of fruits (except in nuts and perhaps mulberries), and that several other insects beside hive bees are very active.

The wind as an agent.—In order to ascertain whether the wind played any part in carrying pollen, glass slips, rendered permanently sticky by smearing with glycerine, were suspended at varying distances from apples, pears, and plums in full bloom. In very few cases were pollen grains of fruit trees found upon them after they had remained suspended for one to three days. Pollen of pines and other plants normally dependent upon the wind for pollination was found in abundance on some occasions. On the few slips bearing pollen of the fruit trees, the grains present were in masses of several together, not scattered as was, for instance, the pine pollen. These masses had evidently been left by an insect alighting upon the slip, for in some cases a leg was left behind as well!

These observations are only in accord with expectations, for the conspicuous flowers, small stigmas, and sticky pollen of fruit trees contrast with the well-known adaptations for wind-pollination found in such plants as the hazel. They are, moreover, confirmed by observations made abroad. They indicate clearly that the wind is not an active agent in the distribution of fruit-tree pollen.

Insect agents.—There is no question that hive bees, where they are numerous, and in suitable weather, are indefatigable workers in fruit flowers, and therefore active agents in carrying pollen. But they are by no means the only agents, and in fact this work may be most efficiently performed by other insects.

Annually, for some years past, the apple crop at Wisley has been

large, and even in the generally bad apple years, 1918 and 1920, almost every variety in the large collection at the Garden has borne a heavy crop, so much so that each year prophets have been numerous who have said that they could not possibly bear many in the next year.

Now no amount of care and attention to cultural details can induce fruitfulness in a large orchard unless pollen-carrying agents are present in sufficient force to ensure adequate cross-pollination of the blossoms. Few bees are kept in the neighbourhood of the orchard, and during the last few years even that small number has been greatly reduced by disease.

Careful observations have been made by various members of the staff, and especially by one of us, on the insects visiting apples, and we find that while hive bees are generally present in the warmer parts of bright fine days, in dull and stormy weather they are not to be seen. On the contrary, whether the weather be fine or dull, other insects are present and at work, and, unless the weather be so severe or so extremely stormy as actually to kill the stigmas or the ovary of the flower, pollination is going on by their aid. In 1920 on no occasion did we find a single hive bee at work on the apple flowers, yet in 1920 the crop of apples was as good as one could wish for.

Among the insects visiting the apple flowers in addition to hive bees, humble bees take a foremost place. They work at least as hard, and they work earlier and later than the hive bees, in good weather and in bad—in fact we have a note of one or two being at work in the flowers during a snow shower! Our notes show that on every day but two in 1920 and two in 1921, when the apples were examined during the blossom-time, humble bees were at work, while frequently even in 1921 hive bees were not seen on the trees. Several species were often found, especially *Bombus lapidarius*, *B. terrestris* and *B. lucorum*. On some occasions the "carder" bee, *B. muscorum*, was present, and more rarely *B. helferanus*. Pollen clings easily to the hairy bodies of these bees, and, while they carry much away, they are apt to leave some on the stigmas of the flowers they visit.

Other hairy wild bees belonging to the genus *Andrena*, and to allied genera, are also numerous, and active.

Next to these the most numerous visitors are hover flies: two-winged flies so named from their habit of hovering in the air and suddenly darting off a yard or so. Species of the genus *Eristalis* are sometimes very abundant, and so also are species of *Syrphus* and allied genera both large and small. They are pollen feeders, and probably keep less consistently to one tree than do hive and humble bees.

Midges and small two-winged flies are also numerous on most occasions, and though their visits to flowers appear less purposeful, in the aggregate the amount of pollen distributed by them must be considerable.

All these insects may be regarded as the normal visitors of apple flowers. In addition, there is a very long list of other insects taken at

the flowers, the visits of which are less constant, and which may in some cases be only accidental, but which certainly play some part in effecting cross-pollination, provided inter-planting of varieties flowering at the same time is practised.

Possibly Wisley is favoured by the visits of more of these useful insects than are many gardens, surrounded as it is by woods and common land and pasture, but the insects mentioned as most active are likely to find a home near most gardens and orchards. Humble bees nest about tufts of grass and in hedge bottoms and the like, *Andrena* in paths and banks, and allied genera in hollow sticks ; the larvæ of the hover flies of the genus *Syrphus* and several other genera feed on green flies on apples, currants, and a variety of other plants, while those of the genus *Eristalis* are common in foul water, puddles, gutters, and so on. The grubs of midges feed in a variety of places, especially in vegetable refuse and manure, where also many grubs of larger two-winged flies are to be found. It is therefore unlikely that the supply of these insects will be short owing to unsuitable breeding places for them.

In one case we have found hive bees more efficient in carrying pollen than the other insects mentioned, for in a series of observations made by one of us on flowers from which the petals had been removed, hive bees were almost the only insect visitors. Where the petals have been blown off prematurely, as sometimes happens in high winds, if a calm follows, hive bees may still act as carriers of the remaining pollen to other varieties.

Our observations are conclusive as to the effective work of insects other than hive bees in carrying apple pollen ; they are less conclusive with pears and plums. They need to be carried over a longer period, but so far as they go they indicate that hive bees and two-winged flies are the most frequent visitors to pear flowers, humble bees being met with less commonly. Plums are visited actively by all three groups, but midges are perhaps less frequent in their flowers than in those of apples and pears.

Apart from the obvious utility of hive bees in providing honey, their presence would make cross-pollination doubly sure ; but on occasions where the keeping of them is not consistent with the economic management of the orchard, the work of cross-pollination may safely be left to wild insects.

THE WINTER STUDY OF FRUIT TREES.

By Edward A. Bunyard, F.L.S.

It is not necessary to enter a plea with Fellows of the Royal Horticultural Society for the recognition of systematic Pomology, as an agreed nomenclature must be the basis of any horticultural work.

Accurate descriptions of horticultural varieties present great difficulties, as the differences between two varieties may be so slight as to tax severely the power of language to define what is patent to the eye.

These slight differences, however, are often a means of determining other points which may not be immediately apparent. For instance, the Kentish and Flemish Cherries are extremely alike in the young leaves and shoots and only a difference in the size and pose of the stipules enables them to be distinguished. To the "practical man" such minute study seems rather trifling, as he thinks of the fruit as the only matter which interests him. In the above case the difference in the stipules is nevertheless important both in the Nursery and after, for the two Cherries ripen at different times and one is self-fertile and the other self-sterile.

In deciduous fruit trees we have the tree before us for fully half a year without leaves or flowers, and it is therefore of some interest to examine the woody parts of the tree to see if any characters are presented which may be of assistance in identifying the varieties. For this purpose it is best to take a moderately vigorous one-year shoot which has grown in a well-exposed part of the tree.

The characters of stoutness and slenderness are at once apparent, while the degree of curving between the buds (geniculation) is often marked, and in some cases the shoot may be almost straight. The distance between the buds (internodes) varies somewhat according to rapidity of growth, but in many varieties it is always markedly long or short.

Colour is an obvious distinction, but it varies considerably according to conditions, and though useful cannot always be relied upon with very great certainty.

In Plums, as is well known, certain varieties have the surface more or less covered with downy hairs, and to some extent this is so with certain varieties of Cherries.

The small corky dots (lenticels) which show up so clearly on the young shoots are by their shape and quantity often of great value for diagnostic purposes.

To come to the buds themselves—we find in certain varieties of fruits differences of size, shape, and angle of insertion. Beneath the bud is a projecting structure which supports the leaf stalk in summer and which is called the leaf base or "support"; perhaps the latter term

is more definite, and it is therefore adopted. In the wood bud and support we have characters of great value ; in fact, they represent one of the most constant characters available during the winter.

The wood bud being a resting structure has not been submitted to the varying actions of external conditions as much as the developed shoot or leaf, and it is remarkable how constant well-developed wood buds are, even when submitted to the test of measurement. At the base of the shoot many buds are found in a state of partial development owing to premature fall or injury to the leaf and equally at the tip of the shoot such buds are often found. But by comparing the buds at the centre of the shoot we find a very near approach to constancy of form and size. In the fruit buds we find also certain very marked differences which will be considered later.

The remarkable variations in form shown by adult trees are well known ; in all fruits we find the upright and weeping forms, while the flat, umbrella-shaped, and round-headed trees are equally obvious.

It is often objected that pruning may alter these characters, but this is only possible in a strictly limited degree. No amount of pruning to a downward pointing bud will make an upright tree into a pendulous one, for the shoot from a bud will always take its natural direction, short of being trained while green in a contrary mode.

As the tree becomes large the weight of fruit and also the weight of its own branches will to some extent pull down the main branches, thus rendering it difficult to see differences in growth in old trees. But even this is only so within certain limits : the upright form of the Pear ' Beurré Clairgeau,' for example, is preserved even during heavy crops.

A character which is quite unchangeable by cultivation is the habit of branching. In most kinds of fruits we find varieties with stout branches which do not produce much spur or lateral wood, and in contrast with these those which produce abundance of fine twiggy wood and spurs. The Apples ' Blenheim Orange ' and ' Worcester Pearmain ' are good examples of these two classes.

It will be seen that these characters are not all of equal value in the different points ; in stone fruits, for instance, the fruit buds are not so distinct as the wood buds, and in Apples the reverse is found.

These are the main points which will be considered in detail in each of the following sections.

Apples.

The general outline taken by adult trees of Apples is best shown in standard trees, and any fruit-grower will have noted the more striking differences. The strong horizontal branches of the ' Rambours,' the compact, round-headed ' Nonpareils,' with their closely set spurs, represent the extremes very well. It is noticeable that upright-growing trees are rare in Apples. Such varieties as ' Annie Elizabeth ' or ' Gloria

Mundi' and 'Zuccamaglio's Reinette' take this form in their youth, but as the trees gain age and crop the branches are much pulled down. I have seen no such permanently fastigiate forms as in the Pears or among the 'Duke' Cherries.

Of the flat umbrella-like heads 'Royal Jubilee' is characteristic, and of the trees which are upright but slightly spreading, making vase-shaped heads, 'Court Pendu Plat' and 'Reinette de Caux' may be cited.

An examination of the shoots of Apples is of value in determining varieties, but both the colour of the wood and the shape of the buds are less marked than in Pears and Plums.

We find the stout dwarf shoots in which the internodes are remarkably short in the same way as in other fruits. 'Royal Jubilee,' 'May Queen,' 'Clark's Seedling' are remarkable in this respect. The whippy shoots with long internodes are found in 'Winter Banana' and 'Cockle's Pippin,' etc. The colour of the shoots is extremely difficult to describe, and though often perceptible to the eye it is almost impossible to relate it to any colours in the standard charts.

It is noticeably deeper, as a rule, on the sunny side of the shoot, but it is often much obscured by the grey down with which many varieties are covered and also the silvery "scarf skin" which develops on a well-ripened shoot. The absence or presence of down is very noticeable in many varieties, and it is curious that so many American varieties are almost free from it. The dark-red shining wood of many of these is so noticeable that one could guess the origin of an unknown Apple from this character and be right nine times out of ten. The lenticels are a well-known feature and are used by most pomologists in their descriptions, and their prominence in such varieties as 'Wellington,' 'Hector McDonald,' and 'Newton Wonder' is well known. They are, of course, often obscured by the down on the shoot.

In studying the forms of wood-buds there is very little that is helpful in the Apple. A slight difference may be found in the shape of the bud, if obtuse or sharply pointed, but the variations are not very patent to the eye. American writers distinguish varieties in which the bud is closely applied to the wood or slightly away from it. In our British varieties, however, I cannot observe enough difference to be of much value diagnostically. A more valuable character is the colour of the wood-bud. This largely depends on the presence or absence of down; those in which it is lacking show up the reddish or chocolate colour of the bud scales and may be called "red," while those in which the down remains are called "grey." Examples of "red" are 'Golden Spire,' 'Duchess of Oldenburg,' 'Early Victoria,' 'Newton Wonder'; of the "grey" 'Allington Pippin,' 'Wellington,' 'Mother,' 'Court Pendu Plat,' 'Beauty of Bath,' and 'Ribston Pippin.'

The fruit-buds often offer remarkable differences in colour and shape; the colour, as in the wood-buds, depends on the presence or absence of hair; such varieties as 'Lord Grosvenor,' 'Ben's Red,' 'Golden Spire,' and 'Duchess of Oldenburg' having buds which are

nearly hairless and therefore a distinct red-brown. Of the grey or downy class 'Pott's Seedling,' 'Red Ribbed Greening,' and 'Braddick's Nonpareil' may be cited.

In form also great variation occurs, from the long and pointed bud of 'Duchess of Oldenburg' to the large, globular, downy, and loosely packed bud of 'Pott's Seedling.'

The variation in hardness of the wood is very remarkable, and when cutting grafts one easily notices a variety of softer texture if mixed in among those of a hard variety. In general it seems that Apples of soft flesh such as the 'Codlins' have a wood to correspond, while the 'Reinettes' fall into the class of hard woods. So striking is the distinction that an eminent pomologist has proposed a classification of Apples based upon their breaking strain. The same character is noticed in the Plums.

Pears.

The pyramidal form taken by many Pears has long been noted, and some philologists derive the name from *pyr*—fire, seeing in their form a likeness to the tapering of ascending flames. This is probably a little fanciful, and if the fire origin is to be upheld one would rather see it in the gold and scarlet of autumnal colour. While nearly all Apples tend to grow upward and then bend down forming a round or flat head with branches more or less pendent, many Pears preserve their pyramidal form even in old age, the lower branches being widest and the outline of the tree diminishing towards the apex. There are, of course, many varieties which do not affect this form; 'Catillac,' for example, makes a round-headed tree, or 'Jargonelle,' which straggles untidily in any and every direction.

The most remarkable feature of the Pear is perhaps the large number of fastigiate forms it includes. When this habit is combined, as it so often is, with a tendency to make spurs rather than shoots, we get such upright forms as 'Beurré Clairgeau,' which rival the Lombardy Poplar. Similar habit will be found in 'Le Lectier,' 'Passe Crasanne,' and many others.

In the young shoots many useful characters are found, and that of colour may be taken first. It has been said by some pomologists that this character is so variable that it is of little use for diagnostic purposes. Decaisne, in fact, went so far as to regret that he coloured the shoots in his illustrations in the "Jardin Fruitier."

Colour is, of course, always a variable factor, and in some varieties is so little marked as to render it unwise to place much reliance upon it. But there are many varieties in which it is both distinct and constant. The striking chocolate-red of the shoots of such Pears as 'Fertility,' 'Beurré Giffard,' 'Jargonelle,' 'Louise Bonne,' 'Verulam,' and 'Catillac' is such as to render them conspicuous under any usual conditions. I have carefully noted the fact for many years under different conditions of soil and exposure, and have always found the above to be entirely constant.

Again in the marked yellow wood-colour of 'Doyenné d'Alençon,' 'Souvenir de Congrès,' 'Marguerite Marrillat,' 'Winter Windsor,' 'Beurré Alexandre Lucas,' and 'Beurré Dumont' are equally reliable in my experience. Scarcely less unchanging is the olive-green tinge of 'Bellissime d'Hiver,' 'Conference,' 'Glou Morceau,' 'Chalk,' 'Le Brun,' 'Duchesse d'Angoulême,' and 'Beurré Diel.'

The nurseryman has perhaps unequalled opportunities for observing such coloration, as a bundle of young trees gives a more satisfactory impression of colour to the eye than observation of individual shoots, and in a bundle of grafts any of the above-mentioned varieties would be immediately conspicuous if intermixed among those of another colour group.

The diameter of the shoot varies largely in the Pear. At one extremity we have the very stout shoots with short internodes such as 'Marguerite Marrillat' and 'Bellissime d'Hiver,' and at the opposite end slender whippy shoots like 'Joséphine de Malines.' Some varieties are very tortuous in growth if allowed to follow their own devices, and 'Jargonelle' and 'Vicar of Winkfield' are among these.

The lenticel characters are sharply defined in many varieties, and may be distinguished as oval and round. In the first class fall 'Uvedale's St. Germain,' 'Dr. Jules Guyot,' 'Beurré Hardy,' 'Zéphirin Grégoire,' 'Marguerite Marrillat.' Round lenticels are borne by 'Verulam,' 'Joséphine de Malines,' 'Fertility,' 'Pitmaston Duchess,' 'Louise Bonne,' 'Duchesse d'Angoulême' (fig. 6), and 'Glou Morceau.' This character is so plainly visible that it provides one of the easiest tests of the genuineness of any variety.

The form of wood-buds is perhaps one of the most distinctive characters in Pears, and they are very constant if the precaution is taken to compare the middle of the shoot, and it is not too much to say that were they studied as carefully as the fruit they would provide a ready means of identification.

It will be found in most varieties that the bud preserves its form and colour throughout the shoot; the size will vary according to the vigour of the shoot and the direction it takes; pointing away more or less tends to be accentuated toward the base of the shoot in most cases. The figures given are typical and, of course, taken from the middle of a one year shoot.

The principal characters are as follows :—

The shape of the bud may be long or narrow, short, plump, conical, or rounded. It may be closely pressed to the shoot or standing away at a greater or less angle. The bud scales may be tightly or loosely wrapped. The colour is rather difficult to describe; it is usually chestnut-brown, lighter or darker, and may have more or less of a white waxy deposit on it. A few varieties, *e.g.* 'Duchesse d'Angoulême,' show a golden felted appearance which is due to yellow down inside the bud scales. When the bud is loosely wrapped this is often seen.

The support or leaf scar on which the bud rests aids very largely by its shape in giving the individual expression. It will be seen by

the figures given that it may be very prominent as in 'Doyenné du Comice' (fig. 8) or in some almost absent.

It is curious to notice that there is some correlation between the shape of the bud and that of the fruit in many cases, though not all. For instance, the Bergamotte shape of fruit, as in 'Eyewood Bergamotte' (fig. 3), is often associated with the peculiarly round pointed bud. 'Joséphine de Malines' (fig. 1) is another case, and the longer fruits as 'Durondeau' (fig. 5), 'Beurré Jean van Geert' have longer buds.

How useful the winter bud character may be in certain cases may be seen by comparing the figure of 'Joséphine de Malines' (fig. 1) with 'Alexandre Lambre' (fig. 2), two fruits which might easily be confused; the bud characters here would prove sufficient to separate them.

A few varieties have small buds closely applied to the wood much as in an Apple. 'Nec Plus Meuris' and 'Chisel' (see figs. 7 and 4) show this character well.

It may be noticed in passing that with these varieties adpressed buds do not throw the stipulary leaves in summer, whereas, as far as I have observed, those which stand away boldly, as 'Doyenné du Comice' (see fig. 8), always do.

Cherries.

The habit assumed by Cherries follows closely that of Apples; the upright forms are found in the Dukes, spreading flat heads among the Bigarreaus, and weeping trees are fairly common. In stature we find remarkable differences, the 'Cluster' or 'Corone,' a variety not far removed from the wild Mazzard, makes an immense spiring tree which is often too high for the fruit to be gathered. At the other end we have the round compact trees such as 'Waterloo' and 'Knight's Early Black.'

In a great measure these differences in habit are due to the species from which our wild cherries have been derived. The Bigarreaus and Guignes are descended from our wild Mazzard, *Prunus Avium*, making immense trees as in the 'Cluster' mentioned above, the weeping trees such as 'Early Rivers,' and the vase-formed trees, notable for their stout main branches and few secondary branchings, as in 'Elton Heart' and 'Turkey Heart.'

The 'Duke' Cherries are distinct by their very close upright growth and seem to be more allied to the Morello, which has probably come from *P. Cerasus* var. *marasca*. These all show the same habit, and it is interesting to note the 'Waterloo,' which was a cross between the common 'Bigarreau' and the 'May Duke,' and shows an intermediate growth, less tall than the 'Bigarreau' and less upright than the 'May Duke.'

The sour Red Cherries or Amarelles, usually called Kentish or Flemish in this country, descend from *Prunus Cerasus* and are quite distinct in their bushy, twiggy habit, never making such large trees as the Bigarreaus. There is a race of these, however, which have an

upright habit and make vase-shaped trees with but little branching; these are the Glaskirschen of German authors.

The shoots of Cherries are not so distinct as many other fruits. The Dukes and Amarelles can, of course, be easily separated, but among the Bigarreaus and Guignes the colour of the bark is difficult to describe as it is so much complicated by the scarf skin, which peels off and gives a silvery tinge.

The lenticels vary in size and conspicuousness, as may be seen by comparing 'Waterloo' (fig. 9) with the 'White Heart' (fig. 10). They may also be raised above the surface as in 'White Heart' or below, for example in 'Guigne d'Annonay' they often fail to break through the outer cuticle.

The shoots vary in length and strength as in other fruits, the 'White Heart,' for instance, making long, feeble, arching shoots like a Jargonelle Pear, and 'Guigne d'Annonay' has stout, short-jointed wood as in the Pear 'Marguerite Marrillat.'

It is in the bud that we find the most distinct characters, and taking again the centre of a well-grown shoot many good characters may be observed. The Bigarreaus and Guignes are sharply separated from the other classes by their long pointed buds, whereas the Morello and Amarelles have rounder and plumper buds.

Typical Bigarreau buds are seen in 'Noir de Guben' (fig. 13) and 'Black Eagle' (fig. 14). It will be noticed that the angle of the bud varies considerably in different varieties, as does the size of the support. Fig. 10 shows the remarkable bud of the 'White Heart'; its large support and direction from the shoot are very characteristic. 'Waterloo' (fig. 9) shows a more normal variety as a contrast.

The support is more marked in the Bigarreaus than in the Dukes and Amarelles and Morellos; in fact, the further away from *Prunus Avium* we get the smaller and more willow-like is the wood, and generally speaking the rounder the bud. A typical Duke bud is that of 'Nouvelle Royale' (fig. 11), while the Amarelle is represented by 'Amarelle très fertile' (fig. 12).

Plums.

In Plums the differences in the form of adult trees are not so striking as in other fruits. We meet the upright forms, of which 'Czar' is a well-known example, and as a general rule the larger the fruit the stouter and less divaricated the branches. Such Plums as 'Oullin's Golden Gage' illustrate the first group and 'Stint' the latter, while the Damsons show the extreme of twigginess.

We find in Plums the short-jointed, stout-wooded varieties as in Pears and Apples, and 'Boulouf' and 'Late Transparent Gage' are striking in this respect; of the long-shooted varieties 'Victoria' is typical.

The winter study of Plums is greatly facilitated by the down which is found on the young shoots, as the presence or absence of this makes it possible to divide them into two groups. There are, however, a

Photographed by R. A. Malby.]

WINTER SHOOTS OF PEARS.

[*To face p.* 24.


9


10


11

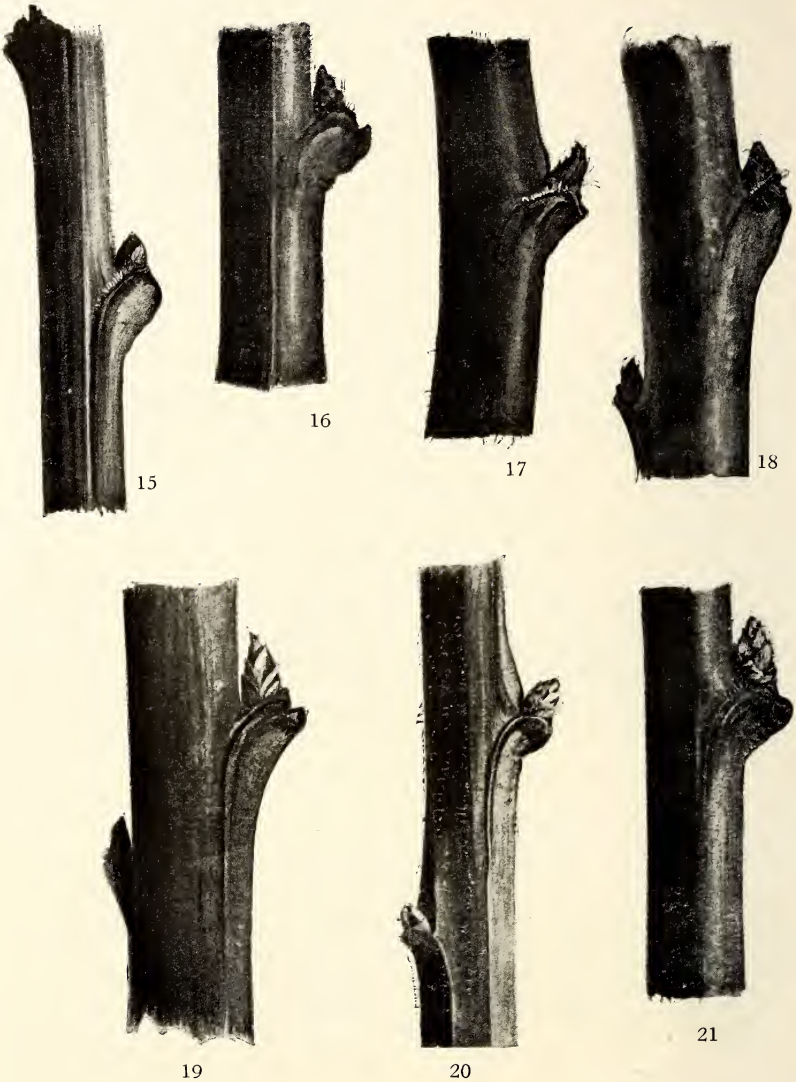

12


13


14

Photographed by R. A. Malby.]

WINTER SHOOTS OF CHERRIES.



WINTER SHOOTS OF PLUMS.

From drawing by F. Bunyard.] [*To face p.* 25.

number of varieties which are usually classed as smooth in Pomologies but which have a certain amount of persistent down, especially just above the bud. As this character is reasonably constant, it enables us to make a third group, the 'half downy.'

Representatives of these groups are as follows:

Wood downy, 'Early Transparent,' 'Late Orange,' 'Czar,' 'Victoria,' 'Admiral,' 'Early Orleans,' 'Prosperity,' 'Late Transparent.'

Half downy, 'Golden Transparent,' 'Kirke's,' 'Green Gage,' 'Stint,' 'Rivers' Early,' 'Heron.'

Smooth. 'Bryanstone Gage,' 'Coe's Golden Drop,' 'Pond's Seedling,' 'Coe's Violet,' 'Archduke.'

It is noticeable that the Gage type are represented mostly in the smooth group and least in the downy.

In the wood buds we find that the differences are extremely striking, perhaps more so than in any other fruit, and with sufficient study it should be possible for most varieties to be easily identified by this character alone.

Taking the shape of the bud, we find several types, those which are short and round, such as 'Sultan,' 'Comte d'Althans' (fig. 15), 'July Green Gage,' and 'Primate'; broader and more conical forms such as 'Green Gage' (fig. 16), 'White Magnum Bonum' (fig. 18), a long pointed bud as in 'Archduke,' 'Oullin's Gage' (fig. 19), and 'Curlew'; and lastly a rather short pointed bud which curves curiously inwards as 'Reine Claude de Bavay' (fig. 17) and 'Coe's Violet.'

The direction of the bud varies from one set away from the wood almost at an angle of 45° ('Reine Claude de Bavay' and 'Coe's Violet') to the upright direction taken by 'White Magnum Bonum,' and finally it may be adpressed to the shoot as in the 'Green Gage,' 'Angelina Burdett,' and others.

As in the Pear, the bud may be closely wrapped ('Comte d'Althans') or very loosely, as 'Curlew,' 'Reine Claude de Bavay'; and the scales may be downy or smooth.

The most characteristic appearance of the shoot is given by the prominence of the supports. In nearly all the Gages it is remarkably pronounced ('Green Gage,' 'Angelina Burdett,' 'Comte d'Althans' etc.), while in the other classes of Plums it is much less prominent and gradually slopes up to the leaf scar as in 'Victoria,' 'White Magnum Bonum,' 'Sultan,' etc.

In the Damsons the bud types are equally distinct and, as a reference to figs. 20 and 21 ('Farleigh' and 'Frogmore' Damsons) will show, they can easily be distinguished in winter state by the bud alone. The colour and hairiness are also, of course, useful aids in these as in Plums.

It would be easy to add other examples, but, space being limited, enough has perhaps been shown to demonstrate that the winter aspect of our fruit trees is full of interest, and it has also a practical side which does not need exposition. Accurate nomenclature can only be achieved by a study of our trees and fruits in all their aspects, and it is evident that the winter need not be an off season for the pomologist.

NOTES ON THE ORIGIN OF THE MOSS-ROSE.

By Major C. C. Hurst, D.L., J.P., F.L.S., and Mabel S. G. Breeze, B.Sc.

In 1908 experiments were undertaken at Burbage to investigate the genetics of certain variable species and garden hybrids of *Rosa* (Hurst, 1911).* These experiments were continued until the outbreak of war in 1914, when more urgent affairs demanded priority, and it was not until 1919 that it was possible to resume the experiments and to prepare a report on what had been done. Among the many interesting problems in the genetics of *Rosa*, the question of the Moss-Rose presented itself as one of outstanding interest from many points of view. But before attacking the problem genetically it seemed necessary to trace as far as possible the history of the original Moss-Rose, its direct descendants, and its parent species. The following notes represent the more important results of these researches.

Characters Peculiar to the Moss-Rose.

The original Moss-Rose, *R. muscosa* of Miller (1768), appears to be identical in all its external characters with the old Cabbage-Rose, *R. centifolia* (Linnaeus, 1753), except that it possesses the following additional characters : The stems, branches, petioles, stipules, pedicels, peduncles, and calyx-tubes are densely covered with irregular aciculi and glandular branched bristles, while the sepals are copiously compound and covered on the back and edges with multitudinous branched gland-edged mossy processes, which give off a resinous or balsamic odour when bruised. In other words, the Moss-Rose differs from the Cabbage-Rose in its multiplicity of glandular organs. It is important, however, to note that the difference is not simply that of presence or absence of glands, for the Cabbage-Rose is glandular in parts, *e.g.* petioles, stipules, peduncles, and sepals. Nor is it a difference merely of many or few glands, nor even of more extended or less extended glandular areas. It is also a difference of compound or simple glands, and these are multitudinous partly on account of the extension and increased density of the glandular areas, but mainly through the multiplicate branching of the gland-bearing organs (*cf.* Blondel, 1889).

Whether the presence of these additional characters in the Moss-Rose entitles it to specific rank, or whether it should be regarded as a variety of *R. centifolia* L. is a question concerning which systematists are divided. Miller, who appears to have been the first to describe the

* Names and dates in brackets refer to the Bibliography at the end of this paper.

Moss-Rose fully (1760), gives it specific rank under the name of *R. muscosa* (1768), which is accepted by the following: Du Roi (1772), Retzius (1779), Curtis (1793), Willdenow (1799), Aiton (1789), (1811), Lawrance (1799), Rössig (1802), Andrews (1805), Persoon (1807), Deleuze and Desfontaines (1809), Thory and Redouté (1817), and Prévost (1829); on the other hand, the following authorities regard the Moss-Rose as a variety of *R. centifolia* L. (or its synonym *R. provincialis* Mill.): Linnaeus (1762), Dumont de Courset (1805), Smith (1815), Seringe (1818), Lindley (1820), Guimpel (1825), Rössig (1826), Crépin (1892), and Willmott (1912).

Some modern authors, *e.g.* Regel (1877), Dippel (1893), Köhne (1893), Bois (1896), Rehder (1902), and Schneider (1906), place both the Moss-Rose and *R. centifolia* L. under *R. gallica* L.

Characters Common to the Moss-Rose and the Cabbage-Rose.

Whatever the systematic status of the Moss-Rose may be, one thing is certain, all authorities agree that the old Moss-Rose and the old Cabbage-Rose are closely allied. Anyone who has seen the two growing side by side, and has carefully examined them, must acknowledge that they have many characters in common, which are quite distinct from any other species or sub-species. For example, both have very double globular flowers, which are red in the bud and rose-pink when open. Both have about a hundred short and broad petals, which are closely incurved and rolled inwards towards the centre, which is frequently quartered like a crown. Both yield the same distinctive fragrance from the petals, which is peculiar to *R. centifolia* L. and distinct from the fragrance of *R. gallica* L. (The resinous and balsamic odour from the mossy glands of the Moss-Rose is naturally much more powerful than the odour from the same area in the Cabbage-Rose, which is but faint.) Both have cernuous or nodding flowers, usually solitary or up to three only, unlike those of *R. damascena* Mill., which are usually erect and many, in corymbs or clusters. Both have the sepals spreading and persistent, not reflexed and deciduous as in *R. damascena* Mill. and *R. gallica* L. Both have a medium habit of growth, not so tall and prickly as *R. damascena* Mill., nor so dwarf and bushy as *R. gallica* L. Both have leaves softer to the touch than the more rigid and coriaceous leaves of *R. gallica* L. and the allied forms. Last, but not least in importance, both the old Moss-Rose and the old Cabbage-Rose are sterile, inasmuch as neither develops perfect fruits (which all the allied species do as a rule), and neither has been known to produce fertile seeds so far as we can ascertain. So far, all attempts to obtain seed from the old Moss-Rose and the old Cabbage-Rose at Burbage have failed, both outside and under glass, though miniature fruits were sometimes obtained containing no seeds.* In view of the fact that some apparently

* In 1921 a few fruits matured under glass, and one contained a seed, the germination of which has not yet been tested.

good pollen was found and that some of the styles appeared to be normal and not petaloid, the result is so far unexpected. From the genetic point of view the sterility of the old Moss-Rose is a serious disadvantage, but this difficulty is not insuperable, as will be seen later. A full discussion of this important question of sterility must be deferred for a time, and for the present we simply record the fact.

History of the old Cabbage-Rose. (R. centifolia *L.*)

The old Cabbage-Rose has been freely cultivated in European fields and gardens for more than 2,000 years. About 450 B.C. Herodotus observes that the Roses growing in Macedonia, near the gardens of Midas, have sixty petals, and are the most fragrant in the world. This is a very neat description of the Cabbage-Rose, and at the same time a critical one, because it is difficult to conceive how such a description can be applied to any other known species of *Rosa*. A century later Theophrastus, the first historian of the Rose, mentions the Roses with a hundred petals, and calls them '*Centifolia*.' In the first century Pliny, who devotes a whole chapter to Roses, repeats the observations of Theophrastus, and adds that the '*Rosa Centifolia*' grows at Campania in Italy, and near Philippi, a city in Greece (Macedonia). He also states that these Centifolia Roses grow naturally on Mount Pangaeus close by, with a hundred leaves but small, and when transplanted into richer soil do thrive mightily, and prove to be much fairer than those growing on the mountain; all of which seems quite natural. From other classic authors we learn that vast numbers of Rose petals were used by the Greeks and Romans for their decorations and festivities, and it is reasonable to suppose that the Cabbage-Rose with its hundred petals and delicious fragrance was cultivated for this purpose in the fields of Italy, Greece, and Macedonia. In these circumstances it does not necessarily follow that the Cabbage-Rose is a true native of the South of Europe, as many of the early authorities conclude (Smith, 1815); on the other hand, it appears more probable, as Lindley (1820) believed, that the Cabbage-Rose was introduced into Europe from Asia at a remote period. As a matter of fact, early in the nineteenth century Bieberstein (1808) found the Cabbage-Rose growing apparently wild on the Eastern side of the Caucasus, on the borders of Armenia and Persia. Rau (1816) states that it is a native of Northern Persia, and Boissier (1872) gives the habitat as Eastern Caucasus, while according to Loureiro (1790) it is a native of China.

Notwithstanding these records we are inclined to believe that the Cabbage-Rose has been cultivated in the fields and gardens of Asia from time immemorial, and that its native country can only be surmised. The fact of its sterility suggests an origin under cultivation, and it is worthy of note that *R. centifolia* L. does not "stool" so freely as *R. gallica* L., nor does it root so well from cuttings and layers as *R. damascena* Mill., so that its chances of survival and increase in a wild state would be very small. The fact that the habitats given

are on the borders of or in Persia is also significant, for Persia is a country which has been famous for its fragrant Roses from the earliest times. Flückiger (1862) refers to a Persian document in the National Library in Paris which states that in the year 810, the province of Farsistan was required to pay an annual tribute of 30,000 bottles of Rose-water to the Treasury of Baghdad. The most important cultivations of Roses for distilling Rose-water were near Shiraz, and are "even to this day" (Flückiger, 1883). Lindley (1820) in commenting on the celebrated Roses of Shiraz, praised so enthusiastically by Kaempfer (1712) suggests that the Rose of Shiraz may be the Cabbage-Rose (*R. centifolia* L.) or possibly *R. damascena* Mill. It was at Shiraz that one of the MSS. of the Rubáiyát of Omar Khayyám was transcribed in 1460. The immortal Persian poet and philosopher, who flourished in the eleventh and twelfth centuries, was a passionate lover of the Rose—as well of the Vine—and red, white, yellow and flesh-coloured Roses are referred to in the Rubáiyát.

It is related by FitzGerald (1859) that one day in a garden Omar Khayyám said to one of his pupils, Khwajah Nizami of Samarcand, "My tomb shall be in a spot where the North wind may scatter Roses over it," and it was so, for on his grave at Naishapur a Rose tree was planted. In Willmott (1914) the late Dr. J. G. Baker (whose botanical knowledge of Roses was unrivalled) relates how a hip of this Rose was brought home by Mr. Simpson, the artist of the "Illustrated London News," and sent to Kew by the late Mr. Bernard Quaritch, from which seedlings were raised which proved to be *R. damascena* Mill., a species, as we have seen, that is allied to the Cabbage-Rose, *R. centifolia* L., but distinct from it. All of which goes to confirm Lindley's conjecture, that the celebrated Rose of Shiraz may have been one of these species. The date of the introduction of the Cabbage-Rose to England is unknown; it may have come during the Roman occupation of Britain with the "English" Elm, or it may have come later through the monastery and convent gardens, in which, according to Amherst (1895), Roses were cultivated as far back as the eleventh century, in the reign of William Rufus. On the authority of Anselm it is related that the Red King, in order to see the twelve-year-old Matilda at the convent of Romsey, entered the convent on the pretext of looking at the roses in the garden.

The late Canon Ellacombe (1905) believed that the Cabbage-Rose was certainly in cultivation in England in the fifteenth century and probably earlier. He identifies it with the 'Rose of Rone' of Chaucer, and with the 'Provincial Rose' of Shakespeare, and adds that the name of this Rose would be more properly written 'Provence or Provins.' It is a curious fact that at Burbage the old Cabbage-Rose for eighty years at least has been more commonly called and known as the 'Red Province,' which is the old name used by the English Herbalists, Gerard (1596), Parkinson (1629), and Salmon, (1710). Apparently Miller (1733) was the first to change 'Province' to 'Provence' though he still retained *provincialis* for the Latin

name. It may be that the old name for the Cabbage-Rose, 'Red Province,' has lingered on in remote country districts for centuries, like that archaic word of Chaucer 'glede,' which is still in common use at Burbage to signify the glowing embers in the fire. Baker in Willmott (1914) states that the first botanical figure of the Cabbage-Rose (*R. centifolia* L.) is that of L'Obel (1581) who describes it under the name of *R. damascena maxima*. Gerard (1596) includes it in his catalogue of plants under the name of "*R. damascena flore multiplici*, the Great Holland Rose, commonly called the Province Rose." In his Herbal of 1597, however, he describes and figures it under the name of "*R. Hollandica sive Batava*, the Great Holland Rose or Great Province." Clusius (1601) describes it under the name of *R. centifolia batavica*. Parkinson (1629) describes fully and figures what is undoubtedly the Cabbage-Rose under the name of "*R. provincialis sive Hollandica Damascena*, the Great Double Damaske Province or Holland Rose, that some call *Centifolia Batavica incarnata*."

Ellacombe (1905) suggested that Parkinson's (1629) "*R. Anglica rubra*, the English Red Rose," is the Cabbage-Rose, but the description "abideth low and shooteth forth many branches from the roote . . . with a greene barke thinner set with prickles . . . red or deepe crimson colour . . . with many more yellow threds in the middle, the sent . . . is not comparable to the excellencie of the damaske Rose, yet this Rose being well dryed and well kept, will hold both colour and sent longer then the damaske, bee it never so well kept," seems to correspond precisely with the characters of *R. gallica* L., the old French Rose, and not at all with *R. centifolia* L., the old Cabbage-Rose.*

Ferrarius (1633), in Italy, describes the Cabbage-Rose under the name of *R. Batava centifolia*. Chabraeus (1677), in Switzerland, describes and figures it under the name of *R. centifolia rubella plena*. In her monograph of the genus *Rosa* (1914), Miss Ellen Willmott draws attention to the interesting fact that the Cabbage-Rose was a favourite subject with the old Dutch painters, especially Van Huysum (1682–1749) who excelled in portraying it. Liger (1708), in France, mentions it under the name of "La Rose d'Hollande à cent feuilles, avec odeur." Salmon (1710) describes and figures it as "The Great Double Damask Province, or Holland Rose." Finally, Linnaeus (1753) describes the Cabbage-Rose under its accepted name of *R. centifolia*. Miller (1768), owing to a misunderstanding of Linnaeus' diagnoses of 1753 and 1762 (which it must be admitted were not very clear) describes the Cabbage-Rose under the name of *R. provincialis*, the Provence Rose, and others followed him. Fortunately

* [It is interesting to compare Parkinson's remarks above, concerning the drying properties of the 'English Red Rose' with the statement of a modern practical chemist, Sawer (1894), who states that "The flowers of *R. gallica* (which are used officinally) are but feebly odoriferous when freshly gathered; their perfume develops gradually in the process of desiccation, while that of the Damask Rose is almost destroyed by drying." From this it appears that there is a real physiological and chemical difference between *R. gallica* L. and *R. damascena* Mill., apart from their morphological differences which to some modern systematists appear to be negligible.]

Lindley (1820) cleared the matter up, and since then the Cabbage-Rose has been known correctly under the original name of Linnaeus, *R. centifolia*. In conclusion it may be useful to mention that the most accurate and life-like coloured drawing of the old Cabbage-Rose is to be found in Redouté (1817). Miss Willmott (1912) considers this to be the most beautiful of all his wonderful drawings of Roses, and we agree.

History of the Old Moss-Rose.

The Old Moss-Rose is of recent origin compared with the Cabbage Rose. Its mossy flower-buds and stalks, and bristly stems and branches, together form such a striking variation that its appearance could hardly fail to be noticed by even the most casual observer. So far as we can trace, no mention of it is made by any of the ancient authors who were familiar with the Cabbage-Rose, nor do any of the old herbalists appear to have noted it. If it had been in existence in their day, the balsamic odour of its mossy glands would surely have attracted them in their search for medicinal virtues and specifics. Gerard (1596) does not mention the Moss-Rose in his Catalogue of Plants, but Dr. Daydon Jackson (1876) in his edition of Gerard's Catalogue, suggests that Gerard's *R. holosericea*, The Velvet Rose, may be the Moss-Rose (*R. muscosa* Mill.). This plant is described and figured by Gerard (1597) and the flowers and fruits are described as " double with some yellow thrums in the midst of a deepe and black red colour resembling red crimson velvet . . . when the flowers be faded there followe red berries full of hard seeds." This description does not appear to correspond at all with the old Moss-Rose which has pink flowers when expanded, and is so double that the stamens and styles are seldom exposed, and finally being sterile rarely, if ever, sets either fruits or seeds. The figure (which is identical with that of L'Obel, 1581) shows no trace of the familiar and striking mossiness, while the flowers are " semi-single " (two rows of petals), with stamens and styles fully exposed, and it is bearing rounded fruits. Parkinson (1629) also gives figures of both the single and the double Velvet Rose. In his description he states that they have " very few or no thorns at all upon them . . . very often seven flowers on a stalk . . . yet for all the double rowe of leaves these roses stand but like single flowers . . . all of them of a smaller sent than the ordinary red Rose." Salmon (1710), after repeating Parkinson's description of the Single and Double Velvet Rose, states that " there is another Velvet Rose much more double than the last, consisting oftentimes of sixteen leaves or more in a Rose, and most of them of an equal bigness, of the colour of the first single Velvet Rose or something brisker, but all of them of a weaker smell than the Common Red Rose." Lawrance (1799) and Andrews (1805) figure both the Single and Double Velvet Rose under the name of *R. centifolia*, but both appear to be forms of *R. gallica* L.,

the old French Rose. Thory (1817) refers *R. holosericea* to *R. gallica* L., quoting L'Obel's figure which is the same as Gerard's. Finally Lindley (1820) refers *R. holosericea* to *R. gallica* L.

In any case, judging by the descriptions quoted above, it seems clear that whatever Gerard's Velvet Rose (*R. holosericea*) may have been, it was not the Moss-Rose (*R. muscosa* Mill.),* and we can find no evidence that the Moss-Rose was known in England in 1596, to support the repeated statements in the books on garden Roses from Rivers (1840) to Pemberton (1920), that it was introduced in that year from Holland.

So far as we know, there is no mention of the Moss-Rose in Chaucer, Shakespeare, or in any literature of that period. Parkinson (1629) describes in detail twenty-eight forms of Roses, but none corresponds in any way to the Moss-Rose. Ferrarius (1633) in Italy, Chabraeus (1677) in Switzerland, Liger (1708) in France, and Salmon (1710) in England, give long lists, descriptions, and figures of various kinds of Roses, but there is no trace of the Moss-Rose in any of them. There is, however, in Ducastel (1746), quoted by Paquet (1845) and Jamain and Forney (1873), a circumstantial account of the existence of the Moss-Rose in the south of France, at Carcassonne, as far back as 1696, and this appears to be the earliest date mentioned for the existence of the Moss-Rose. The account is that the Hundred-leaved Moss-Rose was in cultivation in Cotentin, Messin, and La Manche in 1746, and that it was brought there by Fréard Ducastel, who had found it at Carcassonne, where it had been known for half a century.

The first botanical reference to the Moss-Rose is apparently that of Boerhaave (1720) in his Index of Plants cultivated in the Physic Garden at Leyden under the name *Rosa rubra plena spinosissima, pedunculo muscoso.* In 1724 the Moss-Rose is said to have been in cultivation in London, for Miller (1724) states that it is included in Robert Furber's Catalogue of plants cultivated for sale at Kensington. Miller (1760) tells us that he first saw the Moss-Rose "in the year 1727, in the garden of Dr. Boerhaave near Leyden, who was so good as to give me one of the plants." On the whole we consider it safer to accept Miller's 1727 date.

Martyn (1807) refers to what is apparently the first figure of the Moss-Rose in *Hort.-Angl.*, a Catalogue of Trees, Shrubs, Plants, and Flowers cultivated for sale in the Gardens near London, 1730 (folio) (66 n. 14, t. 18), in which it is called *Rosa provincialis spinosissima pedunculo muscoso*, and under the same name it appears in Miller (1733) who adds "or the Moss Provence Rose."

The second illustration of the Moss-Rose that we can trace is in that exquisite little book, "The Flower Garden Display'd" by Furber (1732) under the name of 'Moss Provence Rose.' The coloured drawing, though rather fantastic, is unmistakable. In the letterpress it is called the 'Moss Province Rose,' and it is said to be "like the Province Rose, and bears blossoms almost as double as that, only somewhat

* Dr. Jackson, to whom I submitted this opinion, concurs.

redder ; and all the stalks are covered with a green Down, like Moss, which gives it its name." The drawing is said to have been " coloured from the life." Willmott (1912) mentions that there is a specimen of the Moss-Rose in the British Museum from the Chelsea Physic Gardens (Miller's) with the date 1735. About the year 1735 is the period which Shailer (1852) quoted by Darwin (1893) gives as the first introduction of the old Red Moss-Rose into England. He states, " It was sent over with some orange trees from the Italian States to Mr. Wrench of the Broomhouse Nurseries, Fulham, in or about the year 1735. It remained in that family 20 years without being much noticed and circulated, until a nurseryman of the name of Grey of Fulham brought it into note." In 1746, as we have already noted, the Moss-Rose was in cultivation in France in four districts of the South and West. Linnaeus (1753) does not mention the Moss-Rose. Miller (1760) published a coloured drawing of the Moss-Rose, with an interesting description of the plant, and following Boerhaave (1720) describes it as " *Rosa rubra plena, spinosissima, pedunculo muscosa.* The most prickly double red Rose with a mossy foot-stalk, commonly called the Moss Provence Rose. . . . This sort sends out but few stalks from the root. These are covered with a dark brown bark, and closely armed with sharp thorns, the leaves are composed of five oblong oval lobes, which are hairy and sawed on their edges ; the footstalks of the flowers are strong, standing erect, and are covered with a dark-green moss, as is also the Empalement of the Flowers. The flowers are the same shape and colour as the common Provence Rose, and have the like agreeable odour. It flowers in June or July, but is not succeeded by fruits."

Linnaeus (1762) adds *R. rubra plena spinosissima pedunculo muscoso* of Miller (1760) to *R. centifolia* as probably belonging to it. Martyn (1807) quotes Retzius' (1779) description of the Moss-Rose, which is worth re-quoting for its originality and acute observation, " Stem very prickly and hispid : peduncles long, beset with curled strigae terminated by a resinous globule, as are also the whole calyxes : these strigae are often branched. Petioles less hispid and unarmed. Leaflets very large 3 or 5, smooth. The colour and smell of the clammy resinous glands are very much the same as in the Flowering Raspberry, or *Rubus odoratus.*" (It is, of course, the fragrant foliage of the *Rubus* to which Retzius refers and not the flowers.) De Grace (1784) mentions the Moss-Rose in France.

It is said (Wright, 1911) that in 1785 the Moss-Rose was sent from Caen Wood, Highgate, by Lord Mansfield to Mme. de Genlis in France as a new introduction to that country. (*Cf.* Vibert's reference below.) We have already seen that it was in cultivation in four districts in France in 1746, and at Carcassonne in the south of France as far back as about 1696.

Rössig (1802) gives under the name of *R. muscosa* the figure of a pink Moss-Rose, less mossy than usual, and states that it is found on the Alps.

Brotero (1804) includes *R. muscosa* in his "Flora of Portugal," while Rivers (1840) alludes to a traveller's report that the Moss-Rose grew wild in the neighbourhood of Cintra, but considers that most likely the plants were of garden origin.

Andrews (1805) states of the Moss-Rose (*R. muscosa provincialis*), "There can be little, if any doubt, that this beautiful variety is the spontaneous effusion of Nature in this country, of which we ever shall regard it as indigenous, since we have never heard of any importations of this species, but frequent exportations."

Thory (1817) appears to have taken this "effusion" of Andrews quite seriously, and replies as follows: "A cet égard, independamment de ce qu'une conclusion de cette espèce est inadmissible en histoire naturelle, nous ferons observer qu'il n'est pas rare de voir les Iconographes anglais considérer beaucoup de plantes comme indigènes au sol de leur pays, toutes les fois que le lieu dans lequel elles végètent naturellement leur est inconnu, circonstance qui doit faire rejeter toutes les assertions de ce genre."

Apparently Thory had not seen Ducastel.

Origin of the Moss-Rose.

We have reviewed the history of the Old Moss-Rose and have traced it back to about the year 1696, when it was apparently in cultivation at Carcassonne, in the south of France, until it was found there by Ducastel, and introduced by him to the gardens of three districts in the North-West of France. We have seen that it was in cultivation in Holland in 1720, in England in 1727, and in Italy in 1735. Andrews (1805) states that ". . . The origin of this beautiful Rose has ever been considered as enveloped in obscurity, but we have no hesitation in assigning it to the Province, to which it assimilates in every particular—with the addition of a rich luxuriant Moss, that gives it a decided superiority, and at the same time a specific distinction. . . . There can be little, if any doubt, that this beautiful variety is the spontaneous effusion of Nature in this country."

Rivers (1840) states: "The Moss-Rose or Mossy Provence Rose is most probably an accidental sport or seminal variety of the Common Provence Rose."

Vibert (1844) of Angers, France, states, curiously enough, that the first Moss-Rose, the Common Moss, was discovered in England. He quotes the statement of Mme. de Genlis in her *Botanique Historique* that she brought the first plant of the Moss-Rose to Paris from England a few years before the Revolution of 1789, but he seems sceptical about her further statement that in Germany, round Berlin, the Moss-Rose grew as high as cherry trees! Vibert proceeds to say that the Moss-Rose is evidently a sport of Nature, a happy accident that Art has fixed, and that the date of introduction has not been preserved in a positive manner. He remarks that in France in 1810 only the Common Moss was known, and that the species *R. centifolia*

has produced more sports or side-steps ("jeux ou écarts") than all the other species of *Rosa* put together.

Loiseleur-Deslongchamps (1844) also states that the Moss-Rose originated in England, and that Miller is supposed to have been the first cultivator of it in 1724.

Paul (1848) states: "The history of the Moss-Rose is wrapped in obscurity. It was first introduced to England from Holland [in the 1888 edition he adds "in 1596"] and it is generally believed that it was a sport from the Provence Rose: that it was not originated by seed, as most new varieties are, but by a branch of the Provence Rose sporting . . . flowers enveloped in Moss.

"Some tribes of plants are more disposed to sport than others; and the Provence and Moss-Roses possess this peculiar property to a remarkable degree."

Finally Darwin (1893) who devoted considerable attention to the question of the origin of the Moss-Rose, states:

"Its origin is unknown, but from analogy it probably arose from the Provence Rose (*R. centifolia*) by bud-variation." After a careful survey of the facts available to him in 1868, Darwin concludes: "That the original Moss-Rose was the product of bud-variation is probable." Many facts have come to light since the time of Darwin, which more fully confirm this conclusion.

Records show that on three distinct occasions the Moss-Rose mutation has appeared among the Cabbage-Roses. First, about 1696, the Old Moss-Rose appeared, as we have seen, in the South of France. Second, in 1801 the Moss de Meaux appeared in the West of England as a bud-mutation on the Rose de Meaux (Hare, 1818). Third, about 1843, the Unique Moss appeared in France, as a bud-mutation on the Rose Unique (Vibert, 1844; Paul, 1848).

Both the mother parents probably originated as bud-variations of the Old Cabbage-Rose, the Rose de Meaux about 1637 in France (Willmott, 1912), and the Rose Unique in 1775 in the East of England (Shailer, 1852).

A confirmation of this view is found in the fact that both the Rose de Meaux and the Rose Unique reverted by bud-variation to the Old Cabbage-Rose (Andrews, 1810; Rivers, 1840).

Origin of the Rose Unique.

The Rose Unique, or White Provence, is a white Cabbage-Rose which differs from the Old Pink Cabbage-Rose in colour only. As a matter of fact it is not a true albino, but a tinged white with pink buds.

Usually the flower is pure white when expanded, but the five outer petals are tinged with colour, and occasionally the centre of the flower too. There is an excellent coloured drawing of this Rose in Redouté (1817) under the name of *R. centifolia mutabilis*, or Rosier Unique. Andrews (1805) also figures it under the name of

R. provincialis alba, White Provence or Rose Unique. This Rose was apparently found in a garden in the Eastern Counties in 1775. Andrews (1805) states that "its introduction in 1777 was entirely accidental, through the medium of the late Mr. Greenwood, Nurseryman, a great admirer and collector of Roses, who, in an excursion which he usually made every summer, in passing the front garden of Mr. Richmond, a baker near Needham in Suffolk, there perceived the present charming plant, where it had been placed by a carpenter who found it near a hedge on the contiguous premises of a Dutch merchant, whose old mansion he was repairing. Mr. Greenwood, requesting a little cutting of it, received from Mr. Richmond the whole plant; when Mr. Greenwood, in return for a plant so valuable, presented him with an elegant silver cup with the Rose engraved upon it; and which in commemoration has furnished food for many a convivial hour. It is of dwarf growth and remains in flower nearly six weeks longer than the other Province Roses, which renders it still the more estimable.

"We wish it had been in our power to have accounted for its having been till so lately a stranger to us, and whence indigenous; but at present our information is entirely confined to the knowledge of its casual introduction, and until some further light is thrown upon the subject to elucidate its genealogy, we shall regard it as a native!" Another account is that of Rivers (1840) who states: "The Unique Provence is a genuine English Rose, which, I believe, was found by Mr. Greenwood, then of the Kensington Nursery, in some cottage garden, growing among plants of the Common Cabbage-Rose. This variety was at first much esteemed and plants of it were sold at very high prices. Most probably this was not a seedling from the Old Cabbage Rose, as that is too double to bear seed in this country, but what is called by florists a sporting branch or sucker." A final account is that given by Shailer (1852), and referred to by Darwin (1893). Shailer states: "The Rose Blanche Unique, or White Provins, was discovered by Mr. Daniel Greenwood of Little Chelsea, Nurseryman. He was on a journey of business in the County of Norfolk in the month of July 1775, when, riding very leisurely along the road, he perceived a rose of great whiteness in the Mill; he alighted and on close inspection he discovered it to be a Provins Rose; he then sought an interview with the inmate of the Mill, who was an elderly female; he begged a flower, which was instantly given him; in return he gave her a guinea.

"In cutting off the flower he cut three buds; he went to the first Inn, packed it up, and sent it direct to my father, at his Nursery, Little Chelsea, who was then his foreman, requesting him to bud it, which he did, and two of the buds grew: in the following autumn he went down to the same place, where for five guineas he brought the whole stock away; he then made an arrangement with my father to propagate it, allowing him 5*s*. per plant for three years; at the expiration of that time he sold it out at 21*s*. per plant, my father's share amounting to upwards of £300.

"Mr. Greenwood sent the old lady at the Mill a superb silver Tankard, etc., to the amount of £60."

Darwin (1893), referring to Shailer's version above, states: "Many other instances could be added of Roses varying by buds. The White Provence Rose apparently originated in this way," with which we agree. The statement that Greenwood paid a guinea for one flower and three workable buds distinctly suggests that only one small shoot of this new White Rose was available at the time, and that it was a bud-variation growing on a Common Pink Cabbage Rose as Rivers suggests. The "stock" that Greenwood bought for five guineas in the autumn was no doubt the original plant from which he cut the sport (cf. Andrews' account), because from his two budded plants and the old "stock" plant Shailer would, with ordinary good fortune, get his 1,200 plants in the three years stated.

Origin of the Rose de Meaux.

The Rose de Meaux is a miniature Cabbage-Rose which differs from the Old Cabbage-Rose only in the smaller size of all its parts. There is a good coloured drawing of this Rose in Redouté (1817) under the name of *Rosa Pomponia* or Rosier Pompon. This Rose is an old inhabitant of French gardens, but its precise origin is not known. Miss Willmott (1912) suggests with good reason that it may have come from the garden of Doménique Séguier, Bishop of Meaux (1637), who was a great cultivator of Roses in his day. In any case, wherever it arose, there can be little doubt that it originated from the Old Cabbage-Rose and probably as a bud-variation.

Aiton (1789) mentions two 'Rose de Meaux' as varieties of *R. provincialis* Mill. (*i.e. R. centifolia* L.), viz. 'the Great Dwarf Rose,' which is no doubt the Spong Rose (*R. provincialis hybrida*) of Andrews (1805), a half-dwarf; and the 'Small Dwarf Rose,' which is clearly the 'Rose de Meaux.' Both these forms are figured by Miss Lawrance (1799) under tt. 31 and 50 respectively.

During a period of more than 2,000 years, only three Moss-Roses have been recorded that were not derived from Moss-Roses. Two of the three are definitely recorded as bud-variations of Cabbage-Roses, viz. Moss de Meaux (1801) in England and Unique Moss (1843) in France. The third is the Old Moss-Rose whose origin is in question. Each of the two is identical with the particular form which produced it, except in the 'Moss' character, which is additional. Further, the 'Moss' character is apparently identical in the three Moss-Roses. None has been recorded as a seed-variation and all are sterile, like the forms which produced them.

Further, on at least seven occasions between 1805 and 1873 the Old Moss-Rose has reproduced the Old Cabbage-Rose by bud-variation or 'bud-reversion' (Andrews, 1805; Hare, 1818; Lindley, 1820; Shailer, 1822; Piper, 1842; Jumain, 1873; Darwin, 1893).

The conclusion, therefore, is irresistible that the original Moss-Rose mutation arose as a bud-variation of the Old Cabbage-Rose (*R. centifolia* L.).

We conclude, therefore, that the original Moss-Rose first appeared at Carcassonne, in the south of France, about the year 1696, as a bud-mutation of the Old Cabbage-Rose (*R. centifolia* L.).

The second 'Moss' mutation was the 'Moss de Meaux,' which appeared in the West of England in 1801 as a bud-mutation of Rose de Meaux.

The third and last 'Moss' mutation was the 'Unique Moss' which appeared in France about 1843 as a bud-mutation of Rose Unique.

All other Moss-Roses have been derived directly or indirectly from one of the three original mutations. As a matter of fact, between 1788 and 1832 no less than seventeen distinct Moss-Roses appeared as bud-variations of the Old Moss-Rose in England and France. One of these had single and fertile flowers (Shailer, 1852), and became the ancestor of many hybrid Moss-Roses raised in England and France between 1824 and 1860.

Further confirmation of the origin of the Moss-Rose may be found in the interesting fact that twelve of the distinct bud-variations of the Old Moss-Rose which appeared between 1788 and 1832 have precise parallels in twelve bud-variations of the Old Cabbage-Rose which appeared between 1637 and 1813, the only difference between them being the presence and absence of 'Moss' respectively. This can only be due to their like factorial composition in all respects except in the presence or absence of the 'Moss' factor.

Presumably this implies a common origin, and here we seem to get a glimpse of the true nature of related species and varieties, for these twelve bud-variations are indistinguishable in kind from the seed-variations that normally arise among seedlings of related species and varieties of *Rosa*.

Another noteworthy fact has become prominent in the course of this inquiry, and that is the comparatively few bud-variations recorded in the fertile *R. gallica* L., and *R. damascena* Mill. compared with the large numbers found in the sterile *R. centifolia* L.

Is it possible that there is a definite connexion between sterility and bud-variation? Are we to regard bud-variation as an alternative mode of expression of variation in the presence of sterility.

The facts in *Rosa* certainly point in that direction. It is interesting to note that no other species of *Rosa* presents the 'Moss' mutation but *R. centifolia* L. No trace of it is ever seen in the closely allied species or sub-species *R. damascena* Mill. or *R. gallica* L. The nearest analogues to the mossiness of *R. centifolia* L., are the extreme hairy and glandular forms of *R. rubiginosa* L. (Sweet Briar) and *R. moschata Brunonii* (Musk Rose), which, however, are quite distinct from *R. centifolia muscosa* Seringe, both in their structure and their glandular secretions.

Genetic Significance.

In concluding this inquiry, it may be of interest to add a few genetic notes on the probable nature and significance of the three definite appearances of this " specific " bud-mutation, after more than 2,000 years of intensive cultivation and vegetative propagation.

That the ' Moss ' character in *Rosa* is a genuine bud-mutation, and not a fluctuating variation, or bud-variant, is evident from its somatic persistence through many bud-generations, and its germinal persistence through various seed-generations.

Rivers (1840) states that : " Plants produced by the seed of the Moss-Rose do not always show Moss ; perhaps not more than two plants out of three will be mossy, as I have often proved."

Again, Darwin (1893) states that : " Mr. Rivers informs me that his seedlings from the old Single Moss-Rose almost always produce Moss-Roses."

We do not yet know definitely whether the ' Moss ' character in *Rosa* is to be identified with a single Mendelian factor or not, though all the evidence so far is in favour of its being a simple dominant. If it is, and Rivers' matings of the Single Moss-Rose were, on the average, one-half selfings and one-half crossings with other Roses, as they probably were, judging by his methods, the Mendelian expectation, on the average, would be the actual ratio he obtained, viz. 2 Moss ; 1 Plain. It is evident that ' Moss ' is a dominant character, for if it were recessive no hybrid Moss-Roses would have the ' Moss ' character, and we know that some have. It is also clear that the Single Moss, a bud-variation from the Old Moss-Rose, is a heterozygous dominant, for according to Rivers (1840) and Darwin (1893) it throws " Plain " as well as ' Moss ' Roses from seed in the proportion of about one in three.

We have already seen that the Old Moss-Rose produced " plain " (i.e. " unmossed ") Cabbage-Roses. So that it is probable that the first mutation of the Moss-Rose was itself a heterozygous dominant for ' Moss.'

In view of the important results recently reported by Morgan (1919) and his colleagues, in their experiments with *Drosophila*, which have led them to formulate the chromosome theory of heredity, it seems on this hypothesis that if the first mutation of the Moss-Rose was a heterozygous dominant, the mutational change would take place in one of the chromosomes in a single locus. In accordance with the " presence and absence " method, this mutational change in a single locus from m to M involves the presence of an additional factor M, which is dominant to the normal allelomorph m from which the factor M is absent.

This conception, however, does not necessarily imply the actual presence or absence of a structural gene as Morgan seems to infer, and in the present state of knowledge it seems safer and sounder to continue the use of the non-committal term " factor " with its

"presence and absence," which need not necessarily involve any assumption as to the nature or constitution of either the factor or its allelomorph, though it does provide an indispensable symbolic method of denoting the difference between them.

On the other hand, the reversionary change by which the Moss-Rose reproduced the Cabbage-Rose by bud-variation involves the absence of the factor M in a single locus of one of the chromosomes, either by somatic segregation with a reduction division, or by a reverse mutational change in the locus concerned. In any case it is evident that in view of Morgan's discoveries bud-mutations take on a new importance, and the case of the Moss-Rose is clearly one of considerable genetic significance; for in a simple way it seems to narrow down to a fine point the difficult and usually complex problem of the origin of a definite mutation, and may bring us within measurable distance of the possibility of tracing the origin to a certain cause.

For the present, however, we must be content to work and wait patiently for the genetic and cytological facts, which alone can offer even an approximate solution.

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RASPBERRIES TRIED AT WISLEY.

I. Summer-fruiting Varieties.

Forty-three stocks representing twenty-nine varieties were sent in for trial. The bulk of them arrived during the winter of 1916–17, whilst one or two were a year later. They were heeled in from the date of their receipt until February, when they were planted in their permanent quarters. At the time of planting they were cut back hard. During the growing season of 1917 very little growth was made, and it was thought advisable to cut the canes back fairly hard again instead of allowing them to fruit in 1918, so that stronger canes would be produced for fruiting in 1919.

This resulted, and many healthy canes were made, the majority of which bore very good crops in 1919.

An inspection was made by a sub-committee of the Fruit and Vegetable Committee on July 17, 1919, and the following awards were made :

Golden Hornet	raised and introduced by	Mr. G. Trinder ...	**A.M.**
Park Lane	,, ,,	Mr. Geo. Pyne ...	**A.M.**
Brown's Excelsior	,,	Mr. Brown ...	**H.C.**
Hornet	,, ,,	...	**C.**
Lloyd George	introduced by	Mr. Kettle ...	**C.**
Profusion	raised by Mr. Brooks and introduced by	Mr. Bunyard	**C.**
Pyne's Royal	raised and introduced by	Mr. Geo. Pyne ...	**C.**
Laxton's Prolific	,, ,,	Mr. Laxton ...	**C.**

Only one of these varieties had previously received an award, this being Hornet, which was awarded **F.C.C.** in 1889 (Rivers).

The following varieties, which were represented in the trial, and which had awards in the past, were on this occasion passed over by the committee, as not of equal value to the above :

Norwich Wonder, **A.M.** 1906.
Superlative, **F.C.C.** 1888.
Queen of England, **F.C.C.** 1899.

As an aid to the identification of varieties, so far as represented in the trial, a simple and rough method of grouping has been adopted which, although only tentative, should be some guide in recognizing varieties.

The two main groups are based on habit, viz., summer and autumn fruiting. These groups are then divided into Red and Yellow fruited varieties, and these again into those with flat and those with curled foliage on the *young* canes, since this is one of the most noticeable

differences between varieties. "Flat" does not mean "not rough," but refers to the fact that the edges of the leaf are on the same plane, more or less, as the mid-rib, whereas in those with "curled leaves" the edges are tucked under. Most of the leaves on old canes are curled in high summer.

The varieties have again been subdivided into "young canes smooth" and "young canes spiny," and a note of explanation is perhaps necessary here. In almost every Raspberry there are spines in varying degrees at the base of the young canes, but there are several varieties that are characteristically smooth on the upper two-thirds of the cane, whilst others are spiny throughout, and this character appears to be fairly constant. It is to the upper portion of the canes that the remarks refer, ignoring for the purpose of this grouping the lower six inches or so near the ground level.

The colour of the canes in summer, confined in a broad way to "brown" or "reddish," serves as a useful line of demarcation between certain varieties. The absence or presence of spines on the pedicels as a distinguishing feature may at first appear undeterminable, as the degree of smoothness or the reverse varies often on the same canes, but certain varieties have undoubtedly more frequently smooth pedicels, whilst others are decidedly spiny, and in cases where the variation in this character on one plant is considerable and entirely "unfixed," it is noted that the pedicels have few spines. The forms of fruit, "round" or "conical," need no explanation.

The colour of the foliage, whether dark, or light, although perhaps variable in different localities, should answer when more than one variety is grown and comparison possible.

Key to Summer-fruiting Varieties.

FRUITS RED.

Foliage Curled.

Young Canes Smooth.

Foliage dark, old canes brown, pedicels with few spines, fruits conical.

(*a*) Young canes green—Superlative.*

(*b*) Young canes with light purple bloom—Condor.
Hornet.
Pyne's Royal.

Young Canes Spiny.

Foliage dark, old canes brown, pedicels spiny.

(*a*) Fruits conical.

(1) Young canes with purple bloom—The Devon.

(2) Young canes green—Norwich Wonder.

(*b*) Fruits round—Brown's Excelsior.

Foliage dark, old canes reddish, pedicels spiny, fruit round—Profusion.

Foliage light coloured, old canes brown, pedicels with few spines, fruit round—Fastolf.

Foliage light coloured, old canes reddish brown, pedicels smooth, fruit round—Penwill's Champion.
Old Red Antwerp.

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* Sometimes with a few small spines on canes.

FOLIAGE FLAT.

Young Canes Smooth.

Foliage pale, old canes reddish, pedicels with few spines, fruit round—
ALLEN'S CHAMPION.

Foliage pale, old canes brown, fruit round.

(1) Pedicels smooth, No. 40 (Laxton's).

(2) Pedicels with few spines—HILLSIDE BOUNTIFUL; fruit conical, LAXTON'S PROLIFIC.

Foliage dark, old canes reddish, pedicels smooth, fruits round—
BATH'S PERFECTION.
MARLBORO'.
PRIOR'S PROLIFIC.

Young Canes Spiny.

Foliage dark, pedicels spiny, fruit round.

(1) Old canes reddish—BAUMFORTH'S SEEDLING.

(2) Old canes brown—GOLIATH.

Foliage light coloured, old canes brown.

(*a*) Pedicels spiny.

(1) Fruit round—PARK LANE.
SEMPER FIDELIS.

(2) Fruit conical—LLOYD GEORGE (wood very light brown).

(*b*) Pedicels with few spines.

(1) Fruit round—CARTER'S PROLIFIC.
LAXTON'S AO_2.

(2) Fruit conical—THIMBLE or WICKHAM RASPBERRY.

Foliage pale, old canes reddish, pedicels smooth, fruit round—
BLACK ANTWERP?

FRUITS YELLOW.

FOLIAGE CURLED.

Pedicels spiny, foliage dark, fruit conical—AMBER QUEEN.
TRINDER'S GOLDEN HORNET.

Pedicels with few spines, foliage dark, fruits round—QUEEN OF ENGLAND.
THE GUINEA.

FOLIAGE FLAT.

Fruit round.

Pedicels spiny, foliage light coloured—YELLOW ANTWERP.

Pedicels with few spines, foliage dark—GOLDEN DROP.

†DESCRIPTIONS AND NOTES.

RED FRUITED VARIETIES.

‖ 19, 20, 20A. SUPERLATIVE (*Bunyard, Paul, Cousens*).—A dwarf-growing variety, seldom more than 3 feet high, producing very few young growths. A good cropper. Fruit borne in good clusters, deep red, conical and firm, flavour good. Raised by Mr. Merryfield.

7. CONDOR (*Cousens*).—Rather a weak grower, the canes being about 3 feet high, and making few canes. Fruit of medium size borne in good clusters, bluntly conical, and of good flavour. For the small canes produced, crops have been good. Raised by Mr. Geo. Pyne.

9, 10. HORNET (*Paul, Cousens*), **C.**—A fairly vigorous grower, canes about 4 feet 6 inches high, and a heavy cropper. Fruit large, very deep red, bluntly conical, firm, and of good flavour. Numerous healthy and sturdy canes made each season.

16, 17. PYNE'S ROYAL (*Cousens, Allgrove*) **C.**—A fairly vigorous sturdy grower, about 4 feet high, and a very heavy cropper, the fruit being large, bluntly conical and dark-red, borne in large clusters, flavour good and berries very firm. Raised by Mr. G. Pyne. This variety makes few canes.

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† These descriptions should be read in connexion with the characters given in the Key.

‖ The numbers prefixed are those by which alonethe plants were known until judging was completed.

21, 22, 23. The Devon (*Cousens, Paul, Allgrove*).—A very strong, healthy grower, the canes being from 4 to 5 feet high. A heavy cropper, a little later than most varieties. The berries are very bright red, conical or sometimes nearly round, firm, and good flavour. Raised by Mr. G. Pyne.

11. Norwich Wonder (*Paul*).—Rather dwarf growing variety, canes about 3 feet high; a heavy cropper; berries deep red, firm, and conical, borne in fairly large clusters. Appears to make very few new canes each season.

2. Brown's Excelsior (*Brown*), **H.C.**—Moderately vigorous, canes about 3 feet high; a heavy cropper; the berries being dull red and almost round, fairly firm and of good flavour. New canes are sparsely produced. Raised by Mr. Geo. Brown of Hull.

6. Fastolf (*Paul*).—Dwarf and rather weak grower, canes about 2 or 3 feet high, but a good cropper; berries borne in good-sized clusters, bright red and almost round, of good flavour, fairly firm; young canes produced are rather weakly.

13, 14. Profusion (*Bunyard, Cousens*), **C.**—Fairly vigorous, canes about 3 or 4 feet high; a very heavy cropper; berries deep red, globular and firm, borne in large clusters, flavour good. Very few new canes are made each season. Raised by Mr. W. Brooks.

13A. Penwill's Champion (*Cousens.*)—A rather weak-growing variety, canes about 3 feet high, berries small, round, dull red, of fair flavour, fair cropper. This variety was sent in to be included in the Autumn Fruiting Trial; treated as such it failed to crop at all, but when treated as a Summer fruiter fairly good crops were obtained.

15A. Old Red Antwerp (*Cousens*).—Another weak-growing variety, almost identical with the above (No. 13A). Sent in as an Autumn fruiting variety and treated as such it failed to crop, but as a Summer fruiter, fairly good crops were obtained.

1. Allen's Champion (*Ballard*).—Moderately vigorous, canes about 3 feet 6 inches high; crops rather lightly; the berries are borne in medium-size clusters, are bright red, and bluntly conical, of good flavour, rather later than most varieties to ripen. Few new canes are produced each season.

40. ? (*Laxton*).—A rather weak-growing variety, canes about 3 feet 6 inches high, a good cropper, the berries being medium-sized, deep red and nearly round, flavour rather poor.

42. Hillside Bountiful (*Stokes*).—Moderately vigorous, canes about 3 feet 6 inches high, a very heavy cropper, medium-sized berries, a deep red, and nearly round, of fair flavour. Produces numerous strong new canes each season. Raised by sender.

36. Laxton's Prolific (*Laxton*), **C.**—A very vigorous grower, but inclined to be of straggling habit, a very good cropper, and a little late in ripening. The berries are of medium size, deep red, conical and firm, and are borne in large clusters. Produces a plentiful supply of young canes each season. Raised by Messrs. Laxton.

3, 5. Bath's Perfection (*Cousens, Paul*).—Also known in some localities as 'Hunter's Cane' or 'Red Cane.' A very vigorous grower and a heavy cropper, one of the earliest to ripen. The berries are of medium size, dull red, almost round, and of good flavour. Very large quantities of vigorous young canes are thrown up each year.

4. Marlboro' (*Bunyard*).—This variety is practically identical with Bath's Perfection, a good cropper and vigorous grower, showing the same earliness and prolific production of young canes as the above variety. Raised by A. J. Caywood.

42. Prior's Prolific (*Prior*).—Another variety so closely allied to Bath's Perfection as to be almost identical.

39. Baumforth's Seedling (——).—A vigorous grower, canes being about 4 feet 6 inches high. A good cropper, berries medium size, deep red, nearly round, but of poor flavour—produces a good supply of strong young canes. The old canes are a very deep reddish purple and are easily recognized.

8. Goliath (*Cousens*).—A very vigorous grower, but of rather straggling habit; canes about 4 to 5 feet high; good cropper; berries fairly large, deep red, globular, having very large drupels, rather soft, of good flavour. Very great quantities of young vigorous canes are produced each season. A variety said to have been imported from Holland.

12. Park Lane (*Cousens*), **A.M.**—A very vigorous grower, frequently making canes up to 7 feet high, very much branched and of straggling habit. The berries are medium to large, bright red and nearly round, of excellent flavour, being quite the best-flavoured variety in the trial; it is inclined to be

late. Great quantities of vigorous young canes are produced each season. Raised by Mr. Geo. Pyne.

18. Semper Fidelis (*Paul*).—A fairly vigorous grower of rather straggling habit, canes 3 to 4 feet high, moderately good cropper, inclined to be late; berries of medium size, bright red, almost round, good flavour. Plentiful supply of young canes produced each year.

41. Lloyd George (*Kettle*), **C.**—A vigorous and free grower, canes about 5 feet high, a very heavy cropper; berries are large, deep red, conical and firm, of good flavour. Produces a plentiful supply of strong young canes each season. This variety crops very well when treated as an Autumn fruiting variety; said to have been found growing in a hedgerow.

15. Carter's Prolific (*Paul*).—Of moderate vigour, canes about 3 feet high, the leaves very small and the canes covered with numerous small spines giving it the appearance of a yellow-fruited variety; it is a good cropper, the berries being medium sized, deep red and nearly round, firm and of good flavour. Young canes are sparsely produced, and are rather weakly.

24. Thimble or Wickham Raspberry (*Cousens*).—A vigorous grower, canes 5 feet 6 inches high, a heavy cropper, berries being of medium size, bright red, bluntly conical, of good flavour, rather soft. Produces a plentiful supply of vigorous young canes each season. In Hampshire this variety has a great local reputation.

38. Black Antwerp ? (——).—Moderately vigorous, canes 3 to 4 feet high. A good cropper, berries being medium sized, very deep crimson, nearly round, of fair flavour; the leaflets are noticeably narrow and down-curved. Produces numerous, fairly vigorous young canes each season. It is doubtful if this is the same as the original Black Antwerp.

Yellow Fruited Varieties.

43. Amber Queen (*Harraway*).—Fairly vigorous, sturdy canes about 4 feet high, numerous strong canes produced each year; a fairly good cropper; berries deep yellow, firm, conical, and of good flavour.

29. Trinder's Golden Hornet (*Trinder*), **A.M.**—A vigorous grower, canes about 5 feet high, crops very heavily; the berries are large, deep yellow, ovate or bluntly conical, and of good flavour. Great quantities of young canes are produced each season. One of the best yellow-fruited varieties. Raised by G. Trinder.

30, 31. Queen of England (*Cousens*, *Allgrove*).—A rather weak grower, canes barely 3 feet high, a fair cropper; berries of medium size, pale yellow and nearly round, of good flavour. Raised by Messrs. J. Veitch.

32. The Guinea (*Cousens*).—Sturdy, dwarf, canes about 2 feet 6 inches high; a good cropper; berries pale yellow, nearly round. Few young canes produced.

25, 26. Yellow Antwerp (*Paul*, *Cousens*).—Sturdy and moderately vigorous grower, canes about 3 feet high; a heavy cropper, berries being of medium size borne in large clusters, a pale yellow and nearly round, fair flavour. Young canes are produced each season very freely.

27, 28. Golden Drop (*Bunyard*, *Cousens*).—A fairly vigorous grower, with often much-branched canes which are about 3 feet high; good cropper; berries of medium size, very pale yellow and nearly round, of good flavour. Young canes produced very freely each year.

II. Autumn-fruiting Varieties.

Autumn-fruiting varieties appear to be almost unknown in many gardens, and yet their cultivation is of the easiest, and there is no more grateful fruit in October (and often November) than these.

The cultivation is similar to that of the Summer-fruiting varieties, except that all the canes are cut down in early February, the fruits being borne on canes of the current year.

Fourteen stocks representing the varieties of this type were received for trial during the winter of 1916–17, the canes being heeled in pending the planting in permanent quarters in February 1917.

Their subsequent cultivation and management has been that usually followed for Autumn-Fruiting Raspberries. They were inspected by the Committee on October 2, 1919, and the following awards were made :—

QUEEN ALEXANDRA, **A.M.**

PERPETUAL SUPERLATIVE, **A.M.**

SOUVENIR DE DÉSIRÉE BRUNEAU, **A.M.**

SURPRISE D'AUTOMNE, **A.M.** Previous award, **A.M.** 1911.

LLOYD GEORGE, **A.M.**

DANN'S MONARCH or HAILSHAM BERRY, **H.C.**

NOVEMBER ABUNDANCE, **H.C.** Previous award, **A.M.** 1902.

WISLEY AUTUMN FRUITING, **C.**

The grouping of these varieties is on the same lines as that described for summer fruiting ones, as far as possible.

The young canes of all these varieties are spiny, but the spines of different varieties often vary in colour—the pedicels of all are also spiny, otherwise the divisions and subdivisions are much the same as with the summer-fruiting varieties.

KEY TO AUTUMN-FRUITING VARIETIES.

FRUITS RED.

FOLIAGE ALWAYS FLAT.

Foliage light coloured, spines on young canes reddish, old canes light brown, fruit round—QUEEN ALEXANDRA.
Foliage dark, spines on young canes purplish.
Old canes light brown or greyish.
Fruits conical—OCTOBER RED.
LLOYD GEORGE.
Fruits round—PERPETUAL SUPERLATIVE.
Old canes, dark brown.
Fruit conical—DANN'S MONARCH.
SOUVENIR DE DÈSIRÉE BRUNEAU.
AUTUMN FRUITING, WISLEY.
Fruit round—NOVEMBER ABUNDANCE.

FRUITS YELLOW.

FOLIAGE ALWAYS CURLED.

Leaves pale, spines on young canes greenish, fruit round.
Old canes light brown—SURPRISE D'AUTOMNE.
Old canes reddish brown—OCTOBER YELLOW.

DESCRIPTIONS AND NOTES.

RED-FRUITED VARIETIES.

2. QUEEN ALEXANDRA (*Cousens*), **A.M.**—A fairly vigorous grower, making very sturdy canes about 3 feet high, very heavy cropper, fruit borne in large clusters, berries medium size, round, firm, bright carmine, of fair flavour.

6, 6A. OCTOBER RED (*Paul, Cousens*).—Vigorous grower of rather straggling habit, canes from 3 to 4 feet high; a good cropper; berries borne in large clusters, large, almost round, very rich red, firm and of fair flavour.

16. LLOYD GEORGE (*Kettle*), **A.M.**—A very vigorous grower, canes up to 5 feet high, a very heavy cropper; berries large, borne in large clusters, conical, deep red, firm and of good flavour; later than most.

7. PERPETUAL SUPERLATIVE (*Cousens*), **A.M.**—Vigorous, a making large quantities of sturdy canes, up to 5 feet high, good cropper, berries large, borne in good clusters, almost round, carmine, firm and of good flavour.

3. Dann's Monarch or Hailsham Berry (*Cousens*), **H.C.**—Strong grower, making sturdy canes about 4 feet high, heavy cropper, berries large, borne in large clusters, bluntly conical, firm, carmine, of good flavour.

8. Souvenir de Désirée Bruneau (*Cousens*), **A.M.**—A vigorous grower rather straggling; canes about 4 feet high; a heavy cropper; berries large, in large clusters, bluntly conical, firm, deep carmine, of good flavour.

14. Autumn Fruiting (*Wisley*), **C.**—Of medium vigour, canes about 4 feet high, good cropper; berries large; borne in large clusters, bluntly conical, firm, very deep red, of good flavour.

4, 5. November Abundance (*Cousens*, *Allgrove*), **H.C.**—Of medium vigour, canes about 3 feet 6 inches high, good cropper, berries of medium size, borne in good clusters, deep red, almost round, rather soft, flavour fair.

Penwill's Champion and Old Red Antwerp (see p. 46) were sent as Autumn varieties, but both proved unsuitable for that purpose.

Yellow-fruited Varieties.

9, 10. Surprise d'Automne (*Cousens*, *Bunyard*), **A.M.**—Of medium vigour, rather straggling, canes about 3 feet 6 inches high, a heavy cropper, berries in large clusters, nearly round, mustard yellow, firm, and of good flavour.

11, 12. October Yellow (*Cousens*, *Paul*).—Fairly vigorous, strong canes about 3 or 4 feet high, good cropper, berries medium size, borne in good clusters, round, deep yellow, firm, of fair flavour.

STRAWBERRIES TRIED AT WISLEY, 1920–21.

ONE HUNDRED stocks of Strawberries were sent in for trial, representing sixty-five varieties.

The majority of the plants were received in the autumn of 1919 or the winter of 1919–20, and a few not until the winter of 1920–21. The last, being only one year old when the trial was judged, will be kept under observation with a view to recommendations being made for awards next season. They are not included in this Report.

During the first year all flowers and runners were picked off as they appeared, with the result that in the spring of '21 the majority of plants were strong and well established and showing much promise for the coming season.

It was by no means a favourable year for strawberries, the prolonged drought making the season short, and the majority of berries undersized and of poor flavour. Many varieties, however, did remarkably well under the circumstances, and valuable comparisons were possible, especially with regard to the ability of varieties to withstand such a prolonged rainless period as was experienced. As might be expected, the very late and perpetual fruiting varieties suffered most heavily, and of the latter, many varieties were a total failure, and will therefore be kept under observation during a more favourable season. A sub-committee of the Fruit and Vegetable Committee examined the plants on June 13, 1921, and again a fortnight later, and made the following recommendations for awards:

Award of Merit:

*7, 8, 9. King George V.
18, 81. Tuckswood Early (syn. Early Evern).
25, 26, 27. International.
37, 38, 39. Laxtonian.
46, 47. Sir Joseph Paxton.
50. Sir Douglas Haig.

Highly Commended:

22. Bedford Champion (previous award, **A.M.** 1905).
24. Bountiful.
28, 29. The Queen.
32, 34. Sturton Cross.
35, 36. The Duke.
44. Rival (previous award, **A.M.** 1913).

* See footnote, p. 45.

57, 58, 59. Laxton's Latest (previous award, **A.M.** 1904).
61, 62. Progress (previous award, **A.M.** 1913).
78. Louis Gautier.

Commended:

1, 2, 3. Royal Sovereign (previous award, **F.C.C.** 1892; **A.M.** 1909 (forcing).

The following varieties included in the trial, having previously received awards, were on this occasion passed over by the judges as not of equal value to the above:

Countess (**F.C.C.** 1896)
The Laxton (**F.C.C.** 1901)
Waterloo (**F.C.C.** 1885)
Connoisseur (**F.C.C.** 1913)
British Queen (**F.C.C.** 1913)
Fillbasket (**A.M.** 1907)
Givons Late Prolific (**A.M.** 1901; **F.C.** 1902)
Kentish Favourite (syn. Leader) (**A.M.** 1907; **F.C.** 1895)
St. Antoine de Padoue (**A.M.** 1900)
St. Joseph (**A.M.** 1898)
Alake (**A.M.** 1904)
Merveille de France (**A.M.** 1912)
Cropper (**A.M.** 1913)

It was intended to attempt a classification of the varieties represented in the trial, with a view to making their identification an easier matter than it is at present, but owing to the abnormal conditions which prevailed throughout the season, and after a close scrutiny of the observations made, it was apparent that such a classification attempted now would not be altogether reliable in a normal season. It was obvious that many important varietal characters were not exhibited in a manner to be expected in an average season, and many other less important features were unduly emphasized. For these reasons a classification must be withheld until a more favourable opportunity occurs.

A few notes, however, on the way in which varieties might be expected to behave in a similar season to that of '21 may be of interest, and are shown in the table given below.

The main columns show the manner in which the varieties withstood the drought, whether *well, moderately well,* or *badly,* as was judged by the general behaviour and constitution of the plant. The time at which the first few fruits are ripe is then noted, and for the purpose *Royal Sovereign, Sir Joseph Paxton,* and *Countess* are regarded as standards for their respective periods—early, mid-season, and late. The length of the period over which ripe fruit was available for each variety is then given, and shown by the signs placed after each variety. *Royal Sovereign* was taken as the standard to demonstrate this point, having a 'season' of *twenty-three days,* and all other varieties are noted as having a longer, shorter, or equal season to this well-known variety. The signs are read as follows:

= means same as Royal Sovereign (23 days).
\+ ,, up to 26 days.
\+ + ,, over 26 days.
— ,, over 18 days but under 23 days.
— — ,, under 18 days.

VARIETIES WITHSTANDING DROUGHT.

Well.	*Moderately Well.*	*Badly.*
Fruits ripe before Royal Sovereign.		
7 days before.		
Tuckswood Early. +		
5 days before.		
Sir Douglas Haig. =		
1 day before.		
Bedford Champion. +	Hatfield Favourite. +	Connoisseur. —
The Duke. —		President. =
Bountiful. +		
Mme. Lafebre. —		
Ripe same time as Royal Sovereign.		
Royal Sovereign. =	Victory. —	Leader. } —
King George V. =		Kentish Favourite. }
The Queen. +		*Alake. + +
Pineapple. +		
St. Dunstan's. —		
Ripe 3–4 days after Royal Sovereign.		
International. —	The Laxton. —	
Rival. + +	Scarlet Queen. —	
Jucunda. +	Loreburn. — —	
	Unique. +	
Ripe same time as Sir Joseph Paxton (5 days after Royal Sovereign).		
Sir J. Paxton. + +	Admiral. —	Glendoick Hybrid. — —
Mme. Kooi. +	Lord Roberts. —	Fillbasket. — —
Ripe within 3 days of Sir Joseph Paxton.		
Sturton Cross. +	20th Century. — —	
	Alice Howard. — —	
	Vicomtesse Héricart de Thury. — —	
	Earl. — —	
	Reliance. — —	
Ripe same time as Countess (4 days after Sir Joseph Paxton).		
		Countess. —
		British Queen. —
Ripe within 3 days of Countess.		
Laxtonian. —	Hibberd's King George. — —	
Progress. — —	Givons Late Prolific. —	
Louis Gautier. =		
Ripe 5–6 days after Countess.		
Amazone. — —	Utility. — —	
Laxton's Latest. —		
Ripe 8 days after Countess.		
		Waterloo. — —

* Very few fruits; odd ones here and there.

All the autumn and perpetual fruiting varieties suffered very badly, ripening only a few fruits here and there from early blossoms.

DESCRIPTIONS AND NOTES.

18, 81. TUCKSWOOD EARLY, syn. EARLY EVERN (J. Scarlett, Cousens), **A.M.**— Strong, compact grower, making medium-sized plants; foliage small, pale; heavy cropper; trusses many, small, semi-erect; berries medium size, firm, conical, elongated, bright scarlet; flesh white, sweet. Award made for earliness. Raised by Mr. Holmes, Tuckswood, Norwich.

50. Sir Douglas Haig (Laxton), **A.M.**—Moderately strong, low spreading; foliage light, leaflets large and often upfolding; good cropper; trusses large, strong, many-fruited; berries on ground, medium size, spherical or bluntly conical, rich deep scarlet; flesh pale, of excellent and distinct flavour. Raised and introduced by Laxton Bros.

22. Bedford Champion (Cousens), **H.C.**—Very strong, making large thick-set, rather spreading plants; foliage very deep green, leaflets large and shining; heavy cropper; trusses large, strong, well fruited, semi-erect; berries medium size, globular, sometimes elongated, bright crimson; flesh pale, flavour good, sweet. Raised and introduced by Laxton Bros.

35, 36. The Duke (Cousens, Laxton), **H.C.**—Very strong, making large, tall, vigorous plants; foliage dark, leaflets obovate, held flat; very heavy cropper; trusses large, well fruited, semi-erect; berries large, bluntly conical or wedge-shaped, bright scarlet; flesh pale, flavour fair. Raised and introduced by Laxton Bros.

24. Bountiful (Laxton), **H.C.**—Very strong, thickset, spreading, making large plants; foliage dark, leaflets large, obovate, shining; good cropper; trusses large and well fruited, semi-erect; berries medium to large, globular, sometimes elongated, glossy, deep scarlet; flesh pale, good flavour. Raised and introduced by Laxton Bros.

88. Madame Lafebre (Cousens).—Very strong, thickset, spreading, making large plants; foliage pale, leaflets large, often upfolding; very heavy cropper; trusses large, many fruited, semi-erect; berries medium size, bluntly conical, deep crimson; flesh dark, very poor flavour. Introduced by R. Hendriksen, Holland.

4. Hatfield Favourite (H. Prime).—Strong, thickset, spreading, making medium-size plants; foliage bright green, leaflets medium size, often slightly upfolding; good cropper; trusses large; berries on ground, large, conical, often globular, deep crimson; flesh pale, good flavour, rather sharp. Raised by Mr. H. Prime.

31. Connoisseur (Pearson).—Moderately strong, making medium size open plants; foliage pale, leaflets large, narrow, upfolding; good cropper; trusses large, well fruited; berries medium to large, conical, often elongated, crimson; flesh salmon, of good flavour. Raised and introduced by Laxton Bros.

33, 34. President (Laxton, Pearson).—Strong, thickset, making large plants; foliage pale, leaflets narrow, upfolding; fair cropper; trusses large, well fruited, semi-erect; berries medium size, spherical or wedge-shaped, deep crimson; flesh pale, sweet. Raised by Mr. Green, of Highcross.

1, 2, 3. Royal Sovereign (Cousen, Laxton, Pearson), **C.**—Strong, thickset, spreading, making large plants; foliage rather dark; very heavy cropper; trusses large, many-fruited; berries large, bluntly conical, bright scarlet; flesh pale, good flavour. Raised and introduced by Laxton Bros.

7, 8, 9. King George V. (Laxton, Pearson, Cousens), **A.M.**—strong, thickset, spreading, making very large sturdy plants; foliage very bright green, leaflets very large, ovate; heavy cropper; trusses large, many-fruited; berries, many on ground, large, bluntly conical, bright scarlet; flesh pale, good flavour. Raised and introduced by Laxton Bros.

28, 29. The Queen (Laxton, Pearson), **H.C.**—Very strong, thickset, making large plants; foliage rather dark, leaflets large, often upfolding; heavy cropper; trusses large, well fruited, semi-erect; berries medium size, conical, pale scarlet; flesh pink, soft, of good flavour. Raised and introduced by Laxton Bros.

49. Pineapple (Pearson).—Strong, fairly compact, making medium-size open plants; foliage bluish green, leaflets large, often slightly upfolding; good cropper; trusses medium size, well fruited; berries on ground, medium size, conical, crimson; flesh pale, flavour good, sweet. Raised and introduced by Laxton Bros.

67. St. Dunstan's (H. Prime).—Very strong, thickset, making very large plants; foliage deep green, leaflets very large; fair cropper; trusses large, well fruited; berries medium size, bluntly conical, bright scarlet; flesh dark, firm, sweet. Raised by Mr. H. Prime.

51. Victory (Laxton).—Strong, thickset, making medium-sized plants; foliage dark, leaflets medium size, coarsely serrate; fair cropper; trusses medium, well fruited; berries on ground, large, bluntly conical, scarlet; flesh pale, sweet. Raised and introduced by Laxton Bros.

19, 20. Leader (Cousens, Laxton).—Moderately strong, flat, making rather small plants: foliage pale, leaflets medium size, often curled; only fair crop; trusses medium size, well fruited; berries on ground, large, cockscomb or wedge-shaped, deep crimson; flesh pale, sweet. Raised and introduced by Laxton Bros.

21. Kentish Favourite (Pearson).—Synonymous with 'Leader.'

82. The Alake (Allgrove).—Fairly strong, spreading, making medium-size plants; foliage dark, leaflets large and often upfolding; fair crop; trusses medium size, few fruited; berries on ground, very large, cockscomb or wedge-shaped, ribbed, deep scarlet; flesh dark, of good flavour. Raised and introduced by James Veitch.

25, 26, 27. International (Cousens, Laxton, Pearson), **A.M.**—Strong grower, thickset, making large plants; foliage rather dark, leaflets large; good cropper; trusses large, well fruited; berries large, bluntly conical or wedge-shaped, deep scarlet; flesh pale, firm, of good flavour. Raised and introduced by Laxton Bros.

44. Rival (Laxton), **H.C.**—Strong, very compact, making large plants; foliage medium size, not very dark; good cropper; trusses large, well fruited, erect; berries well off ground, medium size, conical, sometimes wedge-shaped, deep scarlet; flesh salmon-pink, of good flavour. Raised and introduced by Laxton Bros.

86. Jucunda (Cousens).—Very strong, compact, making large plants; foliage very bright green, leaflets medium size, shining, held flat; good cropper; trusses large, well fruited, semi-erect; berries large to medium, bluntly conical, bright scarlet; flesh pale, sweet. Of Continental origin?

10, 11. The Laxton (Cousens, Laxton).—Fairly strong, spreading, making medium-size plants; foliage pale, leaflets medium, held flat; fair cropper; trusses large, many-fruited; berries medium size, conical, elongated, dark crimson; flesh pale, firm, good flavour, Raised and introduced by Laxton Bros.

17. Scarlet Queen (Pearson).—Very strong, thickset, making medium-size plants; foliage rich green, leaflets large, flat; good cropper; trusses large, well fruited; berries on ground, bluntly conical, deep scarlet; flesh pale, sweet. Raised and introduced by Laxton Bros.

33a. The Loreburn (Learmont, Hunter and King).—Very strong, very thickset, making very large plants; foliage rather dark, leaflets very large, narrow, often upfolding; very light cropper; trusses large, very long, few-fruited, erect; berries well off ground, medium to small, globular, scarlet; flesh white. Raised by Mr. J. H. Fraser, introduced by Learmont, Hunter and King, Dumfries.

63. Unique (Pearson).—Moderately strong, making medium size plants; foliage rather dark; good cropper; trusses prolific, large, well fruited; berries medium size, conical, rich crimson; flesh salmon-pink, fair flavour. Raised and introduced by Laxton Bros.

46, 47. Sir Joseph Paxton (Cousens, Laxton), **A.M.**—Very strong, thickset, making large plants; foliage dark; very heavy cropper; trusses large, well fruited; berries on ground, large, bluntly conical, deep scarlet; flesh salmon pink, of good flavour.

87. Madame Kooi (Cousens).—Very strong, spreading, making large plants; foliage dark, rugose, leaflets large; good cropper; trusses large, well fruited, semi-erect; berries very large, irregularly shaped, cockscomb or globular, pale colour; flesh pale, coarse, sweet. Raised by G. Kooi, introduced by R. Hendriksen.

42, 43. Admiral (Cousens, Laxton).—Moderately strong, thickset, making medium-size plants; foliage dark, shining, leaflets large, flat; heavy cropper; trusses large, well fruited, semi-erect; berries large, bluntly conical or wedge shaped, deep scarlet; flesh pale, sweet. Raised and introduced by Laxton Bros.

53. Lord Roberts (Wisley).—Moderately strong, flat, making small plants; foliage rather dark; fair cropper; trusses medium size, well fruited; berries medium size, bluntly conical, deep crimson; flesh pale, of poor flavour.

32, 84. Sturton Cross (Cousens, F. B. White), **H.C.**—Very strong, compact, making large tall plants; foliage bluish green; very heavy cropper; trusses large, well fruited, erect; berries well off ground, medium size, conical, scarlet; flesh pale, of good flavour. Raised and introduced by Mr. F. B. White, Old Netley, Hants.

5. Twentieth Century (Stokes).—Strong, compact, making medium to small plants; foliage dark; good cropper; trusses numerous but small, well fruited, semi-erect; berries large, wedge-shaped, scarlet; flesh dark, of fair flavour. Raised by Mr. W. D. Vizard, and introduced by W. J. Stokes & Son.

6. Alice Howard (Mr. G. H. Mould).—Strong, compact, making sturdy tall plants; foliage dark; good cropper; trusses large, many-fruited, semi-erect; berries medium size, bluntly conical or wedge-shaped, rich scarlet; flesh pale, sweet. Raised by Mr. G. H. Mould.

12, 13. Vicomtesse Héricart de Thury (Laxton, Pearson).—Moderately strong, spreading, making medium to small plants; foliage bright green, leaflets large, flat; light crop; trusses small, many-fruited; berries medium size, bluntly conical, deep crimson; flesh pink, firm, of good flavour.

14, 15, 16. The Earl (Cousens, Laxton, Pearson).—Strong, compact, making large plants, upright; foliage rather pale; good cropper; trusses medium size, well fruited, semi-erect; berries large, bluntly conical or wedge-shaped, scarlet; flesh pink, firm, of fair flavour. Raised and introduced by Laxton Bros.

40, 41. Reliance (Laxton, Pearson).—Very strong, spreading, making large plants; foliage bright green, leaflets very large, often convex; good cropper; trusses large, many-fruited; berries on ground, large, conical or wedge-shaped, rich scarlet; flesh pale, sweet. Raised and introduced by Laxton Bros.

52. Glendoick Hybrid (Mr. J. Lindsay).—Moderately strong, compact, making large plants; foliage dark, shining; fair cropper; trusses medium size, prolific, many-fruited, erect; berries medium size, bluntly conical, crimson; flesh pale, sweet. Introduced by Mr. J. Lindsay.

48. Fillbasket (Pearson).—Very strong, thickset, making large plants; foliage pale; good cropper; trusses large, well fruited; berries on ground, medium size, conical, rich crimson; flesh pink, firm, of good flavour. Raised and introduced by Laxton Bros.

83. Countess (Allgrove).—Very strong, compact, making medium-size plants; foliage pale, leaflet medium size, flat; good cropper; trusses moderately large, well fruited, semi-erect; berries large, wedge-shaped, deep crimson; flesh reddish, firm, sweet. Raised by Dr. Roden.

30. British Queen (Pearson).—Strong, compact, making large plants; foliage dark, leaflet medium size, narrow, often upfolding; fair cropper; trusses large, well fruited, erect; berries medium size, conical or wedge-shaped; flesh pale, firm, of good flavour.

37, 38, 39. Laxtonian (Cousens, Laxton, Pearson), **A.M.**—Very strong, thickset, making medium to large plants; foliage rather dark, leaflets large, shining; heavy cropper; trusses medium size, prolific, well fruited, semi-erect; berries very large, conical, sometimes wedge-shaped, rich crimson; flesh pale, firm, of good flavour. Raised and introduced by Laxton Bros.

61, 62. Progress (Cousens, Laxton), **H.C.**—Very strong, thickset, making large plants; foliage deep green, leaflets very large, often upfolding; good cropper; trusses large, well fruited; berries on ground, large, conical, elongated, deep scarlet; flesh pale, of good flavour. Raised and introduced by Laxton Bros.

78. Louis Gautier (Pearson), **H.C.**—Strong, compact, making large plants; foliage dark; very heavy cropper; trusses prolific, large and well fruited, semi-erect; berries large, round, pale pink, white on under side; flesh pale, of good flavour. Raised ? by M. Latellier.

65, 66. Hibberd's King George (Cousens, Pearson).—Moderately strong, spreading, making medium-size plants; foliage bright green; good cropper; trusses medium size, well fruited; berries medium size, conical, often wedge-shaped, bright scarlet; flesh pink, firm, of good flavour. Raised and introduced by Mr. Hibberd.

54, 55, 56. Givons Late Prolific (Laxton, Pearson, Cousens).—Strong, compact, medium-size plants; fair crop; trusses medium size, well fruited, semi-erect; berries bluntly conical or wedge-shaped, dark crimson; flesh dark, sweet. Raised by Mr. William Peters.

85. Amazone (Cousens).—Very strong, compact, making large plants, foliage bright green, shining; good cropper; trusses large, well fruited, erect; berries medium size, conical, scarlet; flesh pink, of good flavour. Of Continental origin ?

57, 58, 59. Laxton's Latest (Laxton, Cousens, Pearson), **H.C.**—Strong, thickset, making medium-size plants; foliage rather dark, leaflets often upfolding; fairly good cropper; trusses large, many-fruited, semi-erect; berries very large, conical or wedge-shaped, deep crimson; flesh pale, firm, of good flavour. Raised and introduced by Laxton Bros.

64. Utility (Laxton).—Moderately strong, spreading, making medium to large plants; foliage dull green; good cropper; trusses very large, many-fruited, semi-erect; berries medium size, conical or wedge-shaped, deep crimson; flesh pink, of good flavour. Raised and introduced by Laxton Bros.

60. Waterloo (Laxton).—Moderately strong, spreading, making medium-size plants; foliage rather dark; fair cropper; trusses fair size, well fruited, semi-erect; berries medium size, wedge-shaped, crimson; flesh pink, of very good flavour.

DAHLIAS AT WISLEY, 1921.

For several years past a joint Committee of the R.H.S. Floral Committee and the National Dahlia Society has met during the Dahlia season to recommend varieties for Awards, and considerable numbers of awards have been made on its recommendation. The Council has felt, however, that the appearance of the Dahlia flowers at an exhibition was not alone a reliable guide to their value for garden decoration. In 1920 it therefore arranged, with the acquiescence of the National Dahlia Society, that the function of the Joint Committee at the London shows should be to select from the varieties placed before it those which were thought to be best, and to grow these in the following year at Wisley, and there to judge them for their merit as garden plants.

When seen growing not only can the colour and form be taken into account, but due weight can be given to the habit of the plant, the poise of the flower, the period over which flowers are produced, and the number of flowers the variety will produce at a particular time, as well as to other varietal characters upon which the value of the plant in the garden depends. Too much attention seems to have been concentrated upon form, size, and colour, and too little upon the production of plants which show off their flowers to the best advantage, and produce good flowers without special measures being adopted. It is probably in consequence of this that the Dahlia is less grown than formerly. Yet, since there are good, in fact very good, varieties in existence, which may easily be had in flower by the second week in August, and which will give a constant and lavish succession of flowers from then until frost cuts them down, with no more attention than the tying of the growths and the removal of dead flowers to prevent seeding, to omit them from the garden is to neglect an opportunity of keeping the garden gay over what is often a dull time in the herbaceous border.

Many object to the stiff appearance of the older types on the one hand, and to the heavy, very large, and floppy types on the other, but there are intermediates of refined appearance holding themselves well which cannot fail to please, and to this type the Committee's awards made during the present trial draw particular attention.

Nurserymen and others felt that confusion had arisen between some of the groups as given in catalogues, and the Council, therefore, arranged to grow a comprehensive series of the plants in order that the classification might be considered and put upon sound lines, and to this end they invited raisers to send a certain number of their best forms of all sections to grow with those selected by the Committee. When they were in flower a Conference was called at Wisley, under the Chairmanship of Mr. W. Cuthbertson, V.M.H., and the classification was fully discussed, the classes shown in the notes below being

decided upon. These Awards are given on account of the value of the plants in the garden:

A.M. = Award of Merit.
H.C. = Highly commended.
C. = Commended.

The joint Committee of the R.H.S. Floral Committee and the National Dahlia Society examined the trials on two occasions, and recommended awards as shown in black type at the head of each of the classes.

Of the 50 varieties selected by the Committee in the autumn of 1920, 28 were sent to be grown at Wisley, and in addition 208 varieties were sent by raisers, making 240 stocks (4 being duplicated) in all. These came from growers in America, France, and Holland, as well as from British raisers. The plants belonging to one variety from America and one from France all died, but the remaining 238 stocks were nearly all represented by three plants planted in a group. They were planted out of five-inch pots on June 2 in ground that had been deeply dug and moderately manured, staked with one stake to each plant, and tied as they required it. All flower-buds were picked off until July 20, when they were allowed to remain, and most varieties were well in flower by August 24, on the occasion of the Committee's first visit.

The great drought caused some flagging at times, but the plants were well watered on three occasions, and none suffered from the drought.

In the following list an asterisk (*) marks those which were selected at Vincent Square in 1920 for trial at Wisley in 1921.

Class I. Single Dahlias.

Single Dahlias have a single regular outer ring of flatly expanded rays which overlap more or less at their edges; the centre forms a golden disc.

For show purposes Single Dahlias should not exceed 3 inches in diameter, and the 8 (only) ray florets should be smooth, somewhat recurved at the tips, broad and overlapping so as to form a perfectly round flower. Those in the following list conforming to this type are designated 'Type A.' The remainder ('Type B') have the ray florets touching for only about three-quarters of their length, the tips being separated so that the flower forms an eight-pointed star.

Awards.

113. **Suse, A.M.** Aug. 24, 1921. Raised and sent by Messrs. Treseder, Cardiff.

115. **Bishop Crossley, H.C.** Sept. 7, 1921. Raised and sent by Messrs. Treseder.

Blush white.

† 102. Pathfinder (Dobbie ‖).—5½ feet. Flowers type A, 3 inches diameter, faint blush passing to yellow at base; stalks 9 inches, stiff; free flowering.

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† See footnote, p. 45.
‖ The sender is in every case, except where noted, also the raiser.

Yellow.

123. SELYSETTE (Krelage, 1910).—4½ feet. Flowers near type A, 3½ to 4½ inches, lemon yellow, rather drooping; stalks 5 to 7 inches; flowering moderately.

103. CRAIGMARLOCH (Dobbie).—4 feet. Flowers type A, 3½ to 4 inches, bright lemon-yellow, erect; stalk 9 inches; free flowering.

189. ETOILE DE FOCH (Rivoire, 1921).—4 feet. Flowers of type B, but having one edge of each ray curved in so as to show reverse; face picric yellow, reverse blotched and streaked crimson-magenta; 4½ inches diameter; erect on 12 inch stalk. Not quite at home here, and forming a transition to Single Cactus type.

Pink.

105. KITTY (Cheal, 1906).—4¼ feet. Flowers of type A, 2½ to 3 inches diameter; mauve pink with a quarter-inch ring of velvety crimson next disc; stalks 9 to 11 inches, stiff; fairly free flowering. A.M. 1906.

Mauve.

107. CLEMATIS (Treseder, 1918).—5 feet. Flowers of type B, 4 to 4½ inches diameter; mauve (light phlox-purple); stalks 7 to 9 inches, stiff; free flowering. A.M. 1918.

Pink on yellow ground.

121. AGLAVAINE (Krelage, 1910).—4½ feet. Flowers of type B, 3½ to 4 inches; buff yellow overlaid with pink; stalks 5 to 7 inches, rather weak; flowering with moderate freedom.

104. SUNRAY (Cheal).—4½ feet. Flowers of type A, 3 inches diameter; buff with a band of velvety crimson round disc; stalks 5 or 6 inches, erect; fairly free flowering.

Scarlet.

109. LEON (Cheal).—5½ feet. Flowers of type A, 2½ inches diameter; bright scarlet; stalks stiff, 7 or 8 inches; free flowering.

114. BISHOP HUGHES (Treseder).—4½ feet. Flowers of type B, 3½ inches diameter; scarlet; stalks stiff, 5 or 6 inches; free flowering.

115. BISHOP CROSSLEY (Treseder), **H.C.**—3½ feet. Flowers type B, 3½ to 4 inches, very slightly darker than last; erect on 6 to 8 inch stalks: very free.

113. SUSE (Treseder), **A.M.**—5½ feet. Flowers of type B, 4 inches, very bright; erect on 8 to 12 inch stalks; very free flowering; like the last, excellent for garden and cutting.

110. DICTATOR (Krelage, 1918).—5 feet. Flowers of type B, 5 to 5½ inches, rays not quite flat, rather darker than Nos. 113–115; erect on 12 inch stalks; of moderate freedom.

112. BRILLIANT (Cheal).—5½ feet. Flowers of type A, 3 inches, bright velvety crimson scarlet; erect on 6 or 7 inch stalks; free flowering.

Crimson.

111. HOPE (Dobbie).—5 feet. Flowers of type A; 3 to 3¼ inches, deep velvety crimson scarlet; erect on 4 or 5 inch stalks, raising flowers just above foliage; free flowering.

117. SAMBO (Dobbie).—5½ feet. Flowers of type A, 3 inches; deep crimson maroon; rather drooping on 6 inch stalks; free flowering.

116. VELOURS D'UTRECHT (Krelage, 1918).—6 feet. Flowers of type B, 4½ to 5 inches, of much deeper shade than No. 117; stalks 10 inches. A few of the disc florets sometimes form a thin irregular 'collar' with whitish streaks.

Magenta.

106. DIANA (Cheal).—3½ feet. Flowers of type A, 2½ to 2¾ inches; deep rosy magenta with a band of much deeper shade next disc; erect on 6 inch stalks, slightly above foliage; free flowering.

White, edged scarlet.

118. RED CROSS (Dobbie).—3¼ feet. Flowers of type A, 2½ to 3¼ inches; white with scarlet line at edges of rays only; erect on 6 to 8 inch stalks; free.

Parti-coloured.

119. WILLIE FIFE (Dobbie).—4½ feet. Flowers of type A, 3½ inches; typically lemon yellow, striped and spotted scarlet, but very variable; erect on 6 to 8 inch stalks; very free flowering.

120. Owen Thomas (Cheal).—4½ feet. Flowers of type A, 3½ to 3¾ inches; velvety crimson scarlet, tipped citron yellow; erect on 6 or 7 inch stalks; free.

122. Meligraine (Krelage, 1910).—4½ feet. Flowers of type B; 4½ inches; carmine crimson, tipped picric yellow; drooping on 12 inch stalks; not free

Class II. Mignon Single Dahlias.

Flowers similar in all respects to Class I., but the plants do not exceed 18 inches in height.

This class was not represented in the trials.

Class III. Collerette Dahlias.

Collerette Dahlias have an outer ring of flat rays as in Singles, and just within this, and surrounding the golden disc, a ring of florets (the 'collar') with deeply cut petals generally of a different colour from the outer, and only about half their length.

Awards.

137. **Cyril, A.M.,** Aug. 24, 1921. Raised and sent by Messrs. Treseder.

166. **Hussar, A.M.** Aug. 24, 1921. Raised and sent by Messrs. Dobbie, Edinburgh.

168. **Mountaineer, H.C.** Sept. 7, 1921. Raised and sent by Messrs. Dobbie.

129. **Mrs. O. M. Courage, H.C.** Sept. 7, 1921. Raised and sent by Messrs. Cheal, Crawley.

140. **Linnet, H.C.** Aug. 24, 1921. Raised and sent by Messrs. Dobbie.

138. **Verona, H.C.** Sept. 7, 1921. Raised and sent by Messrs. Burrell, Cambridge.

156. **Ladas, H.C.** Aug. 24, 1921. Raised and sent by Messrs. Turner, Slough.

161. **Padre, H.C.** Sept. 7, 1921. Raised and sent by Messrs. Burrell.

127. **Aria, C.** Sept. 7, 1921. Raised and sent by Messrs. Krelage, Haarlem.

131. **Peronne, C.** Aug. 24, 1921. Raised and sent by Messrs. Treseder.

142. **Lolah, C.** Aug. 24, 1921. Raised and sent by Messrs. Burrell.

White.

*168. Mountaineer (Dobbie), **H.C.**—5 feet. Flowers 4 inches diameter; rays slightly channelled, white; collar ½ to ¾ length of ray, white; erect on 6 to 7 inch stalk; free flowering. Flowers rather irregular.

Buff.

*165. Columba (Dobbie, 1920).—3½ feet. Flowers 4 inches diameter; rays flattish, pale terra-cotta, collar irregular in length, lemon chrome; erect on 9 or 10 inch stalks; free.

Pink to carmine with paler edges.

127. Aria (Krelage), **C.**—4½ feet. Flowers 4 inches, rather basin-shaped; rays white, suffused crimson-carmine, paler towards edges and tips; collar ½ length of ray, irregular, cream to white; erect on 7 or 8 inch stalks; very free.

124. Colleen (Cheal).—4 feet. Flowers 4 inches diameter; rays flat, white suffused deep crimson-carmine paling towards edges and tips; collar irregular, creamy white; erect on 12 to 14 inch stalks; free.

125. Matilda (Burrell, 1920).—5 feet. Flowers 5 inches diameter; rays nearly flat, pale yellow suffused with crimson-carmine paling towards edges and tips; collar ⅔ of ray, sulphur; rather drooping, stalks 8 or 9 inches; free.

136. Preludium (Krelage).—4½ feet. Flowers 4 to 4½ inches diameter; rays flat, lemon-yellow suffused carmine-crimson except at tips; collar ½ length of ray, pale lemon-yellow; rather drooping, on 7 inch stalks; moderately free.

126. Circe (Burrell, 1919).—4¼ feet. Flowers 4 inches diameter; rays flattish, white heavily suffused velvety rosy magenta; collar ½ length of ray,

irregular, white, streaked rosy magenta; erect on 7 inch stalks; very free. Colour near that of 'Mrs. O. M. Courage.'

151. EVELYN (Cheal), 1918.—4 feet. Flowers 4½ inches diameter; rays not quite flat, pale orange heavily suffused crimson carmine, paler at edges and tips; collar ¾ length of ray, rather broad, yellow with streaks of carmine; erect on 7 or 8 inch stalks; free. A. M. Jarrett, 1918.

152. ECLIPSE (Burrell, 1919).—3½ feet. Flowers 3½ inches diameter; rays flattish, lemon-yellow suffused deep crimson, fading at tip to lemon-yellow; collar ½ length of ray, regular, pale lemon; erect on 9 inch stalks; free.

Mauve.

158. ANDANTE (Krelage, 1920).—5½ feet. Flowers 4 inches; rays flattish, mauve; collar irregular in length, mauve; erect on 6 inch stalk; very free.

Crimson Carmine.

128. ARRAN (Dobbie).—5½ feet. Flowers 5 inches; rays flat, rosy magenta; collar creamy white; erect on 12 inch stalks; only moderately free.

129. MRS. O. M. COURAGE (Cheal), **H.C.**—4½ feet. Flowers 5 inches; rays flattish, velvety carmine, paler at edges; collar ¾ length of ray, irregular, white with occasionally streaks of carmine; rather drooping, on 9 inch stalks; free.

140. LINNET (Dobbie), **H.C.**—5 feet. Flowers 5 inches diameter; rays flat, crimson-magenta; collar ½ length of ray, regular, white streaked rosy magenta; erect on 9 or 10-inch stalks; free.

139. TUSKAR (Dobbie).—3½ feet, not robust. Flowers 4 inches diameter; rays flattish, deep rosy crimson-maroon; collar ¾ length of ray, creamy with some crimson streaks; very free flowering. **A.M.** 1913.

157. PRESTO (Bath).—4½ feet. Flowers 4 to 4½ inches diameter; rays flat, crimson-magenta; collar ¾ to ⅞ length of ray, erect, white flushed rosy crimson; erect on 8 or 9 inch stalks; very free. Raised by Messrs. Krelage.

164. BARCAROLLE (Krelage, 1918).—4 feet. Flowers 4 inches diameter; rays flattish, crimson lake; collar ½ to ¾ length of ray, curled, crimson lake tipped white; erect on short stalks; free.

Scarlet.

130. LILIAN (Treseder).—4½ feet. Flowers 3½ inches diameter; rays flat, brick red; collar ½ length of ray, scarlet streaked buff; disc rather large; erect on 12 inch stalks; free.

134. USTANE (Cheal, 1921).—4½ feet. Flowers 5 inches diameter; rays flat, orange-scarlet; collar ½ to ¾ length of ray, irregular, lemon streaked scarlet; erect on 12 to 13 inch stalks; free.

*132. IVOR (Burrell, 1921).—6 feet. Flowers 3¾ inches diameter; rays flattish, orange-scarlet; collar ½ length of ray, regular, scarlet at base, upper half Marten's yellow; erect on 9-inch stalks; free.

138. VERONA (Burrell, 1920), **H.C.**—5 feet. Flowers 4½ inches diameter; rays flat, bright orange-scarlet; collar ½ to ¾ length of ray, orange-scarlet blotched and tipped white; erect on 12 or 13 inch stalks; very free.

133. SONATA (Bath).—3¼ feet. Flowers 3½ inches; rays flat, orange-scarlet; collar ½ to ¾ length of ray, irregular, pale lemon broadly streaked orange; erect on 6 inch stalks; free. Raised by Messrs. Krelage.

142. LOLAH (Burrell, 1921), **C.**—3 feet. Flowers 4½ inches; rays flattish, orange scarlet; collar ½ length of ray, pale lemon streaked orange, disc small; erect on 6 or 7 inch stalks; free.

137. CYRIL (Treseder), **A.M.**—4 feet. Flowers 5 inches; rays flat, cardinal, yellow tipped; collar ½ length of ray, regular, pale lemon with faint flush of cardinal; erect on 6 inch stalks; very free.

131. PERONNE (Treseder), **C.**—4 feet. Flowers 4½ inches; rays somewhat reflexed at margins, orange scarlet; collar ½ length of ray, irregular, pale lemon, streaked orange; stalks stiff, 8 inches; free.

163. J. W. TRAIL (Treseder).—4 feet. Flowers 4½ inches; rays as in 'Peronne'; collar irregular, often twisted, lemon with broad streaks of scarlet; on erect 9 inch stalks; free.

144. SCARLET QUEEN (Dobbie).—4 feet. Flowers 3 to 3½ inches; rays flat, deep scarlet; collar ½ to ¾ length of ray, irregular, deep scarlet with few streaks of lemon; stalks erect, 9 inches; flowering with moderate freedom.

*135. FUGA (Krelage, 1920).—5 feet. Flowers 4½ inches; rays flat, bright scarlet; collar ⅓ length of rays, regular, sulphur with faint flush of scarlet; rising little above foliage on 7 inch stalks, and only moderately free flowering.

108. J. C. Gould (Treseder).—4½ feet. Flowers 4 inches; rays incurved at margin, bright scarlet; collar streaked yellow and scarlet; rising slightly above foliage on 7 inch stalks; free.

150. Fire King (Turner).—4½ feet. Flowers 4 inches; rays flattish, bright cardinal; collar nearly equalling ray, irregular and curled, cardinal, yellow in upper half; on stiff 9 inch stalks; free.

*153. Barbara (Burrell).—3¼ feet. Flowers 3¾ inches; rays flattish, deep cardinal; collar ½ to ¾ ray, irregular, streaked deep cardinal and lemon; very free on erect 6 inch stalks.

*166. Hussar (Dobbie), **A.M.**—4½ feet. Flowers 4½ inches; rays flattish, crimson-scarlet; collar ½ to ¾ ray, crimson-scarlet tipped white; erect on 8 inch stalks; free.

149. Glencoe (Dobbie).—4½ feet. Flowers 4 inches; rays flat, deep cardinal; collar ¾ or over of ray, irregular, deep cardinal, sometimes showing paler reverse; disc small; erect on 9 inch stalks; free. Possibly wrongly named.

*156. Ladas (Turner), **H.C.**—5½ feet. Flowers 4½ inches; rays flattish, bright crimson-scarlet; collar ½ to ¾ ray, twisted, bright crimson with paler reverse; free on 9 inch erect stalks.

*148. Coronette (Burrell, 1921).—5¼ feet. Flowers 5 inches; rays curled at tip, crimson-scarlet; collar ½ ray, crimson, twisted to show paler reverse; erect on 8 to 9 inch stalks; free.

147. W. Dunn (Burrell, 1918).—4½ feet. Flowers 4¾ inches; rays flat, deep crimson-scarlet; collar ½ to ¾ ray, streaked deep crimson and pale lemon; erect on 7 or 8 inch stalks; free.

155. Rhapsody (Bath).—4½ feet. Flowers 4½ inches; rays curled at edges, deep crimson-scarlet; collar ½ ray, deep crimson-scarlet streaked below, yellow at tip; erect on 5 or 6 inch stalks; free. Raised by Messrs. Krelage.

145. Eddystone (Dobbie).—4½ feet. Flowers 4 inches; rays flat, deep crimson-scarlet; collar ½ to ¾ ray, irregular, deep crimson streaked sulphur; erect on very short stalks; free.

146. Cardinal (Brown).—5½ feet. Flowers 5 inches; rays flattish, deep crimson-scarlet; collar ¾ to ⅞ ray, irregular, striped deep crimson-scarlet and lemon; on 8 inch stalks, erect; free.

Crimson.

160. Eliza (Treseder).—3½ feet. Flower 5 to 5½ inches; rays flat, deep crimson-chocolate; collar ¾ ray, sulphur suffused deep crimson; erect on stout 12 to 14 inch stalks; very free.

141. Joan (Cheal).—4½ feet. Flowers 5 inches; rays flat, deep crimson, deepening towards tips; collar ¾ ray, deep crimson streaked sulphur; erect on 5 or 6 inch stalks; free.

143. Tarantelle (Bath).—3½ feet. Flower 4 inches; rays flattish, deep velvety crimson; collar ½ to ¾ ray, irregular, rosy maroon on pale straw; disc large; erect on rather short stalks. Raised by Messrs. Bath.

154. Trio (Krelage, 1921).—4 feet. Flower 5 to 5¼ inches; rays flat, deep crimson; collar ½ to ¾ ray, very irregular, deep crimson tipped white; disc large; erect on 7 or 8 inch stalks; free.

Maroon.

162. Admiral (Cheal).—4½ feet. Flowers 5 to 5¼ inches; rays flat, very dark crimson-maroon, velvety; collar ½ ray, white streaked maroon; erect, well above foliage; free.

*161. Padre (Burrell, 1921), **H.C.**—4½ feet. Flowers 4 inches; scarcely distinct from last in colour, but smaller; free.

*167. Lochnagar (Dobbie).—4¾ feet. Flowers 4¾ inches; rays flat, very dark crimson-maroon; collar ⅞ ray, rather broad, regular, dark maroon and white (not always present); erect on 6 to 8 inch stalks; free.

159. Symphony (Krelage, 1919).—5½ feet. Flowers 3½ to 4 inches; rays flattish, deep velvety crimson-maroon with a tinge of purple; collar ¾ ray, white faintly flushed reddish-purple; erect on 8 inch stalks; moderately free.

Class IV. Anemone-flowered Dahlias.

In Anemone-flowered Dahlias the outer ring of flattened rays surrounds a dense group of tubular flowers, longer than the ordinary disc florets of the single-flowered class and of a different colour.

This group is only now being developed, and it was not represented in the trials.

Class V. Pæony-flowered Dahlias.

The Pæony-flowered Dahlias have large flowers consisting of three or four rows of flattened expanded rays somewhat irregularly arranged, and surrounding a golden disc similar to that of the singles.

The earliest flowers to open are sometimes almost or quite double in some of the varieties mentioned below, and might then be classed as Decorative Dahlias (Class VIII.), but in all grouped together here the majority of the flowers produced conform to the type defined above.

Awards.

38. **King of the Autumn, A.M.** Aug. 24, 1921. Raised by Messrs. Krelage, sent by Messrs. Bath, Wisbech.
78. **Ladysmith, A.M.** Aug. 24, 1921. Raised and sent by Messrs. Dobbie.
68. **Iliad, H.C.** Aug. 24, 1921. Raised and sent by Messrs. Burrell.
70. **Enchantress, H.C.** Sept. 7, 1921. Raised and sent by Messrs. Burrell.
61. **Peggy, C.** Sept. 7, 1921. Raised and sent by Messrs. Burrell.
64. **Orange Sun, C.** Sept. 7, 1921. Raised and sent by Messrs. Krelage.
49. **Nelson's Xarifa, C.** Aug. 24, 1921. Raised by Mr. Wouters, sent by Messrs. Bath.

White.

50. Alma (Burrell).—5½ feet. Flowers 4½ inches, rather loose; stalks 7 to 10 inches, rather weak; free.
60. Aphrodite (Turner).—6¼ feet. Flowers 5¾ inches, compact, clearer white than 'Alma'; rather drooping on 10 inch stalks; free.
58. Fordhook White (Burpee, 1915).—5½ feet. Flowers 4 to 4½ inches; rays with incurved margins; erect on short stalks not well above foliage.
23. Vredesduif (Krelage, 1919).—4 feet. Flowers 4½ to 5 inches; ivory white; erect on 7 or 8 inch stalks, but not free and rather late to flower.

Yellow.

61. Peggy (Burrell, 1920), **C.**—6 feet. Flowers 6½ inches; bright yellow; on 10 to 12 inch stalks, well above foliage; rather drooping; very free. A good garden Dahlia. (Rays sometimes white tipped.)

Apricot.

228. Cleopatra (Scheepers).—7½ feet. Flowers 6½ to 9 inches; citron-yellow, salmon on reverse; rays rather incurved at margin; drooping on 12 inch stalks.

Pale buff.

67. Beatrice (Turner).—5½ feet. Flowers 6 to 7 inches; lemon flushed rose towards outer ends of the flat rays; rather drooping on 10 to 12 inch stalks.
39. Insulinde (Bath).—5½ feet. Flowers 5½ to 6 inches; bright apricot, fading with age; outer rays flat, inner incurved; erect on 9 to 10 inch stalks.
62. Old Gold (Burrell).—5¼ feet. Flowers 6½ inches; yellow flushed light salmon; drooping on 12 to 14 inch stalks; rather late to flower and not much clear of foliage; free.
38. King of the Autumn (Bath), **A.M.**—6¼ feet. Flowers 5 to 5½ inches; apricot yellow faintly flushed terra-cotta; erect on 10 to 12 inch stalks; free.
65. Salome (Turner).—5½ feet. Flowers 5½ inches; orange buff flushed pale grenadine; erect on 6 to 8 inch stalks not much above foliage.

Buff.

75. Gladys (Cheal).—4¾ feet. Flowers 5½ inches; outer rays flat, inner channelled, salmon-pink over yellow; rather drooping, only just above foliage on 6 inch stalks.
85. Fordhook Beauty (Burpee, 1918).—Said to be bronzy red suffused salmon, but stock mixed.
68. Iliad (Burrell, 1920), **H.C.**—6 feet. Flowers 5½ to 6 inches; rays flat, yellow flushed salmon deepening towards tips; erect on 10 inch stalks; free.
80. Portia (Burrell, 1916).—5½ feet. Flowers 6½ to 7 inches; rays channelled, yellow heavily flushed mallow-purple; erect on 7 to 8 inch stalks; free.

Deep buff.

232. Choctaw (Scheepers).—6 feet. Flowers 6 to 6½ inches; rays flattish, salmon-orange; drooping on 6 inch stalks; moderately free.

*64. Orange Sun (Krelage, 1920), **C.**—5½ feet. Flowers 6 inches; ray somewhat curled, orange-salmon; on erect, stout 7 to 8 inch stalks; not free flowering.

Pink.

71. Tendresse (Burrell, 1919).—6 feet. Flowers 5 to 5½ inches; variable in form and colour, the typical form being pink tipped white.

70. Enchantress (Burrell, 1919), **H.C.**—4½ feet. Flowers 5 to 5½ inches; rays somewhat channelled, from a yellow base flushed rose deepening towards tip; rather drooping on 12 to 14 inch stalks; free.

73. Sorcerer (Burrell, 1920).—Characters of last, but flowers deeper in colour; stalks shorter and weak.

Magenta pink.

78. Ladysmith (Dobbie), **A.M.**—5½ feet. Flowers 6 inches; rays channelled, bright rosy magenta; erect on 8 inch stalks; free.

72. Joe (Treseder).—5 feet. Flowers 4 inches; rays in two rows channelled, Tyrian rose; on thick but rather weak 10 to 12 inch stalks; free.

Mauve.

77. Eunice (Burrell, 1918).—5 feet. Flowers 6 inches; rays flat, phlox-purple; just above foliage on 10 inch straight stalks; late to flower and not very free.

Deep pink on yellow.

69. Mafeking (Dobbie).—5 feet. Flowers 5½ inches; rays flattish, fawn flushed rose deepening to tip; rather drooping on 9 inch stalks; free.

63. Marion (Burrell, 1917).—6 feet. Flowers 5½ inches; rays flat, orange-salmon pinker towards base; erect on 12 to 15 inch stalks; free.

84. Mrs. A. Marns (Cheal).—4 feet. Flowers 5 inches; rays channelled, carmine-lake faintly flushed yellow; rather drooping and only just above foliage on 3 to 5 inch stalks; free.

74. Maggie (Cheal).—5½ feet. Flowers 5 inches; rays flat, salmon-orange; erect on 9 inch stalks, but not free.

86. Hon. Mrs. Phillips Roberts (Cheal).—4½ feet. Flowers 5 to 5½ inches; rays rather channelled, carmine on a yellow ground (bronzy rose); stalks 9 to 14 inches; rather weak; free flowering.

Orange.

82. Lorna (Cheal).—4½ feet. Flowers 6 inches; rays rather channelled, bright cardinal, but not so deep as 'Mark'; disc small; rather drooping on 7 or 8 inch stalks; free.

89. Fire Dragon (Dobbie).—5 feet. Flowers 6 to 6½ inches; rays flat, bright fiery red; erect on 9 inch stalks; free.

Scarlet.

90. Mark (Burrell, 1918).—6 feet. Flowers 5 to 6 inches; rays fairly flat, bright cardinal-red; rather drooping on 8 inch stalks; free.

234. Diana (Scheepers).—5 feet. Flowers 5½ to 6 inches; rays nearly flat, bright orange-scarlet; on 8 inch weak stalks; free.

*91. Scarlet King (Burrell, 1921).—5 feet. Flowers 5 inches; rays channelled, bright scarlet ('geranium-lake'); erect on 7 to 9 inch stalks; free but rather slow to start flowering.

49. Nelson's Xarifa (Bath), **C.**—4¾ feet. Flowers, 5 inches; rays flat, bright scarlet-red; on short stalks, but well above foliage and free. Raised in Holland. Closely resembling 'Scarlet King.'

*92. Triton (Burrell, 1921).—5½ feet. Flowers 5½ inches; rays flat, slightly paler than 'Scarlet King'; erect on 8 or 9 inch stalks; free.

Crimson.

87. Aquilon (Cheal).—5½ feet. Flowers 6 inches; rays flat, in two rows, deep carmine; erect on 7 or 8 inch stalks; free.

83. Sincerity (Burrell, 1918).—4½ feet. Flowers 6 inches; rays nearly flat, deep strawberry-red; erect, but not well above foliage, on 7 inch stalks; free.

88. Salute (Burrell, 1920).—4½ feet. Flowers, 5½ to 6 inches; rays channelled, deep crimson; erect on 10 inch stalks; sparsely produced.

94. Tresilian (Treseder).—6 feet, very vigorous. Flowers 5 to 6½ inches; rays channelled, deep crimson with slight purple shade; erect on 10 to 14 inch stalks; free.

81. Emma (Dobbie).—5½ feet. Flowers 6 inches; rays deep channelled, deep velvety rosy carmine; disc covered by narrow curled and twisted florets; rather drooping on 9 inch stalks; not very free.

Maroon.

93. Duncan (Turner).—6 feet, very vigorous. Flowers 5½ to 6 inches; rays channelled, velvety-red maroon; disc florets red with golden anthers; on strong 12 to 15 inch stalks; free.

Class VI. Small-flowered Pæony Dahlias.

The flowers are in essentials like those of Class V., but are smaller.

We have included here some of those at times classed as 'Star' Dahlias, but which have the edges of the rays curved inwards somewhat, instead of backwards as in those in Class XIV. This incurving of the edges gives a somewhat star-like appearance to the flower since the rays do not overlap much, but otherwise they are similar to the Pæony-flowered.

Awards.

95. **Our Annie, A.M.** Aug. 24, 1921. Raised and introduced by Messrs. Burrell.

97. **Rosie, H.C.** Aug. 24, 1921. Raised and introduced by Messrs. Burrell.

White, edged yellow.

169. Jupiter (Dobbie).—4½ feet. Flowers 3½ inches; rays generally in a single irregular row, white narrowly edged yellow and scarlet; on stiff 9 inch stalks; freely produced.

Pink.

*96. Elegance (Burrell).—5½ feet. Flowers 4 to 4½ inches; rays channelled, silvery pink; on fairly stiff stalks 5 or 6 inches long, not above foliage; not free.

*97. Rosie (Burrell, 1919), **H.C.**—5 feet. Flowers 4 inches; rays recurved, soft rosy mauve; on stiff 10 inch stalks; free.

Pink on yellow.

95. Our Annie (Burrell), **A.M.**—4 feet. Flowers 4 inches; rays somewhat channelled, apricot-yellow flushed pink; on stiff 8 or 9 inch stalks; free.

*99. Edith Jones (Burrell, 1921).—6 feet. Flowers 5½ inches; rays flattish, buff flushed pink; on stiff 7 or 8 inch stalks; free; disc becomes dirty brown.

Apricot.

*98. Audrey (Burrell, 1921).—4½ feet. Flowers 4 inches; rays flattish, amber flushed pink; on rather weak 9 inch stalks; free.

Orange-scarlet.

100. Norah Bell (Burrell, 1919).—4 feet. Flowers 4½ to 5 inches; rays channelled, orange-scarlet; on 8 inch stiff stalks, just above foliage; free.

Scarlet or crimson.

46. RUBY GEM (Dobbie).—4¾ feet. Flowers 3 inches; rays flat, bright carmine-cerise; on stiff 7 to 10 inch stalks; free.

51. DAZZLER (Dobbie).—5¼ feet. Flowers 4 inches; rays irregular, channelled or recurved at edges, bright scarlet; on stiff 9 inch stalks; free.

*101. SELMA (Burrell, 1921).—5 feet. Flowers 3½ inches; rays generally flat, velvety crimson; on stiff 7 inch stalks; free.

54. SPARKLER (Dobbie).—5¼ feet. Flowers 3 to 3¼ inches; rays flattish, deep blood-red, on stiff 5 or 6 inch stalks; free.

White, edged scarlet.

56. CASSIOPE (Turner).—6 feet. Flowers 4 inches; rays flat, in two rows, white narrowly edged scarlet; erect on 7 to 12 inch stalks; free.

170. VENUS (Dobbie).—4½ feet. Flowers 3½ inches; rays channelled, in three rows, creamy white edged scarlet; erect on 8 or 9 inch stalks; free.

171. MERCURY (Dobbie).—5 feet. Flowers 3¼ inches; rays somewhat recurved at margins, white edged bright crimson-scarlet; erect on 8 or 9 inch stalks; free; 75 per cent. of flowers were dark crimson.

172. ARIES (Dobbie).—5½ feet. Flowers 4¾ inches; rays flat, in two rows, white edged and flushed bright crimson-scarlet (sometimes wholly crimson); erect, just above foliage on 8 inch stalks; very free.

173. MARS (Dobbie).—4 feet. Flowers 5 inches; rays flat, creamy white edged bright crimson-scarlet (sometimes wholly crimson); erect on 7 inch stalks; very free.

White, edged magenta.

174. SATURN (Dobbie).—3½ feet. Flowers 2¼ inches; rays channelled, white edged magenta; erect on 5 to 9 inch stalks; not free.

210. MRS. JOHN DOWNIE (Turner).—3½ feet. Flowers 4½ inches; rays flat, white edged deep magenta, tip white; erect on 6 to 8 inch stalks; free.

Class VII. DWARF PÆONY-FLOWERED DAHLIAS.

Similar to Classes V. and VI., but not exceeding 2 feet 6 inches in height.

Orange-salmon.

223. CHARLOTTE (Dobbie).—2½ feet. Flowers 3½ to 4 inches; rays flattish or recurved at margins, orange shaded salmon; on wiry 6 inch stalks; free. Raised in Germany.

Class VIII. DECORATIVE DAHLIAS.

Flower heads like Class V., but centre filled with ray florets, and without a yellow disc.

AWARDS.

22. **Bianca, A.M.** Aug. 24, 1921. Raised and sent by Mr. Turner, Slough.

42. **Nancy, A.M.** Sept. 7, 1921. Raised and sent by Messrs. Burrell.

76. **Rose Princess, H.C.** Aug. 24, 1921. Raised and sent by Messrs. Dickson & Robinson, Manchester.

32. **Defiance, H.C.** Sept. 7, 1921. Raised and sent by Messrs. Burrell.

227. **Toreador, H.C.** Aug. 24, 1921. Sent by Messrs. Scheepers, New York.

44. **Cambria, C.** Aug. 24, 1921. Sent by Messrs. Burrell.

45. **Pearl, C.** Aug. 24, 1921. Sent by Messrs. Cheal.

White.

22. BIANCA (Turner), **A.M.**—4¾ feet. Flowers 4½ inches; rays flat, pure white; erect on 7 inch stalks; free.

Yellow.

*26. Mrs. H. J. Jones (Burrell, 1921).—4½ feet. Flowers 5½ to 6 inches; rays flat, pale sulphur; erect on 10 inch stalks; fairly free.

27. Yellow King (Cheal).—6 feet. Flowers 5¼ to 6 inches; rays flat, pale greenish-yellow; erect on 12 inch stalks; fairly free.

Pink.

233. Venus (Scheepers).—5½ feet. Flowers 5 to 5½ inches; outer rays flat, inner with incurved margins, flushed pink on a white ground, inner paler; erect on 10 to 12 inch stalks; very free.

44. Cambria (Burrell, 1918).—5½ feet. Flowers 5½ to 6 inches; rays flat, very long, light phlox-purple; erect on 8 to 10 inch stalks; free.

43. Loveliness (Turner).—4¾ feet. Flowers 5 to 5½ inches; rays nearly flat, amaranth-pink; drooping on 8 inch stalks, rather hidden in foliage.

*42. Nancy (Burrell, 1921), **A.M.**—5 feet. Flowers 6 to 6½ inches; rays rather irregular, amaranth-pink, paler on outer rays; carried just above foliage on 5 or 6 inch stalks; free.

41. Mrs. W. J. Unwin (Burrell, 1920).—6 feet. Flowers 6 to 7 inches; rays more or less flat, light mallow-purple; erect on 5 or 6 inch stalks; free.

45. Pearl (Cheal), **C.**—5 feet. Flowers 5 to 5½ inches; rays more or less flat, mallow-purple, fading after flower opens; on erect 10 to 12 inch stalks; free.

76. Rose Princess (Dickson & Robinson), **H.C.**—5½ feet. Flowers 5 inches; rays channelled, pale violet-rose; rather drooping and only just above foliage on 5 inch stalks; free.

231. Theodora (Scheepers).—6 feet. Flowers 5 inches; outer rays nearly flat, inner with incurved margins; erect on 7 inch stalks; free.

Pink on Yellow.

40. Dictator (Burrell, 1921).—6 feet. Flowers 6 inches; rays channelled, orange suffused rosy lavender; on erect 10 inch stalks; free.

235. Agnes Haviland (Scheepers).—6 feet. Flowers 6 inches; rays channelled, bright yellow overlaid bright pink; drooping on 7 or 8 inch stalks; fairly free.

37. Rowena (Burrell, 1917).—5 feet. Flowers 5½ inches; rays channelled, pale violet suffused salmon; on erect 12 inch stalks; free.

Apricot.

32. Defiance (Burrell, 1919), **H.C.**—5¼ feet. Flowers 6 inches; rays flat, from a yellow base begonia-rose; on erect 6 inch stalks; free.

*34, 35. Dr. Tevis (Riding, 1920, West).—5 feet. Flowers 5½ to 6 inches; rays flat, apricot-yellow faintly flushed purple; rather drooping on 8 to 10 inch stalks; fairly free. Most flowers semi-double. Raised by F. Pelleigno, America.

Orange.

29. Merrie (Treseder).—3¾ feet. Flowers 6 inches; rays flattish, old gold; drooping on 5 or 6 inch stalks; not very free.

28. Helios (Krelage).—5½ feet. Flowers 5 to 6 inches; rays nearly flat, bright orange flushed salmon; on erect 8-inch stalks; not very free.

230. Dakota (Scheepers).—3½ feet. Flowers 6 inches; outer rays flat, inner with incurved margins, orange-scarlet fading towards tip; on erect 8 inch stalks; fairly free.

Orange buff.

*36. Ebor (Burrell, 1921).—4¾ feet. Flowers 5 to 5½ inches; rays flat, cardinal on a yellow ground; drooping on 5 or 6 inch stalks; free.

236. Mephistopheles (Scheepers).—7 feet. Flowers 6 inches; outer rays flat, inner with incurved edges, pale magenta overlaid crimson; more or less erect on 12 inch stalks; not very free.

239. Professeur Gérard (Rivoire, 1921).—4 feet. Flowers 4 or 5 inches; rays flat, toothed, buff flushed rose; on rather weak 9 to 12 inch stalks; slow to flower.

Scarlet.

50. VINDICTIVE (Dobbie).—4 feet. Flowers 6 inches; rays channelled, bright scarlet; carried just above foliage on erect 5 inch stalks; very free.

227. TOREADOR (Scheepers), **H.C.**—5½ feet. Flowers 5½ inches; outer rays flat, inner somewhat channelled, bright carmine-scarlet; erect on 6 or 7 inch stalks; free.

53. DRAGOON (Burrell, 1919).—4 feet. Flowers 5 inches; rays channelled, deep crimson-scarlet; erect on 8 to 12 inch stalks; not very free.

Crimson.

229. EMPEROR (Scheepers).—6 feet. Flowers 6 or 7 inches; rays flat or somewhat channelled, inner channelled, deep crimson-magenta; on 12 inch stalks; free.

Maroon.

55. KING HAROLD (Krelage, 1921).—5½ feet. Flowers 5 inches; rays more or less channelled, very dark velvety maroon; erect, just above foliage, on 6 or 7 inch stalks; free.

Class IX. SMALL-FLOWERED DECORATIVE DAHLIAS.

Like Class VIII., but flower heads small.

Class X. DWARF DECORATIVE DAHLIAS.

The counterpart of Class VIII. in everything but height, which does not exceed 3 feet.

AWARD.

217. **Hetty, H.C.** Aug. 24, 1921. Raised and sent by Messrs. Dobbie.

217. HETTY (Dobbie), **H.C.**—3 feet. Flowers 4 inches; outer rays flat, inner channelled, from an orange-salmon base to deep salmon-shaded-cerise; freely produced just above the foliage on 4 inch stalks.

Class XI. CAMELLIA-FLOWERED.

Fully double (without yellow disc); rays regularly arranged with margins incurved so as to form wide-mouthed tubes with their mouths lengthened and tips generally pointed.

This new Class has been formed to contain the 'Decorative' Dahlias intermediate in form between those in Classes VIII. to X. with open rays, and the 'Show' and Pompon' Dahlias in Classes XII. and XIII. with short tubular rays. The name was suggested by Mr. H. J. Jones.

AWARDS.

33. **Apricot, A.M.** Aug. 24, 1921. Raised and sent by Messrs. Cheal.

52. **Crimson Flag, A.M.** Aug. 24, 1921. Raised and sent by Messrs. Cheal.

57. **Reginald Cory, A.M.** Sept. 7, 1921. Raised and sent by Messrs. Cheal.

24. **White Cloud, H.C.** Aug. 24, 1921. Raised and sent by Messrs. Cheal.

25. **Jean Kerr, H.C.** Aug. 24, 1921. Raised and sent by Messrs. Burpee, New York.

237. **Chenango, H.C.** Sept. 7, 1921. Raised and sent by Messrs. Scheepers.

238. **La Grosse Bête, H.C.** Aug. 24, 1921. Sent by Messrs. Scheepers.

White.

24. White Cloud (Cheal), **H.C.**—4¾ feet. Flowers 4 inches; pure white; erect and free, on 6 or 7 inch stalks.

25. Jean Kerr (Burpee, 1919), **H.C.**—4 feet. Flowers 4½ inches; creamy white; erect on 7 or 8 inch stalks; very free.

Yellow.

216. Dobbie's Bedder (Dobbie).—4 feet. Flowers 4 inches; bright sulphur-yellow, paler at tips; erect and free on 5 inch stalks.

Pink.

30. Jean (Dobbie).—3¾ feet. Flowers 4½ inches; white flushed rose; very free on rather drooping 5 or 6 inch stalks.

Apricot.

31. Medusa (Burrell, 1919).—5 feet. Flowers 4½ to 5 inches; yellow flushed pink; stalks 4 or 5 inches, not strong; free.

33. Apricot (Cheal), **A.M.**—4 feet. Flowers 6 inches; yellow flushed apricot; stalks rather weak, 10 inches; free.

Scarlet.

52. Crimson Flag (Cheal), **A.M.**—3½ feet. Flowers 4 inches; deep crimson-scarlet; erect, somewhat above foliage, on 5 or 6 inch stalks; free.

237. Chenango (Scheepers), **H.C.**—4½ feet. Flowers 4¾ inches, bright scarlet; erect, but not much above foliage, on 4 or 5 inch stalks; free. Nearer the 'Decorative' class perhaps.

Scarlet, tipped cream.

57. Reginald Cory (Cheal), **A.M.**—5 feet. Flowers 3 to 3½ inches; rays white, flushed from base for ¾ their length with rose-red; on 5 to 9 inch stalks, erect, but not much above foliage.

Crimson.

238. La Grosse Bête (Scheepers), **H.C.**—7 feet. Flowers 6 inches; rays with incurved margins, deep crimson; stalks drooping 5 or 6 inches; free.

Class XII. Show.

Fully double, over 3 inches in diameter, almost globular, centre florets like outer but smaller, with margins incurved, tubular, short and blunt at mouth. This Class includes the old 'Fancy' Dahlias, which had each floret tipped with white or striped.

Awards.

213. **Merlin, A.M.** Aug. 24, 1921. Raised and sent by Messrs. Turner, of Slough (**A.M.** 1901).

212. Duchess, raised and sent by Messrs. Dobbie, was indistinguishable from 213.

Yellow, tipped white.

208. Wm. Sheldon (Dobbie).—Fancy. 4 feet. Flowers 4 inches; lemon-yellow tipped white, flushed pink; free on erect 7 or 8 inch stalks.

Mauve.

214. Rover (Dobbie).—4½ feet. Flowers 3 inches; phlox-purple; rather drooping and not much above foliage, stalks 6 inches; free.

Scarlet.

213. Merlin (Turner), **A.M.**—3 feet. Flowers 3¼ inches; orange-scarlet; on erect 7 inch stalks; free.

212. Duchess, from Messrs. Dobbie, was indistinguishable from 213.

211. Chas. Wood (Treseder).—4 feet. Flowers 3¼ inches, orange-scarlet; stalks drooping, 7 inches long.

Bronze-red.

215. Dunedin (Dobbie).—3½ feet. Flowers 3½ inches; bronzy-red; on 5 inch stalks.

Class XIII. Pompon.

Like Class XII. but smaller.

For show purposes the flowers of Pompon Dahlias should not exceed 2 inches in diameter.

Awards.

205. **Albin, A.M.** Aug. 24, 1921. Raised and sent by Messrs. Godfrey, of Exmouth.

194. **Nerissa, A.M.** Aug. 24, 1921. Raised and sent by Messrs. Turner.

225. Bonella, raised and sent by Messrs. Dobbie, was indistinguishable from Nerissa.

202. **Mars, A.M.** Aug. 24, 1921. Raised and sent by Messrs. Turner.

226. **Tommy Laing, A.M.** Sept. 7, 1921. Raised and sent by Messrs. Dobbie.

191. **Pauline, H.C.** Aug. 24, 1921. Raised and sent by Messrs. Cheal.

193. **Orpheus, H.C.** Aug. 24, 1921. Raised and sent by Messrs. Turner.

203. **Electra, H.C.** Aug. 24, 1921. Raised and sent by Messrs. Dickson & Robinson.

197. **Little Jim, H.C.** Aug. 24, 1921. Raised and sent by Messrs. Dobbie.

190. **Queen of Whites, C.** Aug. 24, 1921. Raised and sent by Messrs. Turner.

196. **Glow, C.** Aug. 24, 1921. Raised and sent by Messrs. Cheal.

199. **China Cup, C.** Aug. 24, 1921. Raised and sent by Messrs. Dickson & Robinson.

White.

206. Favourite (Godfrey).—4½ feet. Flowers 3 to 3½ inches; white; erect and just above foliage on 3 inch stalks; free.

205. Albin (Godfrey), **A.M.**—4 feet. Flowers as in 'Favourite,' but often tinged very pale lilac; erect and well above foliage on 4 inch stalks.

These two might well be classed with the 'Camellia-flowered.'

207. Snowball (Godfrey).—4 feet. Flowers 2½ to 2¾ inches; ivory white; carried above foliage on 2½ to 3 inch stalks; free.

190. Queen of Whites (Turner), **C.**—3½ feet. Flowers 2¼ to 2½ inches; ivory; erect, on 6 inch stalks, but not much above foliage; very free.

Yellow.

193. Orpheus (Turner), **H.C.**—4½ feet. Flowers 2½ inches; pale lemon; erect and well above foliage on 3 to 6 inch stalks; very free.

192. Lemon Queen (Dickson & Robinson).—4 feet. Flowers 2 inches; lemon faintly flushed pale rose; not very free, and hidden in foliage.

Pink.

195. Irene (Cheal).—4½ feet. Flowers 2 inches; light phlox-purple; erect on 4 to 6 inch stalks; free.

194. Nerissa (Turner), **A.M.**—4½ feet. Flowers 2¼ inch; mallow-purple; well above foliage on stiff 6 or 7 inch stalks (**A.M.** 1895).

225. Bonella (Dobbie).—Indistinguishable from 'Nerissa.'

Buff.

196. Glow (Cheal), **C.**—3½ feet. Flowers 2½ inches; coral-red; just above foliage on stiff 3 inch stalks; free.

Orange.

201. ELECTRA (Cheal).—5½ feet. Flowers 2¼ to 2½ inches; orange; above foliage on stiff 5 inch stalks; free.

Scarlet.

202. MARS (Turner), **A.M.**—5 feet. Flowers 2½ inches; bright scarlet; above foliage on 2½ to 4 inch stalks; free.

198. MULTIFLORA (Dickson & Robinson).—4 feet. Flowers 2¼ inches; crimson-scarlet, tipped chrome; above foliage on 6 to 8 inch stalks.

Crimson.

203. ELECTRA (Dickson & Robinson), **H.C.**—4 feet. Flowers 1¾ inches; deep crimson; above foliage on stiff 4 inch stalks; free. Quite distinct from No. 201.

204. RUBY (Cheal).—4 feet. Flowers 2 to 2¼ inches; bright ruby-crimson, sometimes showing disc; above foliage on 5 to 6 inch stems; free.

197. LITTLE JIM (Dobbie), **H.C.**—4½ feet. Flowers 2 inches; deep crimson-maroon; above foliage on stiff 6 inch stalks; very free.

Magenta.

200. REGULUS (Cheal).—4 feet. Flowers 2¼ inches; deep rosy purple; above foliage on stiff 5 inch stems; free.

White, tipped mauve.

191. PAULINE (Cheal), **H.C.**—4 feet. Flowers 2¼ inches; white flushed at tip with pale violet; just above foliage on 4 inch stalks; very free.

White, tipped magenta.

199. CHINA CUP (Dickson & Robinson), **C.**—3 feet. Flowers 2 inches; white tipped bright purple-magenta; above foliage on 6 inch stalks; very free.

224. MOIRA (Dobbie).—3½ feet. Flowers 2 inches; white tipped deep rosy purple; very freely produced but rather hidden in foliage on 5 to 7 inch stalks.

Magenta, tipped white.

226. TOMMY LAING (Dobbie), **A.M.**—3½ feet. Flowers 2 to 2¼ inches; purplish-maroon tipped white; above foliage on erect 5 to 7 inch stalks; free.

Class XIV. STAR.

Small, with two to four rows of rays, not or scarcely overlapping at their more or less recurved margins, and forming a cup-shaped flower with a golden disc.

A long thin wiry stem is characteristic of this class, and this and their pleasing form render them most useful for cutting.

AWARDS.

175. **White Star, A.M.** Aug. 24, 1921. Raised and sent by Messrs. Cheal.
187. **Felicia, A.M.** Aug. 24, 1921. Raised and sent by Messrs. Turner.
177. **Surrey Star, A.M.** Aug. 24, 1921. Raised and sent by Messrs. Cheal.
188. **Leda, A.M.** Aug. 24, 1921. Raised and sent by Messrs. Turner.
185. **Lisette, H.C.** Aug. 24, 1921. Raised and sent by Messrs. Turner.
186. **Hildegarde, H.C.** Aug. 24, 1921. Raised and sent by Messrs. Turner.
179. **Mauve Star, C.** Sept. 7, 1921. Raised and sent by Messrs. Cheal.

White.

175. WHITE STAR (Cheal), **A.M.**—4½ feet. Flowers 3 inches; rays nearly flat; white; erect and well above foliage on 7 inch stalks; very free.

White and Yellow.

182. NANETTE (Turner).—5 feet. Flowers 3½ inches; white edged pale yellow; free on 9 to 11 inch erect stalks.

Yellow.

*183. JOAN (Turner).—4 feet. Flowers 3½ inch; ivory flushed pale yellow; erect on 6 or 7 inch stems; very free.

176. PRIMROSE STAR (Cheal).—4½ feet. Flowers 3¾ inches; primrose yellow; erect and very free on 7 or 8 inch stalks.

Pink Shades.

179. MAUVE STAR (Cheal), **C.**—4½ feet. Flowers 3½ inches; light phlox-purple; very free on erect 6 inch stalks.

186. HILDEGARDE (Turner), **H.C.**—5 feet. Flowers 3¾ inches; light mallow-purple; very free on wiry 6 inch stalks.

185. LISETTE (Turner), **H.C.**—4 feet. Flowers 3 inches; mallow-purple; very free on erect 6 inch stalks.

*187. FELICIA (Turner), **A.M.**—4 feet. Flowers 3½ inches; bright rosy pink; erect on 5 inch stalks; very free.

180. EASTERN STAR (Cheal).—4½ feet. Flowers 2¾ to 3 inches; bright rosy purple; erect on 7 to 8 inch stalks; free.

Orange suffused pink.

*177. SURREY STAR (Cheal), **A.M.**—4½ feet. Flowers 3½ inches; light orange suffused pink; erect and very free, stalks 8 inches, but not quite so wiry as in most of its class.

184. AFTERGLOW (Turner).—5½ feet. Flowers 4 inches; yellow suffused rosy crimson; erect and very free on 5 inch stalks.

178. AUTUMN STAR (Cheal).—4½ feet. Flowers 4 inches; orange-buff suffused rosy magenta; erect on 12 to 13 inch stalks; very free.

*188. LEDA (Turner), **A.M.**—3½ feet. Flowers 3½ inches; deep chrome flushed crimson, passing to mallow-purple towards tips; very free and erect on 6 or 7 inch stalks.

Orange Scarlet.

181. CORAL STAR (Cheal).—5½ feet. Flowers 4¼ inches; orange-scarlet; erect and free on wiry 10 inch stalks.

Class XV. CACTUS.

Florets long, spreading, and often twisted, with their margins recurved.

There are three sub-classes.

a. Double, with florets all alike.

b. Semi-double, with several rows of spreading florets surrounding a central disc.

c. Single, with one more or less regular row only of spreading florets around a central disc.

Each sub-class is treated separately below.

DOUBLE CACTUS.

AWARDS.

66. **Edina, A.M.** Aug. 24, 1921. Raised and sent by Messrs. Dobbie.
15. **Waverley, C.** Aug. 24, 1921. Raised and sent by Messrs. Dobbie.
20. **Mrs. Forester Paton, C.** Sept. 7, 1921. Raised and sent by Messrs. Cheal.

White.

1. STE. JEANNE D'ARC (Rivoire, 1921).—4½ feet. Flowers 5 inches; white, greenish at base; not above foliage, nor very free; stalks 6 to 8 inches.

*2. MRS. KRELAGE (Krelage, 1921).—5½ feet. Flowers 6 inches; outer rays flattish; white tinged yellow at base, and sometimes showing a disc; on 6 inch stalks drooping, and not above foliage; not very free.

3. CLAUDINE LÉGER (Rivoire, 1921).—4 feet. Flowers 5½ inches; ivory-white with a faint lilac flush on reverse; not above foliage, and sparsely flowered; stalks weak, 6 inches.

Yellow.

6. CHEVALIER (Dobbie).—5 feet. Flowers 5½ inches; sulphur-yellow; just above foliage on weak 6 or 7 inch stalks; free.

4. CANDÉLABRE D'OR (Rivoire).—4½ feet. Flowers 5 to 5½ inches; pale greenish-yellow, of good form, rays twisted; on weak 5 inch stalks, not above foliage.

7. BERWICK (Dobbie).—5 feet. Flowers 6 inches; pale lemon-yellow; just above foliage on weak 6 to 9 inch stalks; free.

Pink.

5. LILY RIVOIRE (Rivoire).—4½ feet. Flowers 5½ to 6 inches; faintly flushed rosy magenta on a white ground, yellowish towards base, rays rather broad and twisted; on weak 7 inch stalks, not above foliage.

17. MAUVE QUEEN (Cheal).—5½ feet. Flowers 5 inches; light rosolane-purple; carried above foliage on weak 4 to 6 inch stalks; free.

15. WAVERLEY (Dobbie), **C.**—5½ feet. Flowers 6½ inches; deep clear rose; carried just above foliage on rather weak 6 to 8 inch stalks; free.

16. MRS. CHARLES FOSTER (Cheal).—4¾ feet. Flowers 5 inches; amaranth-pink; just above foliage on 8 inch stiff stalks; free.

14. ABBOTSFORD (Dobbie).—7 feet. Flowers 6 to 6½ inches; pink passing to yellow in centre; free and above foliage on 9 to 11 inch stiff stalks.

Pale Buff.

9. MRS. LANDALE (Cheal).—6½ feet. Flowers 5 inches; rose pink from a yellow base; above foliage on erect 9 inch stalks; free.

13. STEINBACH (Dickson & Robinson, 1915).—6½ feet. Flowers 5½ inches; apricot over pink; above foliage on weak 6 inch stalks; free.

Buff-orange.

8. RUHLEBEN (Treseder).—6 feet. Flowers 6 inches; lemon to apricot suffused salmon; carried just above foliage on weak 5 or 6 inch stalks; free.

12. ROB ROY (Dobbie).—5¾ feet. Flowers 5 inches; buff streaked and spotted rose and carmine; free on weak 9 inch stalks, just above foliage.

18. BURBANK (Cheal).—4¾ feet. Flowers 4¾ inches; rose passing at base to light orange-yellow; free, but hidden by foliage on short, weak stalks.

11. GUY MANNERING (Dobbie).—6½ feet. Flowers 5½ to 6 inches; orange striped and spotted scarlet, but very variable; carried above foliage on 6 or 7 inch stalks; free.

10. CAPRICE DE LYON (Rivoire, 1921).—4 feet. Flowers 4½ inches; red overlaid yellow, but fading with age; rays straight, broad, flat for half their length, then recurved at margin; hidden in foliage on straight 5 inch stalks.

Orange.

19. MRS. F. H. COOK (Cheal).—4½ feet. Flowers 4 to 4½ inches; rays broad at base, then quilled and twisted, orange-scarlet; hidden by foliage on rather weak 5 or 6 inch stalks, and not free.

Scarlet.

20. MRS. FORESTER PATON (Cheal), **C.**—5½ feet. Flowers 5½ to 6 inches; scarlet; just above foliage on weak 4 to 6 inch stalks; not very free.

Scarlet and White.

21. LA BASSÉE (Dickson & Robinson, 1915).—4½ feet. Flowers 4 to 4½ inches; white tipped scarlet; rays flat at base and rather broad; hidden in foliage on rather weak 4 to 6 inch stalks.

b. SEMI-DOUBLE CACTUS.

66. EDINA (Dobbie), **A.M.**—5½ feet. Flowers 6 inches; rays broadly quilled and twisted, pale crimson; stalks 6 inches, rather weak; free.

79. BELLFIELD (Dobbie).—6 feet. Flowers 6 inches; rays rather broad, bright rosy violet, white on reverse; above foliage on erect 6 inch stalks.

c. Single Cactus.

47. Alaric (Turner).—5½ feet. Flowers 5 inches; rays rather broad in two irregular rows, bright scarlet; erect on 8 or 9 inch stalks, and very free.

Class XVI. Dwarf Cactus.

The counterpart of Class XV., but not exceeding 3 feet in height.

Award.

219. **Argos, A.M.** Aug. 24, 1921. Sent by Messrs. Dobbie, raised on Continent.

White.

220. Edelweiss (Dobbie).—2½ feet. Flowers 3 inches; ivory white; carried just above foliage on rather weak 4 inch stalks; very free. Raised in Germany.

Pink.

221. Amanda (Dobbie).—3 feet. Flowers 3½ to 4 inches; white flushed pink, paler at tips; not above foliage on short, straight stalks; free. Raised in Germany.

Apricot.

222. Marianne (Dobbie).—3 feet. Flowers 4 inches; rays rather broad, apricot shaded yellow; free, on rather weak 5 or 6 inch stems, just above foliage. Raised in Germany.

Purple.

218. Purple Robe (Dobbie).—3 feet. Flowers 4½ inches; rays rather broad, deep purplish-magenta; free, on rather weak stalks, just above foliage.

Dark Crimson.

219. Argos (Dobbie), **A.M.**—3 feet. Flowers 5 inches; dark crimson; free on rather weak 7 inch stalks.

SWEET PEAS AT WISLEY, 1921.

THE main object of the trial of Sweet Peas at Wisley planned for 1921, 1922, and 1923, was to allow the Floral Committee to judge of the comparative value of available varieties as seen under ordinary garden cultivation instead of as produced for exhibition. The available space was insufficient to carry out a trial of all varieties in one year so as to include, as we wished, different raisers' stocks, in order to judge not only of the value of the variety, but also of the quality of the stocks offered. It was, therefore, deemed best to divide the varieties into three groups, the group falling to be grown in 1921 including varieties of mauve, lavender, and blue shades, that for 1922 including pink varieties, and that for 1923 all others not included in 1921 and 1922.

One hundred and thirteen stocks were submitted for trial in 1921, and all were sown singly in small pots at the beginning of March.

With the exception of No. 27, which failed to germinate, and Nos. 5, 18, and 61, which were poor, all germinated well. As soon as they were large enough they were planted out in clumps (5 feet across), containing, with one or two exceptions, twenty-seven plants. They made good growth in spite of the hot, dry summer, and that without a great deal of watering. The early flower buds were removed, but after June 14 they were allowed to grow on, and when judged on July 16 they had reached a height of nearly six feet and were a mass of flowers. The plot on which they were planted had for a number of years grown Pæonies and Phloxes. After these had been removed it was deeply dug to a depth of about two feet, and had a considerable amount of decayed garden rubbish incorporated and a moderate dressing of pig manure. The plot was somewhat shaded during part of each day by standard apple trees, but every clump was in the full glare of the sun for several hours about midday, and the trial was a severe test of the standing qualities of the colours. In one direction, however, the season favoured the plants, for none of the flowers showed that distressing discoloration which affects some colours, especially the dark blues, in a wet summer, and possibly flowers of this type had never displayed themselves to better advantage than in this season.

It is remarkable that the last trial of sweet peas took place, like this, in a very hot, dry summer (1911). The report of that trial (JOURNAL R.H.S. 37 (1912), p. 394) shows that fourteen varieties of blue shades were included and of these seven only were represented in the present trial. Even at that date the form of sweet pea called 'Grandiflora,' which up to 1900 was the only one known, was being rapidly displaced by the 'Spencer' types, and this movement has gone on until now the 'Grandiflora' types are practically superseded, and it was only because growers were especially asked to include

examples that they were represented by about ten per cent. of the stocks grown in this trial.

The characteristics of these groups of sweet peas are almost too well known to need reference. The 'Grandiflora' types are not now the largest flowered. They have a hooded standard and a clamped keel, and are marked by a pleasing symmetrical severity of outline which the more airy exuberance of the 'Spencers' lacks. The true 'Spencers' have a waved standard, large wings and a baggy keel, open at the top. The intermediate or 'Unwin' type, with a waved standard and a clamped keel, does not now find favour with raisers.

The 'Spencer' varieties are on the whole marked by greater vigour of growth, and this is reflected in the greater size of the flowers, and in the greater number of flowers borne upon the stalks in these varieties than in the 'Grandifloras.' There is also, as a rule, a markedly smaller amount of seed set by the 'Spencers' than by the older forms, and in consequence the flowering period is longer. In both it may be greatly prolonged by constantly removing the dying flowers and so preventing the setting of seed.

It is generally supposed that the 'Grandiflora' types of sweet pea are more odorous than the latter-day Spencer types, but this was not the case in this trial. While there is some difference in the strength of the scent of different varieties, many of the 'Spencer' forms were quite as strongly scented as the 'Grandifloras,' and the whole area about the plantation was redolent with their perfume.

Nos. 4, 19, 32, 44, 72, and 104 were very mixed and are not referred to again. The remainder have been arranged in groups under the name of their dominant colour as seen in May in the garden. At the head of each group is printed in thick type the names of the varieties selected by the Judges as best for garden decoration, the awards being given only where true stocks or those with very little variation in colour or form was to be seen. Then follow fuller descriptive notes upon each variety in the group, the sequence of varieties being from paler to darker forms, or from those of redder to those of more violet tone. There are, of course, no pure blue sweet peas, and the whole of those here described are of different shades between blue and red.

Where varieties are placed close together they are so much alike as to be practically indistinguishable in the garden.

Awards, Descriptions, and Notes.

I. Lavender.

*20. **Hawlmark Lavender, A.M.** July 16, 1921.—Raised, introduced, and sent by Messrs. Dickson.

(*a*) *Spencer types.*

35, 36. Pattie Want (Veitch, Barr).—Opening nearly white, standards becoming very pale lavender, wings light chicory-blue. A good grower, with flowers of rather undecided colour.

* * *

11. Alfred Watkins (Barr).—A weak stock of a beautiful pale self-lavender.

* Plants grown for trial are known by number only until judging is completed.

18. Seedling No. 5 (Hinton).—Pale mauve standards, slightly deeper wings. A poor grower apparently. Raised by sender.

* * *

12. Margaret Madison (Barr).—Lavender standards, bluer wings. Spikes with four large flowers, plants vigorous. Raised by Messrs. Morse. Stock not true.

31. Lavender (King).—A little larger than No. 12, and flowers mainly in threes, otherwise similar. Raised by sender.

13. Don Alvar (Bolton).—For garden purposes not distinct from No. 12. Standards paler towards base, wings slightly pinker. Raised by sender.

* * *

14. Colne Valley (Bolton).—A mixed stock. Raised by sender.

* * *

20, 21. Hawlmark Lavender (Dickson, Veitch), **A.M.**—A vigorous plant, with flowers mostly in threes, pale lavender, the wings at first rather darker. No. 21 not a true stock.

9. Faith (J. Stevenson).—A less vigorous stock with somewhat larger flowers, otherwise similar to No. 20. Raised by sender.

(*b*) *Grandiflora types.*

108. Countess of Radnor (Barr).—Not very vigorous; the rather small flowers in threes on 8 inch stalks, pale mauve. The stock much mixed with next.

* * *

109–111. Lady Grisel Hamilton (Barr, Morse, Pearson).—Opens rather deeper in colour than 'Countess of Radnor,' but fades to the same shade. Raised by Mr. Eckford.

II. Pale Blue.

57, 58. **Mrs. Tom Jones** (Barr, Dickson), **A.M.** July 16, 1921.—Raised by Mr. A. Malcolm, introduced by Messrs. Dobbie.

(*a*) *Spencer types.*

51. Haslemere Blue (Chandler).—A vigorous plant with medium-sized flowers in threes, pale blue standards with wings slightly darker. Raised by sender, but stock not fixed.

* * *

53. May Day (Stark).—Very vigorous, with pale-blue flowers of medium size in fours. A flower of good colour. Raised by sender.

* * *

52. Seedling No. 3 (Hinton).—With rather smaller flowers in threes, deeper and bluer than 'May Day' in tone. Raised by sender.

* * *

61. Blue Wings (Dickson).—A weak stock with flowers paler than 'Margaret Fife.' Raised by sender.

* * *

62, 63. Margaret Fife (Dickson, Pearson).—Vigorous; flowers in threes, with shorter stalks than some, deeper in tone than 'May Day,' and redder than 'Mrs. Tom Jones.' Raised by Mr. Malcolm, introduced by Messrs. Dobbie. No. 62 a mixed stock.

* * *

66–68. Wedgewood (Veitch, Webb, Barr).—Vigorous; flowers mostly in threes, standards brighter than in 'Margaret Fife' and fading quickly, wings lavender-violet. Nos. 66 and 68 were mixed.

* * *

70, 71. Flora Norton Spencer (Barr, Pearson).—Vigorous; flowers in threes, of medium size, more lilac than 'Mrs. Tom Jones.' Raised by Messrs. Morse. Stocks mixed.

* * *

54–59. Mrs. Tom Jones (Webb, Veitch, Bees, Barr, Dickson, Dobbie) } **A.M.**—
60. Mrs. Tom Jones Improved (Ireland and Hitchcock) }

A fine and vigorous variety with large lavender-violet flowers (wings rather bluer) in fours. An excellent garden plant. No. 60 was a poor stock; Nos. 54–56 and 59 were not quite true.

78. EDINA (Dobbie).—A variety intermediate between the light and dark blue series, with large flowers in threes with violet-blue standards and lavender-violet wings. Selected from the last by Messrs. Dobbie, but not quite fixed.

(*b*) *Grandiflora type.*

112. FLORA NORTON (Morse).—A less vigorous stock, but otherwise the 'Grandiflora' counterpart of 'Flora Norton Spencer.'

III. ROSY LAVENDER.

33. **Gladys, A.M.** July 16, 1921.—Raised and sent by Messrs. E. W. King.

23, 25. **R. F. Felton, A.M.** July 16, 1921.—Sent by the raiser, Mr. R. Bolton, and Messrs. Bees.

15. **Austin Frederick Improved, A.M.** July 16, 1921.—Raised and sent by Mr. F. C. Woodcock.

(*a*) *Spencer types.*

33. GLADYS (King), **A.M.**—Vigorous; flowers generally in threes on long stems, large, self-coloured, pale 'Hortense violet.'

* * *

2. MASTERPIECE (Barr).—Vigorous; standards as in No. 33, wings darker, fading quickly, and flowers smaller. Raised by Mr. A. Malcolm, introduced by Messrs. Dobbie. Stock mixed.

* * *

6. FLORENCE NIGHTINGALE (Barr).—Fairly vigorous; flowers in threes, rather redder than No. 2, and fading, large. Raised by Mr. H. Dickson, introduced by Messrs. Burpee.

* * *

16, 17. LAVENDER GEORGE HERBERT (Dobbie, Barr).—Rather less vigorous than foregoing; flowers in threes; deeper in colour than No. 6, large and of excellent form. Raised by Messrs. Dobbie. No. 17 was a mixed stock.

* * *

22–26. R. F. FELTON (Webb, Bolton, Barr, Bees, Dobbie). **A.M.**—A very vigorous and good garden variety; flowers mostly in fours, on long stalks, large, standards redder than in 'Gladys,' wings similar. Nos. 22, 24, 26 were mixed.

15. AUSTIN FREDERICK IMPROVED (Woodcock), **A.M.**—Almost indistinguishable from R. F. Felton, but with flowers in threes.

* * *

28–30. ORCHID (Dickson, Dobbie, Ireland & Hitchcock).—Near 'Lavender George Herbert' but wings a little redder. Raised by Mr. A. Malcolm, introduced by Messrs. Dickson. All the stocks were somewhat mixed.

* * *

43. ITALIA (J. Stevenson).—Very near 'Orchid.' Raised by sender. Stock mixed.

* * *

34. MASCOTT'S HELIO (Ireland & Hitchcock).—Growth poor. Flowers rather smaller and darker than 'Italia.'

(*b*) *Grandiflora type.*

3. ASTA OHN (Barr).—A vigorous stock bearing flowers in threes on rather short stalks, standards slightly deeper and redder, wings paler than in 'Masterpiece.'

IV. PALE BLUISH BICOLORS.

7. VICTORY, **A.M.** July 16, 1921.—Sent by Messrs. Bees, raised by Mr. Bolton.

10. FANCY, **A.M.** July 16, 1921.—Raised by Mr. Hitchcock, sent by Messrs. Ireland & Hitchcock.

77. MAGIC, **A.M.** July 16, 1921.—Sent by Messrs. Bees, raised by Mr. Bolton.

50. AFTERGLOW, **A.M.** July 16, 1921.—Sent by Messrs. Barr, raised by Mr. Bolton.

Spencer types.

7, 8. VICTORY (Bees, Bolton)
10. FANCY (Ireland & Hitchcock), **A.M.**—Not quite so vigorous as some. Flowers very large, in fours on long stalks, occasionally double; standards pale rosy-mauve, wings light violet-mauve. No. 8 slightly mixed.

77. Magic (Bees), **A.M.**—A very vigorous plant with large flowers in fours, on fairly long stalks; standards reddish-lilac, wings lavender-violet; a darker flower than 'Wedgewood.'

* * *

50. Afterglow (Barr), **A.M.**—Vigorous, with smaller flowers than 'Magic,' in threes; standards deeper in tone than 'Magic,' wings lavender-violet. Burns somewhat.

* * *

64, 65. Bluestone (Pearson, Bolton).—Still deeper in colour than in 'Afterglow'; other characters similar. Raised by Mr. Bolton.

V. Mauve.

48. **Brocade, A.M.** July 16, 1921.—Sent by Messrs. Veitch, raised by Messrs. Dickson.

5. **Bertrand Deal Improved, A.M.** July 16, 1921.—Sent by Messrs. Barr, raised by Messrs. Deal.

37. **Shamrock, A.M.** July 16, 1921.—Raised and sent by Messrs. Ireland & Hitchcock.

(*a*) *Spencer types.*

48. Brocade (Veitch), **A.M.**—Vigorous and floriferous, flowers in fours, at first on long stalks, very large; standards deep rose-pink, wings bright mauve. Fading quickly.

No. 49 sent in error as 'Lady Eveline' was identical in every way.

* * *

46. Prince George (Barr).—Vigorous; flowers in fours on medium stalks, large; standards redder than in No. 47, fading quickly.

* * *

5. Bertrand Deal Improved (Barr), **A.M.**—Vigorous; flowers mostly in threes on medium stalks, of medium size; standards mallow purple, wings light phlox-purple.

* * *

47. King George (Woodcock).—Not very vigorous; flowers in fours on long stalks, very large; standards mauve with paler wings. Raised by sender, stock not true.

* * *

99. Tennant Spencer (Veitch).—Vigorous, bearing freely large flowers on medium stalks in threes; rather redder than 'New Marquis.'

* * *

1. New Marquis (Dobbie).—Of medium vigour; flowers of medium size in threes on medium stems; standards pale rose-purple, wings still paler. Sunproof. Raised by sender, stock mixed.

* * *

37. Shamrock (Ireland & Hitchcock), **A.M.**—Of medium vigour; flowers large, in fours on long stalks; standards brighter than in 'New Marquis,' wings deeper.

* * *

38–41. King Mauve (Woodcock, Bees, Dickson, Ireland & Hitchcock).—Vigorous; flowers large in fours on long stalks; standards bright mauve, wings rather more violet than in 'Shamrock.' Raised by Mr. Woodcock. No. 40 a mixed stock.

42. Mauve (King).—A very vigorous plant nearly like 'King Mauve,' but standards not quite so bright. Raised by sender. Stock mixed.

* * *

45. Seedling No. 4 (Hinton).—A weak grower, with large flowers in fours on long stalks, self-coloured violet-mauve, darkening with age. Raised by Dr. Hinton.

(*b*) *Grandiflora type.*

105, 113. Mrs. W. P. Wright (Morse, Barr).—Vigorous, flowering freely, flowers in threes on medium stalks, near 'King Mauve' in colour. Raised by Mr. Eckford.

VI. Dark Bicolors.

(*a*) *Spencer types.*

103. Marks Tey (Dobbie).—A vigorous stock with fairly large long-stalked flowers in fours; standards reddish-purple, wings violet-purple. Raised by sender. Stock not quite true.

* * *

100, 101. Adelaide (Webb, Dobbie).—Vigorous and freely producing large flowers in fours on long stalks; standards reddish purple, wings deep violet-purple. Raised by Messrs. Dobbie. The general effect is bluer than in 'Marks Tey.'

76. A variety sent by Messrs. Veitch as 'Captain of the Blues' (a misnomer), with smaller darker flowers and more purple wings, belongs to this group.

VII. Dark Blue.

83. **Commander Godsall, A.M.** July 6, 1921.—Sent by Messrs. Webb. Raised by Mr. Bolton.

(*a*) *Spencer types.*

90. Le Mahdi (Ireland & Hitchcock).—A fairly vigorous plant bearing large flowers in fours on medium stalks; standards deep reddish-purple, standards bluer. Raised by Mr. Hitchcock.

* * *

80–82. Blue Monarch (Stark, R. Veitch, Webb).—Vigorous, producing fairly large flowers in fours on medium stalks; standards darker than in 'Le Mahdi,' wings very dark violet. Raised by Messrs. Stark.

* * *

86. Lord Nelson Spencer (Pearson).—Vigorous; flowers on rather short stalks in threes, about the size of 'Blue Monarch,' but deeper in colour.

* * *

79. Navy (Ireland & Hitchcock).—Vigorous, bearing very large flowers in fours on 9 inch stems; standards very dark violet, wings equally dark but reddish-violet. Raised by sender.

* * *

83–85. Commander Godsall (Webb, Bees, Bolton), **A.M.**—Very vigorous and almost identical with last, but with a little less red in the dark violet. Loses colour somewhat in water. Nos. 84 and 85 were a little mixed.

87–89. Jack Cornwell, V.C. (R. Veitch, Webb, King).—Indistinguishable from 'Commander Godsall,' but keeps its colour better when picked. Raised by Messrs. King. The award was given to the truest stock.

(*b*) *Grandiflora type.*

106. Lord Nelson (Morse).—The 'Grandiflora' counterpart of the 'Lord Nelson Spencer' above. See general remarks.

VIII. Purple.

96. **Royal Purple, A.M.** July 16, 1921.—Raised by Mr. R. Wright, and introduced by Messrs. Dobbie; sent by Messrs. Ireland & Hitchcock.

(*a*) *Spencer types.*

69. Seedling No. 2 (Hinton).—A weak plant with flowers of short stems in threes. Standards deep lilac with wings a little bluer. Linking this group with the mauves. Raised by sender.

* * *

102.—Mrs. Geo. Winn (Winn).—A very vigorous stock with very large flowers in fours on 10 inch stalks; flowers inside the colour of the standards of 'Adelaide,' but outside mauve, giving almost a bicolour effect. Raised by sender.

* * *

91–96. Royal Purple (Dobbie, Pearson, Webb, Bees, Dickson, Ireland & Hitchcock), **A.M.**—Stocks varied in
97–98. Royalty (Stevenson, King)
vigour; the flowers were very large, in fours on 10 inch stalks, and both wings and standard are purple. A fine variety, but like many plants of its colour needing care in choosing its neighbours. Raised by Mr. Wright and

introduced by Messrs. Dobbie ; also raised by Mr. Stevenson and Messrs. King. Most stocks contained rogues, and the award went to the truest and most vigorous.

IX. Blue Flaked.

(a) Spencer type.

73–75. Loyalty (Stark, Barr, J. R. Pearson).—A vigorous free-flowering variety with medium-sized flowers in threes on long stalks ; standards flaked deep rose-purple, wings deep blue-purple on a white ground. Raised by Messrs. Stark. No. 74 was a mixed stock.

X. Marbled Blue.

(b) Grandiflora type.

107. Helen Pierce (Barr).—Of medium vigour, with small flowers freely produced in threes on rather short stalks ; flowers white-veined and suffused with lavender-violet. Raised and introduced by Messrs. Morse.

MID-SEASON PEAS AT WISLEY, 1921.

One hundred and fifty-three stocks of peas were sent for trial at Wisley in 1921. They were sown on April 4 on ground which had received a good dressing of pig manure in the autumn of 1920. Almost all the stocks germinated well and made good growth, in spite of the abnormally dry season. The distances between the rows varied from 3 feet 6 inches for the dwarf to 6 feet for the tall varieties. The stocks which were fit for use (*i.e.* from which a good picking could be obtained from the row) before June 25 were classed as Early Varieties and these are not further referred to in the report, viz. Nos. 2–6, 9, 10, 14, 28, 34, 36, 40. No. 75 is also omitted as untrue to type.

The Judging Committee inspected the trial several times during the growing period, and in making recommendations for awards took into consideration not only the cropping capacity of the varieties, but also the flavour and size of the peas, the yield of peas for the quantity of pods, the colour of the pod and the ease of shelling.

The following varieties represented in this trial have received awards in previous trials, but were passed over this year by the Judging Committee, viz.:

No. 12. Fillbasket (**F.C.C.** 1872 (Laxton)); No. 32, King Edward (**A.M.** 1911 (Sutton)); No. 29, Evergreen Delicatesse (**A.M.** 1916 (Carter)); Nos. 21–23, Stratagem (**F.C.C.** 1882 (Carter)); No. 80, Yorkshire Hero (**A.M.** 1910 (Sutton)); No. 41, The Newby (**A.M.** 1916 (Hurst)); Nos. 49, 50, Perfection (**A.M.** 1897 (R. Veitch)); No. 46, Prizewinner (**F.C.C.** 1901 (Sutton)); No. 52, Improved Dr. McLean (**A.M.** 1902 (Sutton)); No. 67, Danby Stratagem (**A.M.** 1916 (Carter)); No. 79, Satisfaction (**A.M.** 1916 (Sutton)); Nos. 89, 90, Glory of Devon (**A.M.** 1916 (Barr)); No. 78, Eureka (**A.M.** 1911 (Sutton)); No. 86, Ameer (**A.M.** 1901 (Sutton)); No. 101, Dawn (**A.M.** 1915 (Carter)); No. 151, Prince of Peas (**A.M.** 1916 (Sutton)); No. 152, Warriston Wonder (**A.M.** 1913 (Bell & Bieberstedt)); No. 148, Moneymaker (**A.M.** 1910 (King)); No. 110, Market Gardener (**A.M.** 1916 (Carter)); No. 112, Harvestman (**A.M.** 1916 (Carter)); No. 117, Telephone (**F.C.C.** 1878 (Carter)); No. 121, Quite Content (**A.M.** 1916 (Barr, Carter)); No. 123, International (**A.M.** 1916 (Carter)); Nos. 129, 130, 131, Duke of Albany (**A.M.** 1916 (Carter)); No. 132, Essex Wonder (**A.M.** 1905 (Hobday)); No. 97, Autocrat (**F.C.C.** 1885 (J. Veitch)); No. 99, Sir Arthur Bingold (**A.M.** 1913 (Holmes)); No. 118, Exhibition (**A.M.** 1910 (Carter)).

AWARDS, DESCRIPTIONS, AND NOTES.

I. Above 1½ feet and up to 3 feet in height.

A. Earlier Varieties.

(1) *Seed semi-wrinkled ("dent").*

*62. **Progress, C.** July 4. Raised and sent by Messrs. Laxton.

11. **Gladiator, C.** July 4. Raised by Messrs. J. Veitch; sent by Messrs. Cooper-Taber.

1. Buttercup (Carter).—See Journal, vol. xliii. p. 501. Ready July 3.

* * *

62. Progress (Laxton), **C.**—Height 2 to 2½ feet, with sturdy, dark haulm; pods freely produced in pairs, 4 inches long, broad, and somewhat pointed, nearly straight, dark green; peas large, 7 or 8 in a pod, of fair flavour. Ready July 4.

* * *

11. Gladiator (Cooper-Taber), **C.**—Height 3 feet, with sturdy, medium green haulm; pods in pairs, 3½ to 4 inches long, of medium width, pointed,

* See footnote p. 75.

curved, dark green; peas 7 or 8, of medium size, fairly sweet; commended for its heavy crop. Ready July 4.

12. Fillbasket (Carter).—Indistinguishable from 'Gladiator,' but not quite a true stock. Raised by Messrs. Laxton. Ready July 4.

(2) *Seed wrinkled.*

35. **Beauty, H.C.** July 4, 1921. Raised and sent by Messrs. Unwin.
15. **Wonder, H.C.** July 4, 1921. Raised and sent by Messrs. Unwin.
7. **Eldorado, H.C.** July 4, 1921. Raised and sent by Messrs. Unwin.
26. **James Kelway, H.C.** July 4, 1921. Raised and sent by Messrs. Kelway.
24. **Advance Guard, C.** July 4, 1921. Raised and sent by Messrs. Unwin.

31. Canner's Perfection (Rice).—Height 3 feet, with medium haulm, dark grey-green; pods 2½ to 3 inches, in pairs, of medium width, nearly straight, pale; peas rather small, yellow green, 6 or 7 in a pod, fairly sweet; crop good. A good pea for canning. Ready June 27.

* * *

35. Beauty (Unwin), **H.C.**—Height 2¾ feet, with stout, medium grey-green haulm; pods in pairs, of medium width, blunt, straight, medium green; peas large, 6 or 7 in a pod, of fair flavour; crop very heavy. Ready July 4.

* * *

17. Favourite (Unwin).—Height 2½ feet; with dark yellowish foliage; pods generally in pairs, 3 to 3½ inches long, rather narrow, blunt, nearly straight, dark green; peas 7, large, sweet; crop good. Raised by sender. Ready July 4.

* * *

15. Wonder (Unwin), **H.C.**—Height 2 feet, with medium haulm, dark grey-green; pods in pairs, 3 to 3½ inches, of medium width, straight, dark; peas 6 to 8 in a pod, of medium size and excellent flavour; crop very good. Ready June 30.

* * *

7. Eldorado (Unwin), **H.C.**—Height 2¼ feet, with stout, dark grey-green haulm; pods in pairs, 3 to 3½ inches, blunt, straight, dark green; peas large, 6 or 7 in a pod; flavour good; crop good. Ready July 4.

* * *

32. King Edward (Simpson).—Height 2½ feet, with stout, dark haulm; pods in pairs, 3½ to 4 inches, blunt, broad, straight, medium green; peas large, 6 or 7 in a pod; of fair flavour; crop fair. Ready July 4. Raised by Messrs. Sutton.

* * *

33. Queen (Unwin).—Rather variable in colour and size of pod, the dark type being very good. Raised by sender. Ready June 26.

* * *

51. Charles I. (Carter).—Height 2½ feet, with medium, dark grey-green haulm; pods in pairs, 3 inches long, narrow, pointed, nearly straight, pale; peas small, 7 to 9 in a pod, sweet; crop good. An old type of pea. Ready July 1.

* * *

29. Evergreen Delicatesse (Carter).—Similar to 'Charles I.,' but pods 3½ inches, wider, and dark green. See Journal, vol. xliii. p. 503. Raised by sender. Ready June 30.

* * *

26. James Kelway (Kelway), **H.C.**—Height 3 feet, with stout, medium green haulm; pods in pairs, pointed, of medium length, width, and colour, curved; peas large, 7 in a pod, fairly sweet; crop good. Ready July 4.

* * *

24. Advance Guard (Unwin), **C.**—Height 2½ feet, with medium grey-green haulm; pods generally in pairs, pointed, of medium length, width and colour, curved; peas large, 6 or 7 in a pod, sweet; commended for its very good crop. Ready July 4. A few pale-podded rogues.

* * *

27. Mein's Reliance Marrow (Laing and Mather).—Height 3 feet, with stout, dark haulm; pods in pairs, 3½ inches long, pointed, of medium width, curved, and pale; peas large, light yellowish green, 5 to 7 in a pod, fairly sweet; crop fair. Raised by Messrs. Stuart and Mein. Ready June 27.

21–23. Stratagem (Carter, Kelway, Barr).—Green haulm ; pods often double. See Journal, vol. xliii. p. 504. The pea this season was only 2 feet in height. Raised by Messrs. Carter. Ready July 4.

* * *

19. Bv/3 (Laxton).—A good pea, except that the pods contained many blanks. Raised by sender. Ready July 4.

B. Later Varieties.

Seed wrinkled.

13. **Dwarf Monarch, H.C.** July 11, 1921. Raised and sent by Messrs. Carter.

20. **Commonwealth, H.C.** July 11, 1921. Raised and sent by Messrs. Carter.

16. **Pixie, C.** July 11, 1921. Raised and sent by Messrs. Unwin.

38. **Ideal, C.** July 11, 1921. Raised and sent by Messrs. Unwin.

8. Daisy (Carter).
25. Improved Daisy (Simpson). } —See Journal, vol. xliii. p. 501. Ready July 9.

* * *

13. Dwarf Monarch (Carter), **H.C.**—Height 2½ feet ; haulm stout ; foliage dark ; pods in pairs, 3 to 3½ inches, of medium width, straight, blunt, dark ; peas large, 5 or 6 in a pod, of fair flavour ; crop good. Ready July 8.

* * *

16. Pixie (Unwin), **C.**—Height 2 feet ; characters as above, but pods broader and a little later ; peas 7 to 9 in a pod, of medium size. Ready July 11.

* * *

18. Historian (Unwin).—Height &c. as No. 16 ; pods in pairs, of medium length and width ; peas large, 6 or 7 in a pod, of good flavour ; crop good. Raised by sender. Ready July 7.

* * *

20. Commonwealth (Carter), **H.C.**—See Journal, vol. xliii. p. 502.

* * *

37. King (Unwin).—Height 2½ feet ; haulm stout ; foliage dark ; pods in pairs, 3½ to 4 inches, broad, slightly curved, pointed, rather pale, do not fill well ; peas large, 6 or 7 in a pod, somewhat mealy ; crop good. Ready July 6. Raised by sender.

* * *

38. Ideal (Unwin), **C.**—Height 2½ feet ; haulm stout ; foliage dark ; pods in pairs, 3½ to 4 inches long, broad, straight, blunt, dark ; peas large, 6 or 7 in a pod, of fair flavour ; crop fairly good. Ready July 8.

* * *

39. The Victor (Barr).—See Journal, vol. xliii. p. 511. Ready July 9.

* * *

68. Anticipation (Carter).—Height 2½ feet ; haulm stout, foliage dark ; pods in pairs, 3 inches long, broad, blunt, straight, rather pale ; peas large, 6 or 7 in a pod, of good flavour ; crop fairly good. Raised by sender. Ready July 8.

* * *

59. Paragon (Dickson and Robinson).—Height 2¼ feet ; haulm medium ; foliage dark ; pods generally in pairs, 3½ to 4 inches long, broad, curved, pointed, medium green ; peas large, 7 or 8 in a pod, of good flavour ; crop poor. Raised by sender. Ready July 10.

* * *

65. Chancelot (Bell).—Height 2¾ feet ; haulm stout ; foliage dark ; pods often single, 3½ to 4 inches long, fairly broad, straight, pointed, medium green ; peas large, 6 or 7 in a pod, of good flavour ; crop good. Raised by sender. Ready July 8.

* * *

80. Yorkshire Hero (purchased).—See Journal, vol. xliii. p. 502.

II. Between 3 feet and 4 feet 6 inches.

A. Earlier Varieties.

Seed wrinkled.

66. **Duke of York, H.C.** July 4, 1921. Sent by Messrs. Cooper-Taber and raised by Mr. George Taber.

61. **Northern Record, H.C.** July 11, 1921. Raised and sent by Messrs. Dickson and Robinson.

46. **The Southwark, H.C.** July 4, 1921. Raised and sent by Messrs. Cooper-Taber.

42, 43, 44. **Union Jack, H.C.** July 11, 1921. Sent by Messrs. Kelway, Simpson and Barr; raised by Messrs. Hurst.

30. **Commodore, H.C.** July 4, 1921. Sent by Messrs. R. Veitch.

63, 64. **Senator, C.** July 4, 1921. Sent by Messrs. Rice and Webb.

54. **John Bull, C.** July 4, 1921. Sent by Messrs. Carter.

41. The Newby (Hurst).—See Journal, vol. xliii. p. 504. Not a true stock. Raised by sender. Ready July 1.

* * *

153. The Shrewsbury (Bayley).—Height 3 feet, with stout, medium green haulm; pods in pairs, 3½ to 4 inches long, broad, slightly curved, medium green; peas of medium size, 6 or 7 in pod, of good quality, but crop small. Ready July 16.

* * *

102. William Richardson (Nutting).—See Journal, vol. xliii. p. 510. Crop fair. Ready July 4.

* * *

66. Duke of York (Cooper-Taber), **H.C.**—Height 4 feet, with medium yellow-green haulm; pods mostly single, 4 to 4½ inches, broad, nearly straight, pointed, fairly dark green; peas large, 7 or 8 in a pod, of good flavour; crop heavy. Ready June 28.

* * *

61. Northern Record (Dickson and Robinson), **H.C.**—Height 3 feet, with stout haulm and yellowish green foliage; pods in pairs, 4 to 4½ inches, broad, straight, pointed, medium green; peas large, 8 or 9 in a pod, of fair flavour; crop good. Ready July 4.

* * *

63, 64. Senator (Rice, Webb), **C.**—See Journal, vol. xliii. p. 504. Crop good. Ready July 1.

54. John Bull (Carter), **C.**—Very similar to 'Senator.' (Not 'John Bull' of Messrs. Laxton.) Ready July 4.

* * *

42–44. Union Jack (Kelway, Simpson, Barr), **H.C.**—See Journal, vol. xliii. p. 511. Crop very good. Ready July 4.

* * *

46. The Southwark (Cooper-Taber), **H.C.**—Height 4 feet, with medium light-green foliage; pods in pairs, 3½ to 4 inches long, broad, medium green, pointed, straight; peas 8 or 9 in a pod, large, of good flavour; crop good. Ready June 27.

* * *

30. Commodore (Veitch), **H.C.**—Height 3½ feet, with medium dark-green foliage; pods mainly in pairs, 3 to 3½ inches long, broad, pointed, medium green, nearly straight; peas 7 or 8 in a pod, large, of good flavour. Ready July 4.

* * *

77. Giant Delicatesse (Carter).—Height 4 feet; haulm stout; foliage dark; pods in pairs, 3 to 3½ inches long, narrow, pointed, pale, curved; peas large, 6 or 7 in a pod, sweet; crop fairly good. Ready July 1.

B. Later Varieties.

Seed wrinkled.

53. **The Bell, H.C.** July 11, 1921. Sent and raised by Messrs. Bell.

81. **Magnum Bonum, H.C.** July 11, 1921. Purchased; raised by Messrs. Sutton.

47. **Lord Chancellor, C.** July 11, 1921. Sent and raised by Messrs. Carter.
72. **Lancastrian, C.** July 11, 1921. Sent and raised by Messrs. Dickson and Robinson.

49, 50. PERFECTION (Veitch, Carter).—See JOURNAL, vol. xliii. p. 503. Ready July 10.

* * *

69. DREADNOUGHT (Carter).—See JOURNAL, vol. xliii. p. 518. Ready July 13.

* * *

56. FOLLOWER (Carter).—See JOURNAL, vol. xliii. p. 517. Ready July 9.

* * *

57, 58. PRINCE OF WALES (Rice, Barr).—See JOURNAL, vol. xliii. p. 503. Ready July 1.

* * *

60. NORTHERN CONQUEROR (Dickson and Robinson).—Height 3 feet; haulm stout; foliage dark; pods generally in pairs, 3 inches long, broad, somewhat curved, blunt, dark; peas of medium size, 6 or 7 in a pod, of fair flavour; crop poor. Raised by sender. Ready July 11.

* * *

45. PRIZEWINNER (Kelway).—See JOURNAL, vol. xliii. p. 509. Ready July 10.

* * *

47. LORD CHANCELLOR (Carter), **C.**—Height 3¼ feet; haulm stout; foliage dark; pods in pairs, 4 to 4½ inches long, fairly broad, straight, dark, pointed; peas large, 7 or 8 in a pod, of good flavour; crop good. Ready July 6.

* * *

48. IMPROVED QUEEN (Carter).—See JOURNAL, vol. xliii. p. 505. Ready July 10.

* * *

52. IMPROVED DR. MCLEAN (Carter).—See JOURNAL, vol. xliii. p. 502. Not a true stock. Ready July 9.

* * *

53. THE BELL (Bell), **H.C.**—Height 3½ feet; haulm stout; foliage dark; pods in pairs, 3½ to 4 inches long, fairly broad, curved, pointed, dark; peas large, 6 or 7 in a pod, of good flavour; crop good. Ready July 8.

* * *

55. DELICATESSE (Carter).—See JOURNAL, vol. xliii. p. 508. Ready July 7.

* * *

67. DANBY STRATAGEM (Carter).—See JOURNAL, vol. xliii. p. 504. Ready July 11.

* * *

72. LANCASTRIAN (Dickson and Robinson), **C.**—Height 3½ feet; haulm stout; foliage dark; pods in pairs, 3½ to 4 inches, broad, straight, pointed, dark; peas large, 6 or 7 in a pod, of good flavour; crop good. Ready July 10.

* * *

73. NORTHERN BEARER (Dickson and Robinson).—Characters as above, but pods curved. Ready July 11.

* * *

74. ROYAL SALUTE (Simpson).—See JOURNAL, vol. xliii. p. 505. Ready July 11.

* * *

79. SATISFACTION (purchased).—See JOURNAL, vol. xliii. p. 509.

* * *

81. MAGNUM BONUM (purchased), **H.C.**—See JOURNAL, vol. xliii. p. 503.

* * *

98. NORTHERN HERO (Dickson and Robinson).—Height 3¼ feet; haulm stout; foliage dark; pods often single, 4 inches long, of medium width, curved, pointed, dark; peas large, 7 or 8 in a pod, of fair flavour; crop fair. Raised by sender. Ready July 11.

* * *

96. MODEL (Webb).—Height 3 feet; haulm stout; foliage dark; pods generally in pairs, 3½ to 4 inches long, broad, somewhat curved, pointed, medium green; peas large, 7 or 8 in a pod, of good flavour; crop good. Introduced by sender. Ready July 10.

89, 90. Glory of Devon (Veitch, Nutting).—See Journal, vol. xliii. p. 508. No. 89 had plain green foliage, while that of No. 90 was marbled. Ready July 14.

* * *

134. Northern King (Dickson & Robinson).—Haulm 4 feet, very stout; foliage dark; pods in pairs, 4 to 4½ inches long, curved, broad, pointed, dark; peas large, 8 or 9 in a pod, sweet and juicy; crop medium. Raised by sender. Ready July 1.

* * *

78. Eureka (purchased). See Journal, vol. xliii. p. 510.

III. Above 4½ feet in height.

A. Earlier Varieties.

(1) *Seed round.*

(*a*) Pods edible; flowers violet.

124. Grey Sugar (Carter).—Height 5½ feet; pods single, very broad, irregularly curved, 4 inches long, pale green, blunt; crop heavy. Ready July 3.

(*b*) Pods edible; flowers white.

113. Giant Edible-podded (Carter).—Height 5 feet; pods in pairs, 4 inches long, of medium width, pale, somewhat curved; crop fair. Ready June 30.

* * *

82. Mammoth Melting Sugar (Rice).—Height 5½ feet; pods in pairs, 3 to 3½ inches long, broad, pale, curved. Ready July 4.

83. Serpette Française (Carter).—Similar to No. 82. Ready July 2.

* * *

85. The Mikado (Carter).—Height 5½ feet; pods in pairs, 4 inches long, broad, medium green, nearly straight; crop good. Ready July 2.

(*c*) Pods not edible.

84. Market Favourite (Carter).—Height 5½ feet; haulm medium; foliage medium green; pods single or in pairs, 3 to 3½ inches long, broad, pointed, pale, curved forward; peas 7 or 8 in a pod, large, mealy; crop good. Ready July 2.

* * *

86. Ameer (Rice).—Not a good stock. Ready June 25.

(2) *Seed semi-wrinkled.*

137. **Belvoir Castle, H.C.** July 4, 1921. Sent by Mr. Earl; raised by Mr. Divers.

137. Belvoir Castle (Earl), **H.C.**—Height 5 feet, with stout, medium green haulm; pods single, 4 inches long, pointed, broad, medium green, curved; peas of medium size, 7 or 8 in a pod, of very fair flavour; crop heavy. Ready July 4.

(3) *Seed wrinkled.*

125. **Elephant, A.M.** July 4, 1921. Raised and sent by Messrs. Carter.

91–94. **Admiral Beatty, A.M.** July 4, 1921. Sent by Messrs. Toogood, Veitch, Kelway, Carter; raised by Messrs. Laxton. (**A.M.** 1920 as early pea.)

145. **Alderman, A.M.** July 11, 1921. Sent by Messrs. Nutting; raised by Messrs. Laxton. (F.C.C. 1900.)

150. **King George, A.M.** July 4, 1921. Sent and raised by Messrs. Webb.

128. **Sharpe's Standard, H.C.** July 4, 1921. Sent by Messrs. Barr; raised by Messrs. Sharpe.

104. **Peacemaker, H.C.** July 4, 1921. Introduced and sent by Messrs. Kelway.

108, 109. **Clipper, H.C.** July 4, 1921. Sent by Messrs. Sydenham and Kelway; introduced by Messrs. Sydenham.

76. **Jersey Hero, H.C.** July 4, 1921. Sent by Messrs. Nutting.
136. **King of Peas, H.C.** July 4, 1921. Raised and sent by Messrs. Dickson & Robinson.

71. ADMIRAL (Rice).—Height 5 feet, with medium haulm and medium green foliage; pods single or in pairs, 2½ to 3 inches long, narrow, blunt, straight, medium green; peas small, 6 or 7 in a pod, of fair flavour; crop good. Ready July 1.

* * *

70. GREEN SEED ADMIRAL (Rice).—Foliage a little darker than No. 71. Nos. 70 and 71 much used for canning in America. Ready July 1.

* * *

101. DAWN (Carter).—Height 4½ feet; medium green foliage; pods in pairs, 3 to 3½ inches long, broad, blunt, straight, dark green; peas large, 7 or 8 in a pod, sweet and juicy; crop good. Raised by sender. Ready June 28.

* * *

125. ELEPHANT (Carter), **A.M.**—Height 5 feet; haulm stout, foliage dark yellowish green; pods mostly single, 4 to 4½ inches long, broad, rather curved, blunt, dark green; peas large, 7 or 8 in a pod, of good flavour; crop excellent. Ready July 4.

* * *

138. GOLDFINDER (Veitch).—See JOURNAL, vol. xliii. p. 512. Ready July 2.

* * *

151. PRINCE OF PEAS (purchased). See JOURNAL, vol. xliii. p. 507. Ready July 4.

* * *

152. WARRISTON WONDER (Bell).—See JOURNAL, vol. xliii. p. 513. Ready July 4.

* * *

91–94. ADMIRAL BEATTY (Toogood, Veitch, Kelway, Carter), **A.M.**—Crop very good. See JOURNAL, vol. xlvi. p. 388. Ready July 2.

* * *

128. SHARPE'S STANDARD (Barr), **H.C.**—Height 5 feet; haulm stout, foliage dark green; pods generally in pairs, 3½ to 4 inches long, broad, pointed, curved, dark green; peas large, 6 to 8 in a pod, of good flavour; crop good. Ready July 3.

* * *

133. SHARPE'S STANDARD (Nutting).—Stock somewhat mixed.

* * *

103. ROYAL MARROWFAT (Toogood).—Of Alderman type. Crop good. Selected by sender. Ready July 4.
104. PEACEMAKER (Kelway), **H.C.**—Of Alderman type. Crop excellent. Ready July 4.
141–147. ALDERMAN (Simpson, Barr, Rice, Veitch, Nutting, Toogood, Boulter).—See JOURNAL, vol. xliii. p. 506. Ready July 4.

* * *

140. AMATEUR'S PRIDE (Kelway).—Stock not quite true. Ready July 4.

* * *

148. MONEYMAKER (King).—Stock not true. See JOURNAL, vol. xliii. p. 512. Ready July 2.

* * *

150. KING GEORGE (Webb), **A.M.**—See JOURNAL, vol. xliii. p. 507. Ready July 3.

* * *

108, 109. CLIPPER (Sydenham, Kelway), **H.C.**—See JOURNAL, vol. xliii. p. 506. Ready July 4.

* * *

76. JERSEY HERO (Nutting), **H.C.**—See JOURNAL, vol. xliii. p. 505. Ready June 28.

* * *

105. THE BRITISHER (Kelway).—Height 5 feet; haulm medium; foliage dark; pods in pairs, 4 inches long, medium width, pointed, nearly straight, dark; peas large, 7 or 8 in a pod, of good flavour; crop fair. Introduced by sender. Ready July 1.

106. Old England (Kelway).—A taller pea with broader pods than the last, but requires further selection, the best plants being very good. Ready July 4.

* * *

110. Market Gardener (Carter).—See Journal, vol. xliii. p. 507. Ready July 1.

* * *

112. Harvestman (Carter).—See Journal, vol. xliii. p. 507. Ready June 30.

* * *

114, 115. Telegraph (Rice, Carter).—See Journal, vol. xliii. p. 511. Ready July 2.

* * *

116. Model Telephone (Carter). } —See Journal, vol. xliii. p. 507. Ready
117. Telephone (Rice). } July 4.

* * *

119. Improved Quite Content (Paice). }
120. Model Quite Content (Carter). } —See Journal, vol. xliii. p. 508. Ready July 1.
121. Quite Content (Carter). }

* * *

122. Early International (Carter).—A mixed stock. Ready July 4.
123. International (Carter).—See Journal, vol. xliii. p. 507. Ready July 4.

* * *

129, 130, 131. Duke of Albany (Rice, Carter, Nutting).—See Journal, vol. xliii. p. 506. Ready July 4.

* * *

132. Essex Wonder (Nutting).—See Journal, vol. xliii. p. 507. Ready July 4.

* * *

136. King of Peas (Dickson and Robinson), **H.C.**—Height 5 feet; haulm stout; foliage dark, marbled; pods in pairs, 4 to 4½ inches, broad, straight, pointed, dark; peas 7 or 8 in a pod, of medium size, and fair flavour; crop good. Ready July 4.

B. Later Varieties.

(1) *Seed round.*

87. Market King (Carter).—See Journal, vol. xliii. p. 505. Ready July 9.

(2) *Seed wrinkled.*

111. **1920 Marrow, A.M.** July 4, 1921. Raised and sent by Messrs. Carter.
149. **Reliance Marrowfat, H.C.** July 11, 1921. Raised and sent by Messrs. Webb.
95. **Premier, H.C.** July 4, 1921. Raised and sent by Messrs. Bell.

97. Autocrat (Veitch).—See Journal, vol. xliii. p. 518. Stock not true. Ready July 15.

* * *

126. New Model Battleship (Carter). } —See Journal, vol. xliii. p. 506.
127. Battleship (Carter). } Ready July 9.

* * *

88. Johnson's Glory (Barr).—Height 4½ feet; haulm stout; foliage dark, marbled; pods in pairs, 3½ to 4 inches long, broad, more or less curved, blunt, rather pale; peas large, of fair flavour, 5 or 6 in a pod; crop medium. Raised by Messrs. Johnson. Ready July 11.

* * *

135. Nonsuch Marrowfat (Webb).—See Journal, vol. xliii. p. 511. Ready July 11.

* * *

149. Reliance Marrowfat (Webb), **H.C.**—See Journal, vol. xliii. p. 508. Ready July 6.

* * *

95. Premier (Bell), **H.C.**—See Journal, vol. xliii. p. 507. Ready July 6.

* * *

99. Sir Arthur Bingold (Kelway).—Height 5 feet; haulm medium; foliage medium green; pods generally in pairs, 3½ to 4 inches long, broad, straight or nearly so, pointed, dark; peas large, 7 or 8 in a pod, of good flavour; crop fair. Ready July 7.

100. The Langport (Kelway).—Foliage darker than in No. 99; pods curved and rather longer; other characters similar; irregular in height. Ready July 8.

* * *

111. 1920 Marrow (Carter), **A.M.**—Haulm 5 feet in height, medium; foliage medium green; pods single, 4 to 4½ inches, curved, broad, pointed, dark; peas large, 8 in a pod, of good flavour; crop heavy. Ready July 11.

* * *

107. Up-to-Date (Sydenham).—See Journal, vol. xliii. p. 513. Ready July 10.

* * *

118. Exhibition (Carter).—See Journal, vol. xliii. p. 507. Ready July 9.

* * *

139. Hercules (Dickson and Robinson).—Haulm 5½ feet in height, medium; foliage dark; pods in pairs, 4 inches long, broad, curved, pointed, dark; peas large, 7 or 8 in a pod, of fair flavour; crop fair. Raised by sender. Ready July 9.

MAINCROP POTATOS AT WISLEY, 1921.

EIGHTY-FIVE stocks of potatos were received at Wisley in 1921 for inclusion in the maincrop trial. Forty tubers of each were planted (except in a few cases of seedlings where not so many were available), in two lots of twenty, on April 21. One lot gave consistently higher yields than the other, but the relative differences in the yields of different stocks was, on the whole, maintained throughout. In the whole trial only five plants were found not true to name—a really remarkable instance of the improvement that has taken place in the roguing of varieties for seed purposes during the past few years.

The season was remarkable for the small amount of rain falling during the growing season—less than $3\frac{1}{2}$ inches between planting and lifting on October 14. It gave an opportunity of comparing the propensities of varieties for making the undesirable second growth which so greatly interferes with the keeping and cooking qualities of potatos. The amount made by the different varieties is commented upon below. It also enabled a comparison to be made between the capacity the different varieties had for withstanding adverse conditions, for by August 13, while most varieties were quite green and looked well, 'Drummond Castle,' 'Crusader,' 'Evergood' (albeit, unlike the others, from English seed), 'Gordon Castle,' 'Braemar Castle,' and 'Templar' were all showing signs of distress.

Some varieties, like 'Majestic' and 'Arran Comrade' and 'Ally,' which were planted in the second-early trials of 1920 (see vol. 46, p. 390), were planted again, and enabled comparison to be made between these and later maincrop varieties.

The yields given represent the totals from forty plants, and in comparing them the source of the seed must be taken into account. There was no attack of Phytophthora.

The Committee inspected them on several occasions, and final judgment was given on October 14, when they were cooked. In making awards the Committee took into consideration their cooking quality, cropping, freedom from second growth, shallowness of eyes, as well as other characteristics. The awards made were as follows :

Award of Merit :

'Majestic,' sent by Messrs. Holmes, Barr, Dobbie, and Veitch, raised and introduced by Mr. Findlay.

'Up to Date' (and synonymous stocks, see below), sent by Messrs. Barr, raised by Mr. Findlay.

'Kerr's Pink,' sent by Messrs. Veitch, Clucas, Farmer & Backhouse, Dobbie, Barr, and Bath, raised by Mr. Henry, introduced by Messrs. Dobbie.

Highly Commended :

'Bishop,' sent by Messrs. Clucas, Sutton, and Carter, raised by Dr. J. Wilson.

'King Edward,' sent by Messrs. Farmer & Backhouse, Barr, and Carter, raised by Mr. Butler.

'Ally,' sent by Messrs. Farmer & Backhouse, Dobbie, and Poad, raised and introduced by Mr. McKelvie.

Nos. 24, 36, 51, 65, 66, 67, were too poor to describe. Nos. 82, 'Arran Rose' (Veitch), and 83, 'Zenith' (Macdonald), were early varieties and are not further referred to.

All through this trial we have had the benefit of Mr. Lasham's advice, which we gratefully acknowledge.

Descriptions and Notes.

(*a*) *Tubers kidney, white or yellow.*

1. Flowers white.

*7–10. Majestic (Holmes, Barr, Dobbie, Veitch), **A.M.** 1921.—Described vol. 46, p. 391. Crop 85½ lb., 88 lb., 89 lb., 84¾ lb. (Scotch seed). Some second growth. An early maincrop.

* * *

11–13. Nithsdale (Veitch, Dobbie, Bees).—Described vol. 46, p. 391. Crop 87½ lb., 88¾ lb., 90 lb. (Scotch seed). Much second growth. Introduced by Mr. McAlister. Died down earlier than 'Majestic.'

* * *

14. Oliver's Kidney (Dobbie).—Plant vigorous, dark green, haulm 24 in., tinged reddish brown, erect ; foliage large, rough, dull, rather crumpled ; flowers many, creamy, anthers orange ; tubers medium, flattened kidney ; skin light brown, smooth ; eyes many, shallow ; sprouts purple ; flesh firm, fine, light yellow ; when cooked more or less mealy, deepish yellow, flavour poor. Crop 97¼ lb. (including 16¾ lb. chats) (Scotch). An old variety, raised by Mr. Oliver. Much second growth.

2. Flowers coloured.

2–6. Bishop (Clucas, Sutton, Carter, Dobbie, Holmes), **H.C.** 1921.—Plant vigorous, medium green ; haulm 26 in., green, erect ; foliage large, rough, dull, rather crumpled ; flowers many, dark mauve ; tubers kidney ; skin brown ; eyes few, at end, small, shallow ; sprouts slightly tinged pink ; flesh firm, light yellow ; when cooked firm, yellowish white ; flavour good. Crop 64½ lb. (Irish), 89 lb., 76¾ lb., 91 lb., 80½ lb. (Scotch). Very little second growth.

* * *

1. What's Wanted (Poad).—Described vol. 43, p. 138, as 'Langworthy.' Crop 58½ lb. (Scotch, not sprouted). Little second growth. Flowers dropped in bud.

* * *

15. Jupiter (Dobbie).—Plant vigorous, grey green ; haulm 24 in., very slightly tinged, erect ; foliage of medium size, rough, dull ; flowers mostly dropped in bud ; tubers large, kidney to oval, light brown, smooth ; eyes many at end, small, shallow ; sprouts tinged red ; flesh firm, coarse grained, faintly yellow ; firm, white and mealy when cooked, of fair flavour. Crop 71 lb. (Scotch). Little second growth.

* * *

25. Drummond Castle (Sutton).—Plant vigorous, grey green ; haulm 26 to 28 in., slightly tinged, rather spreading ; foliage large, rough, dull ; flowers few, mostly dropping in bud ; tubers flattened kidney, of medium size, pale, finely russeted ; eyes many, small, of medium depth ; flesh firm, fine, white ; when cooked very firm and mealy, white, and of fair flavour. Crop 106½ lb. (Scotch). Raised by Rev. A. Paton, introduced by sender. Whiter tubers than next ; much second growth. An early maincrop.

* See footnote, p. 75.

26. Harlech Castle (Sutton).—Scarcely so vigorous as last, more compact and remaining green rather longer; tubers of medium size, and with firm pale lemon flesh; when cooked more or less mealy, yellowish, and of poor flavour. Crop 89 lb. (including 18 lb. chats) (Scotch). Raised by Rev. A. Paton, introduced by sender. Much second growth.

* * *

23. White City (Sutton).—Described vol. 43, p. 139. Crop 118 lb. Little second growth and few chats.

3. Flowers drop in bud.

32. Titan (Toogood).—Plant vigorous, spreading, medium green; haulm 22 to 24 in., medium green; foliage large, rough, dull; flowers many, dropping; tubers kidney, of medium size, many at a root; skin smooth, yellowish; eyes many, mainly at end, large, shallow; sprouts purplish; flesh firm, rather coarse, white; when cooked firm, close, waxy, white, of poor flavour. Crop 145½ lb. (Dutch). Chats few, but some second growth.

4. Flowers none.

27–28. Crusader (Veitch, Dobbie).—Plant vigorous, fairly erect, dark green; haulm 28 in., green; foliage large, rough, dull; tubers kidney to oval, flattened, smooth, light brown, of medium size; eyes many, small, shallow; flesh firm, lemon; when cooked firm, rather close, white, of fair flavour. Crop 93¾ lb., 84¼ lb. (Scotch). Raised by Mr. J. Wilson and introduced by Mr. Reid and others. Some second growth, and plants suffered more from drought than many.

(*b*) *Tubers kidney, brown.*

29–31. Golden Wonder (Carter, Dobbie, Barr).—Described vol. 43, p. 140. Crop 83 lb., 74 lb., 68 lb. (Scotch). Raised by Mr. Brown. Little second growth.

(*c*) *Tubers kidney, coloured.*

Flowers coloured.

33–35. King Edward VII. (Farmer & Backhouse, Barr, Carter), **H.C.**, 1921—Described vol. 43, p. 140. Crop 135 lb. (Devon), 143½ lb., 132½ lb. (Scotch). Little second growth.

(*d*) *Tubers oval, white or yellow.*

1. Flowers white.

44–46. Ally (Farmer & Backhouse, Dobbie, Poad), **H.C.**, 1921—Described vol. 46, p. 392. Crop 97½ lb. (Devon), 123¼ lb., 124½ lb. (Scotch). Still green when lifted. Little second growth. Raised by Mr. McKelvie.

* * *

38–41. Rhoderic Dhu (Bees, Clucas, Veitch, Dobbie).—Plant vigorous, dark grey green; haulm somewhat spreading, 24 in., dark green; foliage large, rough, dull; flowers few; tubers large, oval, smooth; eyes many, small, shallow; sprouts slightly tinged; flesh firm, rather coarse, pale lemon; of medium texture and creamy when cooked, flavour fair. Crop 50¾ lb. (Lockerbie), 75¾ lb. (Lancs.), 107½ lb., 114½ lb. (Scotch). Many chats. Much second growth. Raised by Mr. Farish.

* * *

53. Abundance (Sutton).—Described vol. 43, p. 120. Crop 119¾ lb., including 12¾ lb. chats (Scotch). Much second growth. Raised by Mr. Clarke, introduced by sender.

54. Culdees Castle (Barr).—Similar to 'Abundance.' Crop 115¾ lb. (Scotch). Much second growth in both stocks.

* * *

47. Dominion (Poad).—Described vol. 43, p. 121. Crop 110½ lb. Much second growth. Raised and introduced by sender.

2. Flowers coloured.

17–19. Tinwald Perfection (Carter, Dobbie, Barr)—Described vol. 43, p. 121. Crop 76½ lb., 87¼ lb., 80¾ lb. (Scotch). Raised by Mr. W. R. Farish.

16. Rob Roy (Veitch).—Identical with 'Tinwald Perfection.' Crop 75 lb. (Scotch).

68. Braemar Castle (Sutton).—Described vol. 46, p. 392. Crop 91¾ lb. (including 11½ lb. chats) (Scotch). Raised by Rev. A. Paton, introduced by sender.

* * *

20–22. Irish Chieftain (National Inst. Bot., Clucas, Dobbie).—Described vol. 43, p. 138. Crop 101¼ lb. (Scotch), 115¾ lb. (Irish), 110¼ lb. Chats many, second growth copious All stocks were more or less affected with mosaic disease. Raised by Mr. McKenna. Still very green at lifting time.

* * *

59. Up to Date (Barr), **A.M.** 1921.—Described vol. 43, p. 143. Crop 156 lb. Neither in this nor in any of the following stocks of the same type was second growth conspicuous or chats numerous.

60. Factor (Barr).
61. Longkeeper (Carter).
62. Irish King (Barr).
42. Mein's Model (Laing and Mather).

} Indistinguishable from 'Up to Date.' Crops respectively 148 lb., 150 lb., 152¾ lb., 140½ lb. (Scotch).

3. Flowers drop in bud.

63. Gordon Castle (Sutton).—Described vol. 43, p. 144. Crop 72¼ lb. (Scotch). Died down early. Introduced by sender.

* * *

43. Evergood (Bath).—Plant vigorous, spreading, medium green; haulm 20 in., green; foliage large; flowers many, dropping; tubers flattened oval, of medium size; skin rough, brown; eyes many, mainly at end, small, shallow; sprouts tinged pink; flesh firm, pale lemon; when cooked mealy, nearly white, of fair flavour. Crop 65¼ lb. (Cambridge). Some second growth. Died down mid September. Raised by Mr. Findlay.

(*e*) *Tubers round to flat round, white or yellow.*

1. Flowers white.

52. Great Scot (Farmer & Backhouse).—Described vol. 46, p. 393. Crop 118 lb. (Devon). Little second growth. An early maincrop. Raised by Mr. Mair.

* * *

48–50. Arran Comrade (Holmes, Veitch, Bath).—Described vol. 46, p. 393. Crop 127½ lb., 110 lb., 113 lb. (Scotch). Some second growth. An early maincrop. Raised by Mr. McKelvie.

* * *

54. Templar (Veitch).—Plant vigorous, medium green, rather spreading; haulm 28 in., tinged reddish brown; foliage medium, rough, dull; flowers many on long stalks; tubers round, of medium size; rather rough-skinned; eyes mainly at end, shallow, small; sprouts tinged purple at base; flesh firm; rather watery when cooked, and dirty white, flavour fair. Crop 60¼ lb. Suffered from drought. Some second growth. Raised by Dr. Wilson.

* * *

55–56. Arran Chief (Farmer & Backhouse, Barr).—Described vol. 43, p. 142. Crop 134½ lb. (Devon), 170 lb. (Scotch). Tops green at lifting time. Some second growth. Raised by Mr. McKelvie.

2. Flowers coloured.

58. President (Poad).—Described vol. 43, p. 142 (as 'Scottish Farmer'). Crop 97½ lb. (not sprouted) (Scotch). No second growth. Of Continental origin.

57. Scottish Farmer (Carter).—Indistinguishable from last. Crop 110 lb. (Scotch).

3. Flowers drop in bud.

37. Siddington Beauty (Mason).—A promising seedling; but, grown from southern seed, the crop was very moderate—48¼ lb. Should be tried in Scotland.

4. Flowers none.

64. The Netley (F. B. White).—Another seedling of some promise, but not at its best for the same reason as the foregoing. Crop 64¼ lb.

(f) Tubers round or flat round, coloured.

1. Flowers white.

75–77. THE LOCHAR (Veitch, Carter, Dobbie).—Described vol. 43, p. 145. Crop 109½ lb., 125¼ lb., 123½ lb. (Scotch). These weights included 57½ lb. chats ! There was a considerable amount of second growth, and the tops were quite green at lifting time.

* * *

69–74. KERR'S PINK (Veitch, Clucas, Farmer & Backhouse, Dobbie, Barr, Bath), **A.M.** 1921.—Crop 138½ lb., 120½ lb. (Scotch), 120 lb. (Devon), 146¼ lb., 109 lb. (Scotch). Considerable second growth.

* * *

79–81 ARRAN VICTORY (Carter, Farmer & Backhouse, Veitch).—Vigorous, compact, dark green ; haulm 26 in., reddish brown ; foliage large, rough, dull ; flowers many ; tubers deep purplish, smooth, large, round ; eyes many, of medium size, deep, mainly at end ; sprouts purple ; flesh firm, pale lemon ; when cooked soft, creamy, and of poor flavour ; Crop 111 lb. (Scotch), 102 lb. (Devon), 98½ lb. (Scotch). A little second growth. Green at lifting time. Raised by Mr. McKelvie.

* * *

2. Flowers coloured.

78. RECTOR (Carter).—Vigorous, somewhat like 'Lochar' in foliage; haulm 28 in., dark green ; flowers mauve, tipped white ; tubers dark brown, much tinged reddish pink ; eyes deep, mainly at end ; sprouts reddish ; flesh firm, lemon ; dry and mealy when cooked, of rather poor flavour ; crop 97 lb. (Scotch). Little second growth. Green at lifting time. Raised by Dr. Wilson.

BOOK REVIEWS.

"Insects and Human Welfare." By C. T. Brues. 8vo. xii + 104 pp. (Humphrey Milford, London.) 10*s.* 6*d.* net.

This volume gives a short review of the principles and practice of economic entomology.

Of the five chapters, four are devoted to insects and their particular relationships to man, such as Insects and Public Health, Food Supply, Forest and Household.

There are forty-two illustrations, including several maps, showing the introduction, subsequent spread, and present distribution of many well-known pests in the United States, together with over thirty photographs of insects.

On p. 61 is given a useful diagram showing the various combinations in which arsenical compounds may be used with Contact Insecticides and Fungicides. Although lead arsenate and soap is advised as a combination, it should be tested on a small scale before being used to any large extent in this country, on account of the danger of adding soap to acid lead arsenates, which will burn foliage.

Although this book is intended for American readers, it can be profitably read in this country. It is clear and concise, and shows the effect of insects on human life, and the enormous damage done, directly and indirectly, to man's health and comfort, his food, both animal and vegetable, his clothing, and the general necessaries of life, such as timber &c.

"Insect Pests of Farm, Garden, and Orchard." By E. Dwight Sanderson and L. M. Peairs. 8vo., v + 691 pp. (Chapman & Hall, London, 1921.) **26*s.* net.**

This book has been revised and several chapters added in this second edition, the first having been published in 1915 (R.H.S. JOURNAL, xlii. pt. 2–3, p. 452). It is profusely and clearly illustrated with 604 illustrations.

The necessity for such a book in the States is readily recognized when the grand total annual loss by Insects to crops and stock is estimated at over £500,000,000. The chapters are divided up into the pests of Cabbage, Fruits, Stored Grain, Household, Domestic Animals, &c., together with the very necessary chapters on Insect Structure, Beneficial Insects, Insecticides, and Spraying Machinery.

The mistake common to most American writers appears, *i.e.* to call the Bean and Pea Beetles (*Bruchus* spp.), 'Weevils,' whereas the true Weevil is *Sitones*, the genus Bruchus not being a weevil in any sense of the word.

Although this book is intended for American readers, it contains many of our British pests, often under synonyms.

A few of our common pests, as the Apple Sawfly, Apple Psylla, Pear Midge, and Black Currant Mite are omitted, presumably on account of their absence in the States. The life history of the Woolly Aphis does not mention its migration from the Elm to the Apple, although this important knowledge of reinfection was first worked out in America.

Most of the important Pests of Farm, Garden, and Orchard are described and figured, and remedies given for the great majority, and it should prove a useful reference book.

"Manual of Tropical and Sub-Tropical Fruits." By Wilson Popenoe. Pp. xv + 474, with 24 plates and text illus. (New York: The Macmillan Co., 1920.) Price 30*s.* net.

From this manual are excluded the banana, the coconut, the pineapple, citrus fruits, the olive and the fig, the reason for these omissions being that these important fruits have been fully treated by other writers. A few of the subjects dealt with, such as the date, the avocado pear, the mango, the kaki or Japanese persimmon, and the pomegranate, are more or less regular articles of commerce and are fairly well known on the London market, whilst others such as the loquat, the guava, and the litchi are sometimes met with as preserves; but the majority are seldom seen in shops and are scarcely known outside botanic

gardens. The manual affords ample evidence that there is an abundance of material still awaiting development in tropical regions, but the author is careful to point out that it is a mistake to assume that in the tropics "luscious fruits grow on every tree and the languorous native has only to stretch forth his hand to obtain his dinner." As a matter of fact, inhabitants of tropical countries frequently suffer from lack of fresh fruit and have nothing like the supplies that are available to dwellers in temperate zones. The ignorance of the art of grafting is advanced by the author as one of the principal causes of the absence of superior fruit, most of the fruit available in tropical countries being the produce of wild or semi-wild trees that have not been improved by cultivation. As is well known, the finest fruits are artificial productions and can only be retained for use of man by artificial means. Tropical fruits leave ample room for improvement, but this can only take place when their cultivation is taken up on the lines of rubber, coconut, cotton, and other tropical crops which have seriously engaged the attention of European and American planters during recent years. The food supply of natives of tropical countries becomes more important every year, and this is more especially the case when food is given in return for labour, as is the case with most planting companies. Several of the fruits mentioned in the manual are of considerable food value apart from their importance as an adjunct to the ordinary dietary. It is on this account suggested that agricultural development should be carried on on broader lines, and that the production of food crops, including fruit, should proceed along the same lines as the development of crops for export. Systematic cultivation has already done wonders for several tropical and sub-tropical fruit crops, for instance, bananas, pineapples, coconuts, and citrus fruits, to mention only a few of the fruits that have engaged the attention of planters in tropical countries. In carrying on this good work the manual should prove of great assistance, for it presents in a convenient form all the available information regarding the subjects treated, and in cases where they have been experimentally cultivated particulars of their requirements and methods of propagation are furnished. The text-illustrations, prepared from photographs specially for this work, are very helpful; but the plates, which are also good, would have been better placed opposite the descriptive matter relating to them instead of being scattered through the work without page references.

"A Garden of Peace: A Medley of Quietude." By F. Littlemore. 8vo. 271 pp. (Collins, London, 1919.) 10*s.* 6*d.* net.

The sub-title better conveys an idea of the contents of this book than the main title. A medley it is, but a very pleasant one, and recurring again and again to the garden "about it and about," and breathing a spirit of quiet humour from beginning to end, sometimes developing into fun. But again and again the garden and what it means comes up, and (p. 143) "If I were asked in what direction one should look for the salvation of the race from the rush into Avernus toward which we have been descending, I would certainly say, 'The garden and the allotment only will arrest our feet on the downward path.'"

"The Flora of South Africa: Dictionary of the Common Names of Plants, with List of Foreign Plants cultivated in the Open." By R. Marloth. 175 pp. 8vo. (Specialty Press, Cape Town, 1917.) 6*s.* 6*d.*

Part III. of this book gives a partial list of exotic plants cultivated in South Africa, beginning with "aardapple" (potato) and ending with "zooneblom" (sunflower). The two names quoted illustrate well the keynote of the source of the common names of native plants which occupy the first two parts of the book—the majority appear to be derived from Dutch, and comparatively few from the native languages. As usual many common names are attached to some plants. For instance *Asclepias fruticosa* is variously called gansies, melkbos, tondelbos, wilde kapok, fire-sticks, shrubby milkweed, wild cotton; and also as usual the same common name is made to apply to several species—for instance, steek-gras means *Aristida congesta, Heteropogon contortus,* and *Cymbopogon hirtus,* as well as other species. The list should be very useful to students of the Cape flora.

"The Fungal Diseases of the Common Larch." By W. E. Hiley, M.A. xi + 204 pp. 8vo. (Clarendon Press, Oxford, 1919.) 12*s.* 6*d.* net.

An excellent and exhaustive account of the subject with which it deals, well illustrated, clearly written, and amply indexed.

"A Text-Book of Mycology and Plant Pathology." By John W. Harshberger, Ph.D. 8vo. 779 pp.; 271 illustrations. (P. Blakiston's Son & Co., Philadelphia, 1917.) $4.00.

This book contains, as far as possible, an up-to-date account of the general morphology, classification, and physiology of the fungi. This is followed by a comprehensive survey of general plant pathology. Four chapters are devoted to specific diseases of plants and methods of control. The latter part of the book contains a useful account of the more important cultural and inoculation methods employed by the bacteriologist and mycologist.

Teachers and students should find this book useful for reference and class-work. The illustrations and diagrams are numerous, and there is a good index of original papers.

It is pleasing to find such a wealth of information included under one cover, and in the English language.

"The Rose Guide for Amateurs." By E. Percy Smith. 8vo. 160 pp. (Garden Life Press, London, 1920.) 3*s*.

This is a little book of 160 pages, of which the first twenty-four and the last three are devoted to the usual cultural directions, the remainder being a descriptive list of garden varieties. Of these, upwards of 250 are described, each variety being allotted about half a page of letterpress.

The book is therefore rather of the nature of a glorified catalogue, and as in a catalogue the older varieties are described in the groups to which they belong, but those introduced within the past five years are collected together irrespective of their affinities.

The selection of varieties made by the author is a very fair one, and the descriptions given are often good, and are followed by a note of the faults of each variety. He has, however, included rather too many varieties which do not grow sufficiently well under ordinary garden treatment, and some of these are even described as vigorous. This is particularly the case among the new roses, of which some half-dozen out of the forty-nine mentioned are open to this criticism. His views as to roses suitable for garden ornament, however, are decidedly optimistic; for instance, 'Mrs. Cornwallis West' is recommended for this purpose, while 'British Queen' is described as excellent for bedding. The flowers of the latter are certainly of very great beauty, but they are far too often found bending over face downwards, on or near the soil, while the plants produce too much thin and twiggy growth to be of any value as a bedding variety.

A feature of the book is that at the bottom of each page is a short aphorism or piece of advice, such as "Roses are not bog plants. They require plenty of drainage." The author is to be congratulated on his industry in collecting 160 of these recommendations.

There is no index, but a list of the varieties is given with a reference to the page in which each is described. There are some half-dozen illustrations, one of which is coloured and represents the rose "Victory."

"The Australian Rose Book." By R. G. Elliott. 8vo. 224 pp. (Whitcombe & Tombs, Melbourne and London, 1920.) 12*s*. 6*d*.

This book, which is illustrated with seventy photographs and illustrations, is an interesting contribution to the literature of the Rose, as showing the interest taken in rose-growing and hybridizing in the Colonies. A list of forty new roses raised in Australia and New Zealand is given, the greater number of which are due to the industry of Mr. Alexander Clark in Victoria, and Mr. W. E. Lippiatt in Auckland. The volume is divided into four parts. Parts I. and II. deal with cultivation and treatment, Part III. with cross-fertilization and varieties, and Part IV. consists of seven chapters, each by a different writer, dealing with rose-growing in New South Wales, South Australia, Queensland, Western Australia, Tasmania, and New Zealand, to which is added one from Oregon, U.S.A.

Naturally enough, the methods of cultivation employed in Australia do not differ materially from those that are found successful in this country, but, after reading Mr. Elliott's book, one is convinced the Australian climate is excellent for rose-growing, even in Western Australia that one had been accustomed to regard as parched and barren. The gold mines have provided the necessary water in unlimited quantity, and we read that with this addition the soil, a red clayey loam, is very suitable for rose-growing, plants growing very strongly and producing fine blooms.

In his short chapter on diseases, Mr. Elliott professes to have found a cure for the disease sometimes called crown canker, which has become very destructive in many gardens. He paints the stems, not the leaves, with dilute sulphuric acid (two tablespoons to a gallon of water), or with dilute permanganate of potash. This should be good news for many rosarians the world over.

Mr. Elliott's book is pleasantly written and well printed, and will repay perusal by rose-growers in this country, who will find that, generally, the roses that succeed in this country are also popular in Australia.

"Chemistry of Crop Production." By T. B. Wood. Cr. 8vo. 199 pp. (Clive, London, 1920) 7*s.* 6*d.*

This is an eminently readable little book dealing clearly with the main factors of plant-growing, so far as water supply and supplies of chemical substances—such as lime, potash, nitrogen, and phosphates—go. The text is illustrated by some excellent maps; and various easily carried out tests and experiments, within the competence of most who have had any experience of elementary science, are suggested. The book is one that the elementary student and the grower will both be able to profit by.

"Sweet Peas and Antirrhinums." By W. Cuthbertson. Ed. 2. 119 pp. 8vo. (Clarke, London, 1920.) Paper boards, 2*s.* 3*d.*

A past master in the art of growing and showing Sweet Peas and Antirrhinums, the raiser and introducer of many fine varieties of both, and an excellent judge of what is best in such popular flowers as these, we can have no better guide to their choice and cultivation. Both plants are plants for every garden; both appeal in various ways to almost every gardener, both are useful for the decoration of the greenhouse, and both are good for cutting. Neither has yet reached the limit of its possibilities nor the maximum of its cultivation, and both the old gardener and the novice may turn to the pages of this little book with profit.

"Dictionary of Botanical Equivalents—French-English, German-English." By E. Artschwager, Ph.D., and E. M. Smiley, M.A. 8vo. 137 pp. interleaved. (Williams & Wilkins, Baltimore, 1921.)

A useful, but unequally balanced book, whereof pages 1 to 15 comprise French botanical terms with their American equivalents, and the remainder German. Naturally, therefore, we find *Mischling*, but not *Métis*, and the like. We hope the next edition will give greater prominence to French terms, and that endeavours will be made to give the simplest exact equivalents.

"Black's Gardening Dictionary." Edited by E. T. Ellis. 8vo. 1238 pp. (A. and C. Black, London, 1921.) 15*s.* net.

We have examined this rather bulky work with a great deal of interest and much care, and arrived at the conclusion that it is a capital book for all gardeners, old or young, professional or amateurs, and likely to fill a long-felt want at a moderate price. The various writers are all well-known, able, and experienced, and it would be difficult to find a more capable body of men. Their knowledge has been admirably classified, and put together excellently, so that any subject can be easily found; and so arranged that every subject is dealt with in a concise plain manner, so well put that even a novice can quickly grasp it. It would be exceedingly difficult to point out any features especially noticeable or worthy of special attention, as every section is most carefully dealt with. In most instances the common name is given, the botanical or other names, cultural details are admirably dealt with, the best proved varieties and most useful ones, manures, insect and fungus pests, and innumerable details of great importance, including the information of how to choose and make all kinds of gardens, such as market gardens, fruit gardens etc., which will prove of immense value to all concerned in such work. There is no index, but all is arranged in alphabetical order, rendering an index unnecessary. The whole is so good in every respect that we have no hesitation in saying all garden lovers should have this book.

"The Garden of Earth." By Agnes Giberne. 8vo. xiv + 178 pp. (S.P.C.K. London, 1921.) 6*s.* 6*d.* net.

This "little book on plant life, plant-growth, and the ways and uses of plants" is written in simple language, but gives an introduction to the ways in which plants live, so that the unlearned may get some idea of the miracles

continually going on around them, silently but surely. We can commend it for the intelligent child, and for the older children in knowledge too. It is an untechnical Botany book.

" London Trees." By A. D. Webster. 8vo. xii + 218 pp. (Swarthmore Press, London. 1920.) 15*s*. net.

This is rather a high-priced book, but it contains a considerable body of information, gathered during the author's long experience in London parks. The illustrations, of which there are thirty-two, are generally good.

The love of gardens, which has so long imbued the dwellers near London, has contributed to the establishment of large numbers of interesting trees in the city and its environments. Many old trees still flourish, in spite of the drainage that has been carried out, and of the smoke and dust and sooty fog, and many have reached fine proportions. Fortunately the spirit, which has gradually extended, tends now to the preservation of fine and interesting trees, so that the builder does not always ruin them.

Lists, descriptions, notes, and historical incidents all form parts of this book, which contains a unique record which Londoners will value.

" Market Nursery Work." I. " Glasshouses and the Propagation of Plants." II. " Special Greenhouse Crops." By F. J. Fletcher, F.R.H.S. 76 + 72 pp 8vo. (Benn Bros., London. 1921.) 4*s*. 6*d*. each.

These two little books are intended as guides to market nursery work and are clearly written, and give fairly full practical directions for carrying out the work involved. The first deals with generalities concerning glasshouses, but might perhaps have given fuller information on suitable arrangements of pipes and the like. It gives instructions for the raising of seedlings, making of cuttings, potting and watering of newly potted plants. The second takes the story further with particular reference to Tomatos, Cucumbers, Melons, Grapes, Sweet Peas, Forcing Bulbs, " lifted " Chrysanthemums, and various catch crops. The treatment recommended in each case appears to be the outcome of practical experience, and the books should be very helpful to those who are concerned with the industry, so long as they realize that their practice may need modification according to the special circumstances which surround them.

" The Manufacture of Sugar from the Cane and Beet." By T. H. P. Heriot. 8vo. illus. (Sir Edward Thorpe's Monographs on Industrial Chemistry. London, 1920.)

This valuable treatise by Mr. Heriot, the lecturer on sugar technology at the Royal Technical College, Glasgow, is written on the principle that a theoretical knowledge of their subject is becoming more and more indispensable to all those engaged in the various branches of chemical industry.

NOTES AND ABSTRACTS.

[For Index to Abbreviations, etc., see volume xlv.]

Asparagus, Washington (*U.S. Dep. Agr., Bur. Pl. Ind., Circ.* 7, pp. 1–8).—'Martha Washington,' the most highly rust-resisting variety of Asparagus, was obtained by fertilizing 'Martha,' a seedling of Sutton's 'Reading Giant,' with the male plant 'Washington,' an American seedling of unknown origin. The seeds are small and the strain is late, but the shoots are of the finest market type.

Another new variety is 'Mary Washington,' also derived from 'Washington' and a seedling of 'Reading Giant.' It yields the largest seeds and seedlings yet produced. The shoots are very large, early, and prolific.

In digging seedlings pains should be taken to avoid damaging the roots leading away from the crown. One-year-old roots do better than two-year roots. To keep the pedigree strains pure for seed production, the plants must not be grown in fields near inferior strains. Poor male plants should be weeded out at the beginning of blooming time.—*S. E. W.*

Bacterial Leaf-spot Disease of Protea cynaroides, exhibiting a Host Reaction of possibly Bacteriolytic Nature. By Sidney G. Paine and H. Stansfield (*Ann. Appl. Biol.* vol. vi. No. 1, Sept. 1919, pp. 27–39; plate and text figs.).—Disease noticed on plants of *Protea cynaroides* in houses at Kew Gardens, where for a number of years it has caused considerable disfigurement to the plants. It occurs on all the leaves of older plants and on leaves of seedlings after they reach a height of 10 or 12 inches. A description of the disease and possible control measures are given. The leaves develop characteristic brown blister-like spots, or brown sunken spots with bright vermilion border.—*R. C. S. R.*

Caprifigs and Caprification. By J. L. Condit (*U.S.A. Exp. Stn., Cal., Bull.* 319, March 1920; 23 figs.).—The native fig-growers of Smyrna make a practice of suspending wild figs or caprifigs among the branches of their fig trees. From these caprifigs issue hundreds of small insects known scientifically as *Blastophaga grossorum.* These enter the eye of the Smyrna fig and cause the fruit to set. The process is known as caprification.

On account of the recent large plantings of Smyrna figs in California there is a keen demand for practical information about varieties of caprifigs, cost of caprification, and methods of distribution in the orchards.

This bulletin presents the latest and most reliable information on these points.—*V. G. J.*

Chicory: Control and Eradication. By Albert A. Hansen (*U.S.A. Dep. Agr., Circ.* 108, Sept. 1920; 1 fig.).—Chicory (*Cichorium Intybus*) is a weed of fields, gardens, lawns, meadows, and waste places. It has little or no preference for any particular kind of soil, and the heavy root enables it to endure severe dry spells. It is commonly introduced by means of impure grass, clover, and forage crop seeds. Hand pulling and frequent hoeing and grubbing up are the best means of eradication.—*V. G. J.*

Citrus-Fruit Improvement: a Study of Bud Variation in the Lisbon Lemon. By A. D. Shamel, L. B. Scott, C. S. Pomeroy, and C. L. Dyer (*U.S.A. Dep. Agr., Bull.* 815, June 1920; 14 figs.).—The California Fruit-growers Exchange, a co-operative organization of 8,000 Citrus growers, has established a bud supply department as a result of these investigations. This department furnishes at cost to growers and nurserymen bud wood from superior performance trees.

V. G. J.

Erica sessiliflora Linn. f. By W. B. Turrill (*Bot. Mag.* t. 8868; December 1920).—A species from the coastal region of S. Africa, with greenish semi-transparent flowers in terminal many-flowered heads. Corolla curved, tubular, about 1 inch long, stamens included.—*F. J. C.*

Evaporation of Grapes, The. By W. V. Cruess, A. W. Christie, and F. C. H. Flossfeder (*U.S.A. Exp. Stn., Cal., Bull.* 322, June 1920; 11 figs.).—Drying has proved to be one of the best methods of converting the wine-grapes of California into a non-perishable, saleable product, but as in many parts of the grape-growing districts the fruit ripens late much of it gets spoilt by the early rains when dried in the sun.

An evaporator of the horizontal tunnel air-blast type, and of six tons of fresh fruit capacity each charge, has been constructed on the university farm at Davis, and has been most successful in drying the grapes.

Plans, cost, and specifications are included in this bulletin.—*V. G. J.*

Fritillaria pontica Wahlenb. By W. B. Turrill.—Appears to be a shade-loving species, native in Macedonia. The flowers are dark, or pale yellowish, green with a purple tinge, and without tessellations. The plants grow about 12 inches high.—*F. J. C.*

Frost, and the Prevention of Damage by it. By Floyd D. Young (*U.S.A. Dep. Agr., Farmers' Bulletin* 1096; 24 figs.).—All frost protection methods can be carried on more successfully if the processes by which the earth's surface cools at night and the factors which influence the rate of cooling are well understood. This bulletin gives in a simple manner a description of the changes that take place at or near the earth's surface on a frosty night, and describes various methods and devices now being used for protection against frost, together with a chapter on temperatures injurious to plants, blossoms, and fruits. *V. G. J.*

Frost Protection in Lemon Orchards. By A. D. Shamel, L. B. Scott, and C. S. Pomeroy (*U.S.A. Dep. Agr., Bull.* 821, June 1920; 15 figs.).—These data show that in orchards which were protected with an adequate supply of heaters during the cold weather of 1912–13, a large percentage of fruit was saved and harvested throughout the year.—*V. G. J.*

Grape Syrup, Commercial Production of. By W. V. Cruess (*U.S.A. Exp. Stn., Cal., Bull.* 321, May 1920; 5 figs.).—Grape syrup has a great many different uses, and its manufacture presents one of the most promising methods of profitably utilizing the crop of wine grapes.

It requires only the use of the present wine-making machinery, plus vacuum pan equipment of the kind already installed in some vineyards.—*V. G. J.*

Insect Injuries in Relation to Apple Grading. By B. B. Fulton (*U.S. Exp. Stn.. Geneva, N.Y., Bull.* 475, May 1920, pp. 5–42; 17 figs., 4 plates, 2 charts).—This Bulletin deals with the numerous injuries and blemishes on mature apples caused by insects, fungi and natural causes.

A key is given to identify these injuries. By the careful isolation of fruit clusters, covering them with light cages made of copper wire and black gauze, and introducing various pests into these bags, the typical damage of any particular pest could be ascertained.

Several of the insects causing blemishes are not British, but amongst our pests included in this Bulletin are the Codling Moth, Casebearers (*Coleophora sp.*), Bud Moth, and Rosy Apple Aphis (*Aphis sorbi*).

With these defects caused by insects are compared those caused by mechanical means, as bruises, hail, constant rubbing of fruit against a limb, frost injury, spray injury, sunburn, scab, and bitter-pit.

A chart shows the periods during which the insects are actively injurious to fruit. Some pests, as the Codling Moth, San José Scale, and Apple-maggot are often injurious after the fruit has been stored or packed for market.

As is pointed out, not only do these injuries lower the market value of the fruit, but many of the insects reduce the yield by destroying the flowers, preventing the setting of fruit and causing premature dropping.

Two tables are given clearly showing when to spray and what to use for the various pests mentioned, and formulæ for lime-sulphur washes are given.

The damage done to the fruit is shown on two well-coloured plates, making identification unmistakable.—*G. F. W.*

Insecticides and Fungicides. (*Jour. Min. Agr.* vol. xxvii. No. 7, Oct. 1921, pp. 628–631.)—A few short notes are given explaining a Bill, which has been drafted at the request of the Chamber of Horticulture and a section of Insecticide and Fungicide manufacturers, to ensure the grower against materials of inferior quality. On grounds of national economy this Bill is postponed, but several manufacturers are prepared to meet the terms of the Bill without

legislation. Purchasers of the following Insecticides and Fungicides are advised to see that the articles supplied comply with the conditions laid down.

(1) Lead arsenate paste; (2) Lime-sulphur; (3) Nicotine; (4) Copper sulphate; (5) Soft (Potash) soaps; (6) Liver of Sulphur; (7) Sodium and Potassium cyanides; and (8) Formaldehyde.—*G. F. W.*

Kniphofia Snowdeni C. H. Wright (*Bot. Mag.* t. 8867; December 1920).—A native of Uganda, possibly hardy at Kew, reaching 5 feet in height, with reddish flower-buds and yellow flowers, but colour varies.—*F. J. C.*

"Larch Blight." A Contribution to the Life-history of the Larch Chermes (Cnaphalodes strobilobius, Kalt). By E. R. Speyer, F.E.S., M.A. (*Ann. Appl. Biol.* vol. vi. Nos. 2 and 3, Dec. 1919, pp. 171–182; plates and diagrams).—The brunt of the damage is sustained by Larch in the case of young plants, and this can be adequately controlled by fumigation. The Spruce does not appear to be attacked severely while young. It suggests an opening for a method of control by spraying. A method of preparing Aphidae for microscopic examination is given.—*R. C. S. R.*

Manure, Observations on the Habits of certain Flies, especially those Breeding in. By J. E. M. Mellor, B.A. (*Ann. Appl. Biol.* vol. vi. No. 1, Sept. 1919, pp. 53–88; figs. and charts).—An account, with control measures, of flies breeding in manure heaps.—*R. C. S. R.*

Melaleuca Radula Lindl. By R. A. Rolfe (*Bot. Mag.* t. 8866; December 1920).—A newly introduced small, virgate shrub, with narrow spreading opposite leaves and large lilac-purple flowers borne in pairs in the leaf axils. Native of W. Australia and requiring glasshouse treatment.—*F. J. C.*

Mesembryanthemum dichroum Rolfe (*Bot. Mag.* t. 8872; December 1920).—Native in S. Africa. Leaves about 4 to 6, 2½ inches long, glaucous, fleshy, triquetrous; flowers about 1½ inch diameter, white passing to rose at tip of petals.—*F. J. C.*

Odontoglossum Humeanum Reichb. f. By R. A. Rolfe.—A natural hybrid between *O. Rossii* and *O. cordatum* now verified by crossing. (See JOURNAL R.H.S. 1919.)—*F. J. C.*

Onions, Grades for Northern-grown. By Hartley E. Truax (*U.S.A. Dept. Agr., Circ.* 95, May 1920).—The specifications are based upon extended investigations in centres of production and important markets, and it is believed that in their present form they will meet the requirements of the Northern-grown onion trade.—*V. G. J.*

Pears and Apples, A Phytophthora Rot of. By H. Wormald, D.Sc., A.R.C.Sc. (*Ann. Appl. Biol.* vol. vi. Nos. 2 and 3, Dec. 1919, pp. 89–100; plate and text figs.).—In wet seasons *Phytophthora Cactorum* sometimes produces a rot of apples and pears in this country, causing falling. Dark brown discoloration of the affected tissue with surface clusters of sporangia, seen with the naked eye as glistening particles, characterize the pear rot. In apples the discoloration is paler and the sporangia less easily seen. Frequently the skin splits, when the mycelium is seen on the exposed surface as a whitish bloom. All rotting fruit on ground or tree should be collected and burned. Bordeaux Mixture, 4 lb. copper sulphate, 4 lb. quicklime, 50 gals. water, is suggested as an effective wash in the event of a threatened epidemic. A bibliography is appended.[3]

R. C. S. R.

Pests, Various. "Notes." By J. C. F. Fryer (*Ann. Appl. Biol.* vol. vi. Nos. 2–3, Dec. 1919, pp. 207–209).—Included in the notes are: (1) *Charaeas graminis* L., (2) *Sitotroga cerealella* Oliv., (3) *Anthonomus pomorum* L., (4) *Phyllobius urticae* De G., and *P. oblongus* L.—*R. C. S. R.*

Phlomis spectabilis Falc. By S. A. Skan (*Bot. Mag.* t. 8870; December 1920).—Discovered in Kashmir and introduced by Mr. Elwes. Quite hardy. A perennial herb up to 6 feet in height, with pale rose-purple flowers, in an interrupted verticillate spike; basal leaves up to a foot long.—*F. J. C.*

Plant Competition, Some Factors in. By Winifred E. Brenchley, D.Sc. (*Ann. Appl. Biol.* vol. vi. Nos. 2 and 3, Dec. 1919, pp. 142–170; plate and 10 text figs.).—Plant competition is broadly analysed as (1) for food from the soil, (2) for water, (3) for light, (4) for the possible harmful effect due to toxic excretions from the roots, if such occur, but the mutual action of one plant on

another when grown in close proximity is a very complex phenomenon. When the food supply is limited the chief factor of competition is that of food, in particular the amount of nitrogen available. Even when ample supplies of food and water are available for individual plants, the decrease in light caused by overcrowding is a most potent factor in competition.—*R. C. S. R.*

Potatos, Grades for. By Hartley E. Truax (*U.S.A. Dep. Agr., Circ.* 96, May 1920).—In order to reduce waste and conserve transport facilities during the war, the Food Administration issued a rule, requiring the use of the United States grades by licensed dealers. The regulation was cancelled in 1918, but the use of grades has been continued voluntarily.—*V. G. J.*

Potatos, Protection of, from Cold in Transit: Lining and Loading Cars. (*U.S.A. Dep. Agr., Bull.* 1091, Feb. 1920; 22 figs.). During the winter of 1917–18, 75 per cent. of cars were either lined or loaded incorrectly. This bulletin explains successful methods.—*V. G. J.*

Rhododendron Sargentianum Rehder and Wilson. By J. Hutchinson (*Bot. Mag.* t. 8871; December 1920).—A dwarf species collected by E. H. Wilson in W. Szechwan. Probably best in half shade, hardy, bearing smallish pale-yellow flowers in terminal clusters in May; leaves about ½ inch long, finally smooth and polished above, softly scaly below.—*F. J. C.*

Rhododendron strigillosum Franch. By J. Hutchinson (*Bot. Mag.* t. 8864; December 1920).—Seed of this Szechwan species was collected by E. H. Wilson for Messrs. Veitch, and it has flowered at Kew in early spring. The flowers are red, crimson, or white, and the nectaries black; the leaves narrowly oblong-lanceolate, 3 to 6 inches long, with crisped hairs beneath. The young shoots are very bristly.—*F. J. C.*

Seed, Physiological Predetermination: The Influence of the Physiological Condition of the Seed upon the Course of Subsequent Growth and upon the Yield. By Franklin Kidd, M.A., D.Sc., and Cyril West, A.R.C.Sc., D.Sc., F.L.S. (*Ann. Appl. Biol.* vol. vi. No. 1, Sept. 1919—continued from vol. v. pp. 1–26; plate and diagrams).—The effect of conditions during germination and in the early seedling stage upon subsequent growth and final yield. Physical treatment of seed includes high and low temperatures, electrical discharge and X-rays; chemical treatment with acids and chemical agents other than acids. In conclusion the evidence seems to show that the factors which influence the plant during its earliest stages of development have a more or less pronounced effect upon the whole of its subsequent life-history. A bibliography is appended.

R. C. S. R.

Street Trees. By F. L. Mulford (*U.S.A. Dep. Agr., Bull.* 816, June 1920; 37 figs.).—Deals with the planting and after-care of shade trees in streets and towns.—*V. G. J.*

Syringa reflexa C. K. Schneider. By S. A. Skan (*Bot. Mag.* t. 8869; December 1920).—A shrub up to 13 feet from Hupeh, introduced through E. H. Wilson. Distinct by its pendulous inflorescence and warted fruits. Hardy in England. Flowers purplish-red without, whitish inside.—*F. J. C.*

Tomato Moth, The Habits of the Glasshouse, Hadena oleracea, and its Control. By Ll. Lloyd (*Ann. App. Biol.* vol. vii. No. 1, Sept. 1920, pp. 66–102; 4 diagrams, 6 tables, 6 figs., 3 plates).—This paper deals with the life-history of the tomato moth, which is spreading in the Lea Valley. A list of food plants is given. The methods of control are very fully dealt with.

Spraying, larva- and moth-trapping, and the destruction of pupæ are advised.

Fruit as well as foliage is eaten, as the latter alone is insufficient for the caterpillar. Spraying with lead arsenate should be done at least three times: (1) Seedlings in pots, (2) just after planting out, and (3) about a month before picking fruit, and this last operation is the most important.

Constant baiting for moths should be done throughout the growing season by jars baited with ale, treacle, and 1-per-cent. sodium fluoride.

Larvæ may be trapped in sacks placed about the houses, and collected every third week and dipped in boiling water.—*G. F. W.*

Tomato, Stripe Disease of. Studies in Bacteriosis, IV. By Sidney G. Paine (*Ann. Appl. Biol.* vol. vi. Nos. 2 and 3, Dec. 1919, pp. 183–202; plates and text figs.).—A stripe disease of tomatos growing under glass is described, the causal organism a small yellow bacillus, believed to be identical with *Bacillus lathyri.*

Susceptibility in the plant is increased by an excess of nitrogen, but it can be largely counteracted by an increase of potash. Susceptibility varies with the variety of tomato. A suggestion is made that the Grand Rapids Tomato Disease may be identical with this stripe disease. Control methods suggested are sterilization of soil by heat, of seed by formalin, and selection of resistant varieties. The cutting away of a diseased stem and allowing a lateral to develop often gives a clean plant. Infected prunings should be burned and the pruning-knife sterilized. Artificials should be used with care.—*R. C. S. R.*

Tomatos under Glass. By H. H. Zimmerley (*Virginia Truck Exp. Stn., Bull.* 26; 23 pp., 2 figs.).—The tomato is grown in solid beds (in preference, of raised benches) composed of well-drained friable soil mixed with one-fifth well-rotted manure. After the fruit has set, fresh horse-dung is used as a mulch. The plants are grown on single stems in rows 30–36 inches apart. Thorough watering when necessary is preferable to frequent sprinklings. Attention must be paid to ventilation so that the air of the house may be dry. The success of the undertaking largely depends on the control of insect and fungus pests. Annual steam sterilization destroys nematode worms and checks Fusarium wilt. Fumigation with hydrocyanic acid destroys white fly (*Aleyrodes vaporariorum*). Plants showing signs of mosaic must be discarded. Lime is a partial remedy for blossom end-rot due to irregular watering and to excessive use of certain commercial fertilizers.—*S. E. W.*

Trimming Camphor Trees, A Machine for. By G. A. Russell (*U.S.A. Dep. Agr., Circ.* 78, Feb. 1920; 4 figs.).—Contains a description of the machine and the operation of trimming the trees.—*V. G. J.*

Tropical Fruits. By a Committee (*Am. Pom. Soc.*, 1917, pp. 196–214).—An annotated list drawn up with the object of working toward a greater degree of uniformity in the naming of tropical fruits. It shows the common names by which they have been mentioned or described by various writers, accompanied by their botanical, and suggested common, names.—*A. P.*

Tulips, Darwin. By S. Mottet (*Rev. Hort.* vol. xcii., pp. 10, 11; 1 coloured plate).—Under certain conditions of soil and climate, the pure self colours of the Darwin Tulips exhibit variegation. In the coloured plate the flower supposed to represent 'Goldflake' is incorrectly named.—*S. E. W.*

Tussock Moth. By H. L. Webster (*Iowa State Hort. Soc. Trans.*, 1918, pp. 408–410).—The ravages of the white-marked tussock moth have been held in check by encouraging children to collect the cocoons and eggs of the moth, by grease banding, and by spraying the trees with lead arsenate (1 lb. to 10 gallons of water).—*S. E. W.*

Vegetables, Two Exotic (Dasheen and Chayote). By H. W. Youngken (*Amer. Jour. Bot.* vol. vi. No. 9, Nov. 1919, pp. 380–386; 3 figs.).—Within recent years two exotic vegetables, the dasheen and the chayote, have been introduced into the Southern States of America.

The dasheen is a native of Trinidad, West Indies, and is a variety of *Colocasia esculenta* (L.) Schott of the natural order Araceae. It has a large central corm of 2 to 4 lb., and has numerous ring-like scars of foliage leaves. These leaves are ear-shaped and of 3 feet in length. The corms are alone used as food and are prepared in a similar manner to the potato. The taste is not unlike a mealy potato. An excellent flour may be obtained by grinding the dried corms.

The chayote (*Chayota edulis* Jacq.) is found in tropical America. It is a vine with perennial tuberous roots, leaf tendrils, and green or cream-coloured flowers. The fruit is a pear-shaped gourd and is about 8 oz. The fruits are collected when half ripe and are used in a similar way to the squash. The leaves and roots are eaten as fodder by cattle, while the stem gives a fine fibre.—*A. B.*

Venidium macrocephalum DC. By J. Hutchinson (*Bot. Mag.* t. 8845; June 1920).—This Composite, nearly allied to *Arctotis*, is an annual from between Kano and the Orange River. It has large yellow-rayed flower heads with a red ring around the greenish disc florets, and grows to about a foot in height.—*F. J. C.*

Verbascum Blattaria var. **grandiflora** Turrill (*Bot. Mag.* t. 8863; December 1920).—An extremely luxuriant form of *V. Blattaria*, with large white flowers instead of typically yellow ones.—*F. J. C.*

FIG. 23.—YUCCA WHIPPLEI IN MR. CHRISTY'S GARDEN AT EMSWORTH, 1921.

[*To face p.* 105.

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YUCCAS FOR ENGLISH GARDENS.

By E. A. BOWLES, M.A., F.L.S., V.M.H.

THE fruiting of *Yucca Whipplei* (fig. 23) in the open air in Sussex is one of the outstanding events of the remarkably dry summer of 1921.

It is not the first time it has flowered in the open in that county. An excellent photograph was published in the *Gardeners' Chronicle* for February 17, 1912, of a plant flowering in Mr. Fletcher's wonderful garden at Aldwick Manor, Bognor, in 1910, after growing in the open for some six years or more. It has also flowered in Messrs. R. Veitch & Sons' nursery at Exeter; but a plant that grew to a large size on the rock garden here, near Waltham Cross, Herts, failed to produce the flower-spike, rotting off in the heart after a severe winter when the thickening of the centre was giving promise of the coming flowering.

There have been but few records of any Yuccas bearing fruit in England. Canon Ellacombe reported the formation of pods on *Y. recurvifolia* more than once, but, except in the year 1876, no seeds were formed.

The pollination of most of the species of Yucca is entirely dependent on the visits of a genus of small moths specially adapted to roll up pellets of the pollen and deposit them in the stigmatic tube of the flowers. To obtain a return for this service the female moth inserts her remarkably lengthy ovipositor into the young ovary, placing a few eggs among the seeds which will result from her careful

work in pollinating that flower. The interdependence of insect and plant in the case of the small Tineid genus *Pronuba* and the Yucca is one of the strangest facts brought to light by biological studies in the field. Without the moth few species of Yucca set seed, and the larvæ feed only on the immature seeds of Yuccas, destroying a certain number in every seed-pod, but sparing others to ripen.

The general sterility of Yuccas in Europe is due to the absence of the moths, but it is possible that beetles visiting the flowers for pollen may occasionally deposit a few grains in the stigmatic tube.

The flowers of *Y. Whipplei* differ in several characters from those of other Yuccas, and therefore it is now regarded as a sub-genus, *Hesperoyucca*. The filaments are attached to the lower part of the petals, and so when the flower is fully expanded the stamens are drawn well away from the ovary. The pollen is not loose and powdery as in Yucca proper, but distinctly glutinous. The stigma is capitate, more open and covered with moist papillæ, ready in fact to retain any pollen carried to it. Thus, as Professor Riley has recorded, *Y. Whipplei* is quite likely to be pollinated by visitors other than *Pronuba*. Professor Trelease has further stated that it possesses a limited power of self-pollination, for in the smaller, later-opening flowers it is possible for the pollen to be deposited on the margin of the stigma directly from the anthers of closing flowers.

This doubtless occurred in the specimen which fruited in July 1921 in Mr. W. M. Christy's garden at Watergate, near Emsworth, only two pods being formed, but both containing seeds that have since germinated.

It is a pity that this fine species is just too tender for all but the southern and western gardens of England, for its 8- to 10-feet flower-spike is one of the finest produced by any of the Yuccas. It would, however, be worth planting where a well-drained bank facing south, and the possibility of overhead protection in winter, could be provided. The narrow grey-green leaves of a healthy specimen are very beautiful and give it the aspect of a Dasylirion rather than of a Yucca.

The hardiest of all Yuccas is the stemless species *Y. flaccida*. It is frequently offered as *Y. filamentosa*, and these two are nearly related, and both are variable plants and in some of their forms approach one another very closely. They are best regarded as distinct species, however, and may be distinguished by the following characters:

Y. filamentosa.—Leaves rigid, dark green, with curling marginal threads. Inflorescence usually glabrous.

Y. flaccida.—Leaves thin, flexible, the outer recurved, often glaucous; marginal threads, if present, straight. Inflorescence usually pubescent.

Y. flaccida is the hardier and more vigorous plant, spreading by means of underground stolons and soon forming dense clumps, one or more rosettes of which will flower every season, dying afterwards, but retaining its leaves green for another year. It pays, however, to remove the old crown that has flowered and so to make room for the

development of younger offsets. The flower-stems are 3 to 4 feet in height, and bear a great number of creamy-white blossoms that are seen at their best on a moonlight night when the flowers are widely expanded.

There are at least seven distinct varieties grown in gardens, besides some hybrids raised by Sprenger of Naples into which *flaccida* parentage enters. All are good if planted generously—either in groups among perennials in borders, as edges to shrub beds, or in bold masses on lawns.

Y. filamentosa needs a well-drained southern slope in my own garden, but in warmer gardens grows freely in ordinary beds. A healthy group with stiff, wide leaves, edged with a tangle of white threads, is very attractive, and the flowers are in most of its forms larger and whiter than those of *flaccida*.

There is a finely variegated form—alas! too tender for outdoor planting north of London, but which grew into fine specimens in Canon Ellacombe's Gloucestershire garden.

Y. rupicola is a good species for hardiness and distinct appearance. The leaves are very stiff, sharp and slightly twisted, and unlike those of any other Yucca hardy in England in having a dark brown edging to the leaves formed of minute horny teeth. In summer they are beautifully glaucous, with tones of purplish blue here and there. The flower-spike is very tall for a stemless species, and the flowers so large that, though they are rather greenish in colour, they make a fine sight when fully expanded.

Y. glauca is more often called *Y. angustifolia* in gardens. It is the Bear-grass or Soap-weed of the Rocky Mountains, and a very distinct and beautiful plant. The long leaves are narrow and grey, with conspicuously white edges that give the plant an air of xerophytic tenderness that its hardy constitution proves to be false, for it will thrive in any well-drained sunny border, forming large branching specimens. In middle age it forms a short-stemmed specimen that eventually becomes top-heavy and falls over after the manner of *Kniphofia caulescens*. The flowers are greenish and generally arranged in a tall simple spike.

Yucca gloriosa is the nobler of the two hardy caulescent species, but more tender than *Y. recurvifolia*. It is a good plant for the small front gardens of town houses, finding there the protection it craves from winds and stagnant moisture. In southern gardens it will grow into noble specimens with stems 6 feet or more in height, and when crowned with its large flower-spikes is a fine sight. Unfortunately, the spikes are generally produced so late in autumn that it is only in favoured districts that they escape frost long enough to flower. Even in its native localities it flowers so late that it seldom bears seed, the *Pronuba* moths being no longer on the wing. If a spike is produced out of season, and while the moths that fertilize *Y. aloifolia* are still about, it has been observed to set seed.

Many varieties are known in gardens, but the best are those with

very stiff concave leaves, such as var. *plicata*. In the var. *robusta* some of the older leaves bend over after the manner of those of *Y. recurvifolia*. There is a narrow-leaved form known as *Y. Ellacombei*, which Trelease considers to be the same as *Y. g. nobilis* Carrière. It has large and handsome flowers, but does not grow so tall as the others. There is a good figure of it in SAUNDERS' "Refugium Botanicum."

One of the most striking forms has a broad golden margin to the leaves, and when seen in good health is one of the best of variegated plants. It grows well in Mr. Fletcher's fine garden near Bognor, and is there one of the most floriferous of all Yuccas. One single-stemmed plant, topped with several crowns, showed seven old flower-stems. There was for many years a fine specimen of this variety growing in front of the library window at Bitton Vicarage, but after flowering it became diseased, lost its crown, and had to be propagated from the stem, which, laid down on good soil, rooted and produced young shoots throughout its entire length.

Y. recurvifolia is easily recognized by the glaucous tint of its flat leaves, and their habit of bending over and drooping for two-thirds of their length. It will form a stem of 5 or 6 feet, and is almost as hardy as *Y. flaccida*. It has been suggested that it may be a natural hybrid of that species and *gloriosa*. In 1917, both at Waltham Cross and at Kew, several fine old specimens were ruined through the severe frosts. Those with tall, bare stems suffered most, the frost rendering them flaccid, so that they bent over and finally decayed. In some seasons it flowers freely and lasts in beauty for a long time. There are two variegated forms in cultivation. The better one has bright yellow stripes on the margins of the leaves, but is not very hardy here. The second has a faint median stripe of dull yellowish green and appears as hardy as the type, but the variegation is not sufficiently defined to make the plant more than a curiosity.

In sheltered gardens in the south, or where a specially favourable site could be found, such as an angle between two walls, or at the end of a verandah, where overhead protection is provided, it might be worth while trying some of the following species :

Y. Treculeana.—A fine arborescent species. It has survived several winters in my garden at the foot of a south wall, but makes little progress.

Y. aloifolia forms a stem rapidly when grown under glass ; but here it has been cut to the ground repeatedly in severe winters.

Y. baccata.—A short-stemmed species with rigid blue-green leaves and very large flowers. It flowered at St. John's, Ryde, but only exists in a state of summer convalescence here.

Carl Sprenger raised a great number of hybrid Yuccas at Naples in the early years of this century, and advertised about fifty named forms. Some of them have succeeded well at Ludgvan Rectory in Cornwall, but only one has so far proved valuable here. It was sent out as *Y. vomerensis*, and described as a cross between *aloifolia* and *recurvifolia*. It is a strikingly handsome plant and now stands 8 feet

high, with rich green pendent leaves measuring 42 inches in length. It has not flowered, and grows close to an evergreen hedge on the top of a well-drained southern bank. In a more exposed position it was killed to ground level in 1917.

The following key to the truly hardy species may be useful :

STEMLESS.

Leaves rigid, marginal threads many and curling. Inflorescence glabrous. *Y. filamentosa.*

Leaves thin, the outer bending over, marginal threads absent, or few and straight. Inflorescence pubescent. *Y. flaccida.*

Leaves with thin, brown, horny border. *Y. rupicola.*

FORMING A STEM.

Stem short, often prostrate.

Leaves very long and narrow, grey-green edged with distinct white margin and few, fine threads. Inflorescence unbranched. *Y. glauca.*

Stem well developed.

Leaves rigid, upright, generally concave. *Y. gloriosa.*

Leaves flaccid, recurved, nearly flat. *Y. recurvifolia.*

LESSONS FOR PRACTICAL MEN FROM THE INTERNATIONAL POTATO CONFERENCE.

By W. Cuthbertson, J.P., V.M.H.

[Read February 28, 1922 ; the Rt. Hon. Lord Lambourne, P.C., V.M.H., in the Chair.]

I thought it would be a good thing to extract from the papers read at the International Potato Conference in November some lessons helpful to practical men. Few working farmers or gardeners have the time and opportunity to read carefully the thirteen elaborate contributions on the problems and difficulties surrounding modern potato cultivation. These contributions were by the best men of the present day, and I group them as follows :—

(1) Mr. Wm. Stuart's Paper on "Breeding, Selection, and Development in the U.S.A." ; Mr. Chittenden's on "Breeding, Selection, and Development in the British Isles ; and Mr. William Robb's on Dr. Wilson's work.
(2) Mr. J. M. Hannah's on "The Early Potato Industry" stands by itself, as does—
(3) Mr. H. V. Taylor's on "The Industrial and Commercial Uses of the Potato," and
(4) Mr. McKelvie's contribution on "Bud Variation."
(5) Dr. Salaman and Mr. J. W. Lesley, Professor Blackman and Dr. A. B. Brierley, on "Wart Disease."
(6) Dr. G. H. Pethybridge, on "Recent Work on the Potato Blight."
(7) Mr. Paul A. Murphy, Dr. H. M. Quanjer, and Mr. A. D. Cotton, on "Leaf Roll (Curl), Mosaic, and Allied Diseases."

Mr. William Stuart, the famous United States Government expert, starts by defining Breeding and Selection—always a very wise thing to do at the outset of any investigation. Breeding refers strictly to sexual reproduction, *i.e.* raising plants from the true seed which is produced in the plums or fruits which follow the flower. Selection "refers to the isolation of any desirable variation in a variety, from that of the normal and its perpetuation by asexual propagation," *i.e.* its perpetuation from the tuber or divisions of the tuber. Mr. Stuart says little if any progress was made in potato-breeding prior to 1850 either in America or Europe, but from that date onward rapid strides were made in the development and improvement of commercial varieties of Potatos. Goodrich, a clergyman of Utica, N.Y., conceived the idea that long-continued asexual reproduction had weakened the constitution of the cultivated potato, and hence it succumbed to the severe epidemic of late blight which swept over

America and Europe from 1843 to 1847. In 1851 he received from the American Consul at Panama a small quantity of South American potatos for breeding. One of these was named by him ' Rough Purple Chili.' From some naturally fertilized seed of this he raised a batch of seedlings, one of which he selected and introduced in 1857 under the name of ' Garnet Chili.' I refer to this because " blood " of ' Garnet Chili ' was in ' Early Rose '—in fact, ' Early Rose ' is said to have come from a naturally fertilized seed-ball of ' Garnet Chili '; and Mr. STUART says: " ' Early Rose ' may be regarded as the first real promising commercial variety produced in America. It may also be regarded as the foundation stock from which emanated many of our present-day varieties." Before leaving this point let me allude to Luther Burbank's variety—well known in America but no good here—' Burbank's Seedling.' It, Mr. STUART says, is " simply a story of the discovery of a naturally fertilized seed-ball in an ' Early Rose ' plant in his mother's garden at Lancaster, Mass., from which Burbank grew twenty-three seedling plants and selected the best and introduced it." ' Early Ohio ' also came from ' Early Rose.' ' Beauty of Hebron ' came from a naturally fertilized seed-ball of ' Garnet Chili,' to which I have already referred. Mr. STUART states that although a number of new varieties have been introduced by American seedsmen since 1900, it can hardly be claimed that much real progress has been made in a commercial way—the only acquisitions that are really promising are the russet types of the Burbank and Rural groups. Most of us have grown the better-known American varieties, such as ' Beauty of Hebron,' ' Puritan,' ' White Elephant.' I have grown many others—' Burbank,' ' Bovee,' ' Vermont Gold Coin,' ' Noroton Beauty '—and at present am growing and observing a number of the most recent of America's creations, some of which are most promising; but if I only discover one which will be a decided acquisition to Britain I shall be amply repaid.

Mr. STUART deals with the technique of breeding very fully, but those interested must go to his published paper. He says that the communicability of mosaic and leaf-roll is established, and that, of course, has a most important bearing on breeding.

Much has been written in the United States about Selection and Development, especially what is termed " Hill Selection," *i.e.* selecting the best plants in a crop and going on with their progeny and continuing the selecting process. Many years ago I came to the conclusion, after several years' careful work in conjunction with my friend Mr. C. E. GREGOR, of Innerwick, East Lothian, that such methods were useless, as far better results could be obtained by a change of the venue of a good stock of the potato in question to the far north for one or two seasons, and I am delighted to hear from Mr. STUART that America's workers are now coming to exactly the same conclusion. Before leaving Mr. STUART's paper I would like to refer to two things he sets down: first, the necessity for all plant-breeders carefully and conscientiously to reject all inferior plants and firmly resolve not to offer

to the trade any unmeritorious variety; second, the very general truth that "those who follow the pioneer usually reap the richest harvest." In our own country we have many examples of this. One I mention: Mr. EZRA MILES, of Leicester, a humble but very successful raiser of seed which has passed into the hands of growers who have raised several of our leading sorts from it, notably 'Great Scot.' The National Institute of Agricultural Botany has awarded Mr. MILES the first John Snell Memorial Gold Medal as a suitable acknowledgment of his fine work, from which he has reaped little pecuniary reward. I think it might possibly help such cases as this by awarding once a year a gift of ten or twenty guineas to a man who, like Mr. MILES, has done a useful work for horticulture, and who has remained in very humble circumstances as many worthy men are found to do.

Mr. CHITTENDEN, Director of the R.H.S. Gardens and Laboratories at Wisley, gave a résumé of Breeding, Selection, and Development in Britain, which is familiar to most of us, but which wanted putting on record at such a conference. In 1831 Dr. LINDLEY submitted to the Royal Horticultural Society an account of an important series of potato trials carried out in their gardens at Chiswick. Mr. CHITTENDEN states that from that report it appears that many of the best varieties were of American or Continental origin. One would not have thought so from Mr. STUART'S statements, but I suppose it is possible that some sorts got across to this country which did better here than at home. Another point brought out by Mr. CHITTENDEN: some of the 1831 varieties had as heavy cropping capacity as any of the present-day varieties. That fact should tend to keep us humble. Here is what Mr. CHITTENDEN says a little further on: "Though modern varieties are not better than the best of that day in yielding power, the general level of excellence is probably higher now than it was then, and substantial advances have been made in other directions, if we may judge by illustrations and descriptions of older varieties that have come down to us." Note that further statement to prevent us patting ourselves on the back too much.

Mr. CHITTENDEN sets out clearly and accurately what present-day taste demands in a potato:

1. Medium size; mealy white flesh when cooked.
2. For the special chip potato trade, varieties which take up comparatively little fat in the cooking (and, may I add, large in size for this trade, and thick kidney in shape).
3. For caterers a potato that can be cooked twice without blackening.

Mr. CHITTENDEN says: "The blackening of the flesh on cooking is apparently not altogether a varietal character, but is dependent partly upon the nature of the environment in which the potato is grown, and the matter is not well understood." It would be a very great help if it were well understood. Some varieties are more prone to it

than others. 'King George,' for example—5,540 acres of it were grown in Scotland in 1920, and only 2,327 in 1921. Some of the Dunbar men grew it in 1918–19–20, and I am sure they did not help the fine reputation their potatos had deservedly earned! Mr. CHITTENDEN sets out also in addition to these qualities demanded by the public, the desiderata of the growers, and winds up by saying that he thinks 'Great Scot' most nearly approaches the grower's ideal of all our modern potatos. He points out that the same incentive to progress acted in Britain as in America after the great blight of 1845 —old varieties were considered worn out, and great efforts were made to raise new ones resistant to Phytophthora—'Scottish Champion' and 'Magnum Bonum' being fine examples of what was done.

Mr. CHITTENDEN did well to emphasize the work of Mr. A. W. SUTTON, who collected and bred from all wild types of tuber-bearing Solanums, and proved that little hope lay along that line of work of evolving disease-resisting forms.

Mr. CHITTENDEN hopes the day is not far distant when one variety will have one name and one only, and claims that the Royal Horticultural Society has always been active in pointing out where two names had been given to the same thing:

'tis a consummation
Devoutly to be wished;

but I do not think it will ever be accomplished. We are told that attempts have been made to estimate the chemical composition of different varieties of potato, but no definite conclusions have been reached. Practical men must leave it at that, remembering that the scientists are busy, and may one day discover things that will help them in their work of selection.

In conclusion Mr. CHITTENDEN emphasizes the value of a change of seed, and no man can speak on this with greater authority, because he has passed through his hands and grown at Wisley thousands of samples from every quarter of the British Isles. On the question of immature seed, *i.e.* tubers lifted before they are ripe for seed, he has always failed with them to get results as good as those given by seed tubers procured from a moister climate than Surrey.

Mr. WILLIAM ROBB, of the Scottish Plant Breeding Station, who was the late Dr. WILSON'S assistant at St. Andrews, deserves to be listened to because he was associated with the Doctor in raising 'Rector,' 'Templar,' 'The Bishop,' and 'Crusader'; but the work of the raiser does not come directly under the title of my subject to-day. Under the methods of cultivation practised to-day deterioration does take place, Mr. ROBB truly says, and this invariably creates a demand for either new and vigorous varieties or selected and vigorous strains of those already in cultivation to take the place of those that are declining in vigour. To meet these demands raisers are faced with the problem among others of effecting the combination of two characteristics which, in a large measure, may be rather difficult to combine

—large cropping capacity and a high standard of table quality—the tubers should have shallow eyes, be resistant to blight and wart disease, easy to harvest and come to maturity when wanted. These are ideal aims for potato raisers anywhere.

Dr. WILSON'S method was to sow seeds in February in shallow bowls under glass and transplant the seedlings when two inches high. They were afterwards grown on in pots and planted out in June, when they were 10 to 14 inches high. In this way strong plants were procured, yielding up to 3 lb. of tubers each. No better plan could be recommended to beginners in potato-raising than this.

Mr. ROBB proceeds to give in detail most wise and valuable advice on the selection of seedlings and the development of the best. He unhesitatingly condemns hill selection in the following words: "In no instance is there any record of a variety having been improved either as regards cropping power or shape by selecting only the best plants or what have been called the plus fluctuations."

Dr. WILSON kept in view always the possibility of raising varieties resistant to blight, and Mr. ROBB has on hand at the Plant Breeding Station at Edinburgh a number of varieties which have had a most remarkable blight-resisting record. I hope we shall hear more about them. Mr. ROBB makes a passing reference to "Rust," and thinks that it may be due to abnormal soil conditions. With this I agree. Mr. ROBB, in conclusion, discusses an interesting proposition: Should the potatos of last season be improved in keeping quality, or, should the early varieties be accelerated in earliness to meet the demand for good potatoes in May and June? The public appetite, I feel, is all in favour at that time of the year of "new" potatos, and the improvement of earlies in every way is the premier duty.

When we come to Mr. J. M. HANNAH'S paper on "The Early Potato Industry" we come to the only paper actually dealing with potato-growing read to the Conference. Mr. HANNAH is the most successful grower of potatos for the early market in Scotland, and every line of his contribution ought to be read and studied by growers large and small. I shall only emphasize a few of his main points—or rather summarize them. Potatos, he tells us, have been grown in Ayrshire on the same land for from 30 to 50 years; large quantities of seaweed are washed ashore in the autumn and winter months and spread on the land at the rate of 30 to 40 loads an acre; dung is brought by rail, applied at the rate of 12 to 15 tons an acre, an effort being made to alternate the application where both are available. In addition, 11 to 12 cwt. of the best-balanced artificial manure is applied at planting time. Cultivation begins in October when the land is ploughed 9 or 10 inches deep after the dung and seaweed are spread on the land. The treatment of the seed is a feature with all the successful Ayrshire growers. It is selected when the crop is being raised, stored in boxes and put away for the following year's crop. Mr. HANNAH says the most essential requirement in the storage places is light, and

those who have watched the development of potato sprouts in cool light houses know how true this is. Mr. HANNAH sums up regarding seed thus: "An early crop depends more, almost, than anything else, on the proper handling of the seed both before and at the time of planting." The most popular size of seed is from 2½ to 3 ounce tubers, and about 30 cwt. is required to plant an acre. Planting is general from the middle of February to middle of March. The young shoots appear above ground towards the end of April and a light harrow is passed over the drills to destroy as many weeds as possible; after that the land is cultivated between the drills and hoed between the plants by hand labour. Later, the land is cultivated as deeply as possible between the drills, and just before the haulms meet in the drills a moulding-up plough is used to finish the work. In an average season the crop is ready for lifting about the middle of June. The variety grown in almost every case is 'Epicure.' It is grown because it has been found that the tops stand rough weather better than any other and because it bulks early, that is, it gives size of tuber early in its career, and that is what counts from the money-making point of view—tonnage when prices are good.

We now come to one of the most important papers in the whole series—Mr. H. V. TAYLOR'S on "The Industrial and Commercial Uses of the Potato." Mr. TAYLOR'S paper is important in itself: it is doubly important because of Mr. TAYLOR'S position as an adviser to the Ministry. The potato crop in the United Kingdom is used almost entirely for human food: a small portion of the waste and chats being used for cattle and pig feeding. Practically none is used for industrial purposes, *i.e.* the manufacture of dried potatos, potato starch, alcohol. These are important industries in Germany, America, Holland, Japan, and other countries in a lesser degree. Why cannot they be set up profitably here is the question Mr. TAYLOR sets out to answer. He puts the case thus: "Farmers are as satisfied as farmers ever are with the financial results of growing when the supply of potatos is less than, or balances the public demand; but they are disappointed when the supply is excessive (and the prices consequently very low), and their anxieties would be relieved if some machinery existed in this country for utilizing the surplus crop, so that remunerative prices would be secured for the surplus in excess of human consumption." In Mr. TAYLOR'S words, "Can industries to accomplish this be established in England, and if established would the undertakings be a financial success for the manufacturers and the potato-growers?" To answer the question the industries which exist abroad have been carefully studied, and a mass of valuable information about them is given in Mr. TAYLOR'S paper. The conclusion of the whole matter is put thus—"Reviewing the whole position, it does not appear that in this country, which has for many years adhered to the great Free Trade policy, and freely opened the home markets to the world's supplies, the farmers can hope to secure any material financial gain

by growing potatos specially for the manufacture of dried potatos, farina or alcohol. . . . An industry of this kind only appears possible in a country where protection has been accepted as a national policy." Even in a country like Germany, where protection is the national policy, farmers cannot wax fat over the returns they get for their potatos, for, according to Mr. TAYLOR'S enquiries, "farmers as a general rule did not in pre-war years receive more than £1 5*s*. per ton for their potatos—the average being nearer £1. These figures do not take into consideration the farmers' proportion of the State bonus, returned to them as distillers, in accordance with the arrangement of the Distillation Tax. The amount received from this bonus would in most instances be less than 20*s*. per ton of potatos used." Those whose potatos go to the production of starch do not fare any better, £1 6*s*. per ton being the return in pre-war times. Mr. TAYLOR has little hope of an alcohol industry being established in this country, but considers the starch industry should be encouraged and placed in the position of a "Key Industry."

Mr. DONALD MCKELVIE'S paper was devoted to "Bud Variation," which is not a subject which comes under the heading of my lecture. Many present at the Conference were disappointed that he, the eminent raiser of 'Arran Chief,' 'Arran Comrade,' and 'Arran Rose,' did not discourse on the "Raising of New Varieties of Potatos."

The series of papers dealing with the Wart Disease problem are not for discussion this afternoon. In the words of Dr. BRIERLEY: "We know that certain varieties of potato are immune to the disease, while others are susceptible: we do not know wherein lies this difference, nor which is the positive degree. We possess detailed information regarding the cytology and life circle of *Synchytrium endobioticum* as this fungus behaves under laboratory conditions, but we do not know how far the truth holds for the complex reality of the field." Until these talented research workers get farther advanced, practical men must be content to carry on with the very slight understanding of the problem which has been vouchsafed to them.

"From the economic point of view the potato blight is still the most serious disease which attacks the crop, and the diminished yields and actual losses occasioned by it, though difficult to estimate accurately, are truly enormous." Dr. PETHYBRIDGE uses these pregnant words in the introduction to his paper on "Some Recent Work on Potato Blight." We all know of Dr. PETHYBRIDGE'S splendid work on Blights and other diseases, and it is the duty of every practical man to study most carefully his paper. One of the most helpful things PETHYBRIDGE clearly states is that "the view that oospores (resting spores) are an absolutely necessary factor in the perpetuation and incidence of the blight from year to year is of course untenable. It was shown by Bary in 1876 that the disease may arise directly from the mycelium hibernating in a blighted tuber if the latter be planted.

This fact was confirmed by Jensen in 1883, and has since been further confirmed by the present writer under greenhouse and garden conditions, and by Melhers in America under field conditions, and there can be little doubt but that this is the source from which infection of the crop commonly occurs." What a lesson is there on the absolute necessity for planting clean tubers! Dr. PETHYBRIDGE proceeds to deal fully with spraying as a preventive of blight. It is now looked upon in many countries, and rightly so, he says, as just as necessary an operation in growing potatos as are proper cultivation and manuring. He discusses the possibility of raising varieties which will be immune to blight. So far some late ripening varieties are almost, if not quite, resistant, but such resistance seems to diminish with age. I must leave this interesting paper with this quotation: "Wherein the power of resistance to blight lies is not definitely known, but from the small amount of experimental work which has been done on the matter up to the present it would appear that it is not of a mechanical nature, such as thickness of skin, impenetrability of the cell walls and the like, but is due rather to the presence of some substance in the cells which inhibits the development of the fungus mycelium within the tissues. The subject is one of extraordinary interest and demands further investigation. Whether varieties exist which are absolutely immune to the blight is not known. The search for them or the raising of them by breeding are problems for the future."

The last group of papers, those on Leaf-roll (Curl), Mosaic and allied diseases is most suggestive. The writers are Mr. PAUL A. MURPHY of the Irish Department of Agriculture, Dr. H. M. QUANJER of Holland, and Mr. A. D. COTTON of the Ministry of Agriculture. We are asked by Dr. QUANJER to drop the old name of "Curl" and adopt the term "Leaf-roll" instead for the specific disease, as the term "Curl" has been hitherto used in a general sense to cover different types of disease. There seems reason in this request—"Curl" has been with us for 150 years. It is time we knew the different varieties of it!

All the writers agree that leaf-roll is a serious, QUANJER calls it a dominant, disease in the South of England, the Southern States of America, and the Continent of Europe—at least, he adds, in certain varieties. All agree that the disease is carried in the tubers, and therefore that seed from infected crops spell failure up to 50 per cent. in the areas just mentioned. COTTON proved that in twelve centres in England last year. In his peregrinations in Scotland in 1920 he discovered a field of 'Arran Comrade' which was affected with leaf-roll. He secured 12 cwt. of that crop and 12 cwt. from a perfectly healthy crop growing some miles away in an adjoining county. He had 1 cwt. of each sent to twelve stations in England and grown, and found that the clean healthy stock yielded about double the crop of the other. When a gentleman in Mr. COTTON'S position gets hold of a series of figures like these the matter is not going to rest there, and I quite agree it shouldn't. I got in touch with the grower of the 12 cwt.

infected stock. In 1919 he grew half a ton of the original stock of 'Arran Comrade' and it behaved well but was attacked with green-fly. Growing alongside was 'Edzell Blue,' among which some plants were affected with leaf-roll. The 1921 crop which Mr. COTTON saw was grown from the produce of that half-ton—"leaf-curl or no leaf-curl, it did me very well," the grower told me. It was all sold for ware (except the 12 cwt. Mr. COTTON got), and it yielded 15 tons per acre! It was a good thing it was all sold for ware; had it gone to the South of England for seed, it would have been a serious matter for the man who planted it and for the reputation of the variety.

QUANJER in his visit to Scotland declares he saw the process of infection going on; 'Crusader' which was growing alongside a variety badly infected with leaf-roll had contracted the disease where it was adjacent to the other variety, and was clean where it was not in proximity. At Kew Mr. COTTON in 1920 grew small lots of 'King Edward,' 'Lochar,' and 'President,' selected from stocks which were perfectly free from disease. Alongside he grew an infected stock of 'Kerr's Pink.' By the end of July all were infected with leaf-roll. A duplicate set of the *clean* stocks was planted half a mile away in an isolated position. 'King Edward' and 'Lochar' remained healthy right to the end, but two plants of 'President' went wrong. It came from a supposed clean stock in Holland. The 'King Edwards' and 'Lochar' were from Scotland. The crop in 1921 from tubers saved from these experiments proved that leaf-roll or mosaic developed from the infected plants in every case, and the healthy stocks reproduced healthy stocks with the exception of two plants.

Mr. MURPHY grew in Ireland in 1921 duplicate sets of Mr. COTTON'S Kew-grown tubers with the same results— tubers from plants exposed to infection all gave produce affected with leaf-roll, and from those grown in isolation healthy plants resulted.

Mr. COTTON says his experiments "clearly explain the abundance of leaf-roll and mosaic in small gardens. Seed of all kinds is in use and there is always an abundance of infective material. . . . A certain amount of clean northern seed is introduced by the best allotment holders each year, but the crop is promptly infected, the extent varying with the susceptibility of the variety and the nature of the season. Consequently, allotment seed usually deteriorates sooner than any other."

All the three writers agree that the diseases we are dealing with now are highly infectious, and that the carriers of the disease are aphides or green fly. In this connexion it must be pointed out that these diseases are and can only be serious and virulent in districts where green-fly abounds, and that "the further north the less disease, until one reaches the extreme north of Scotland, where there is reason to believe that leaf-roll and probably mosaic also do not spread, and, consequently, that under entirely natural conditions they would not be found to occur" (COTTON). QUANJER confirms that. His words are: "In Great Britain we see that potato-seed is better the greater

the latitude and altitude are." This is very comforting to Scotsmen, but they will require to do their part by seeing that their stocks are clean, and they must be prepared to go to any amount of trouble to keep them so. For several years Dr. QUANJER has worked in conjunction with Dr. OORTWYN BOTJES. Dr. BOTJES isolated the healthy strains of the different varieties on his farm of 100 acres, and Dr. QUANJER isolated the different diseases. Their work reads like the remarkable work done in the medical research world in connexion with malaria and yellow fever. It was BOTJES' efforts to try and eliminate leaf-roll by careful selection of healthy plants that first called QUANJER'S attention to the injurious influence diseased plants had on their healthy neighbours. Let me quote in QUANJER'S words what followed :

" The aphid experiments were undertaken during the last three years in insect-proof cages by Dr. BOTJES for leaf-roll and by myself for mosaic. Selected and numbered tubers from healthy grown plants were cut into four pieces; one series of fourth parts was, during the latter part of the winter 1918–19, grown in a hot-house to control their state of health ; another series of fourth parts of the tubers, which proved healthy, was afterwards grown for being infected by green-fly on leaf-rolled plants ; another series for the mosaic-infected green-fly ; and the last series for green-fly fed on disease-free plants. All other insects were excluded from the experimental plants. We never came to a decision the same year whether the transmission of the disease took place, since the symptoms of primary disease are not always to be trusted. But we always cultivated the progeny of each plant treated and waited for the symptoms of secondary disease the following season. It was a slow method of experimenting, slower than that followed by our American colleagues, but the evidence obtained was conclusive. Every plant on which leaf-roll aphides were fed got leaf-roll progeny; every plant on which mosaic aphides were fed got mosaic progeny; and every plant on which healthy aphides were fed gave healthy progeny."

It is time I proceeded to say a little about preventive measures suggested by the writers of these papers. What we growers have been often inclined to dismiss simply as degeneration in a variety has been, I fear, in many instances an undermining of the constitution brought about by disease. Is the road out of all the trouble the raising of new varieties from seed ? QUANJER tells us that " the mosaic diseases of tobacco, mangolds, sugar, beet and cucumber cannot be transmitted by the grain (true seed), but this has not yet been conclusively proved in the potato." There is a point here for breeders—work on parents that are known to be absolutely free of mosaic and leaf-roll. But, what lines are growers for seed to take with their general crops ? Get stock seed from disease-free stocks, get it from the north, and if any diseased plants appear get them rogued out as soon as observed. In Holland a system of inspection has been in operation since 1903—a co-operative method arranged by the farmers themselves. In

order to get a higher price for their seed the growers are only too ready to have their fields inspected and to obtain certificates. Dr. QUANJER explains this pretty fully, and I imagine the day is coming in Britain when certificates of freedom from these diseases will be called for as well as certificates of purity and freedom from wart disease.

In concluding, let me quote MURPHY, who sums up the position in a sentence: "It is the appearance of the plant which produced the tuber which counts most." Healthy plants will give healthy offspring, and we can never have healthy plants without a good appearance. Every farmer and gardener knows this to be true.

One serious difficulty we practical men are up against is the difficulty of diagnosing the diseases—leaf-roll, mosaic, crinkle, which I have not referred to, but which QUANJER warns us against—a disease resembling mosaic but more rugged with leaves curled downwards—the difficulty of recognizing the troubles when we see them with certainty when the experts admit at times that it is quite impossible for them to be certain. The Ministry of Agriculture publishes two very helpful 4-page leaflets on Potato Leaf-curl and Mosaic Disease—Nos. 164 and 373 respectively. I advise every grower to obtain these, which he can do by sending a letter of request to the Publication Branch, Ministry of Agriculture, 10 Whitehall Place, London.

Sir DANIEL HALL, Chief Scientific Adviser to the Ministry of Agriculture, was to have delivered the Inaugural Address to the Conference, but he was detained at Geneva, where he had gone to represent the Government at an International Agricultural Conference. Lord Lambourne, the President of the Royal Horticultural Society, presided at the opening and gave an address of welcome to the delegates. It was most unfortunate that Sir DANIEL HALL was not able to attend, because in his address, which is printed in the Report of the Proceedings, he raises many issues of supreme importance. For example, he advocates the increase of yield by improved cultivation, by the introduction of better cropping varieties, by the dissemination of good seed, and by the prevention of disease: but he is wise enough to say "that we cannot all at once increase our potato acreage, the market will not stand it, and it is one of the duties of the industry to conduct a propaganda and enlighten the people on the value as food, and on the many ways in which it can be utilized." I can imagine that would have formed a fine subject for discussion. Sir DANIEL also says that diseases of all kinds are "the chief factors limiting production and increasing the price to the consumer." In a discussion the question would have arisen—how much lower can the grower go in his price to meet the consumer? Not a penny if he is to remain solvent under present rents, taxes, rates, costs of manures and labour. Sir DANIEL is alive to the present heavy freight charges on potatos for seed that come from any distance to the southern potato-grower. What about the freight charges for ware from the northern

growers to the southern consumers ? It is a serious handicap and is equivalent to a bonus to the foreigner. Sir DANIEL also said that the attention of the Conference would be called to the steps which are being taken by the Ministry to secure the purity and freedom from disease, not only of the seed potatos we export but also of the stocks that are imported.

In his absence that was not done. He also trusted that the Conference would help to establish a good understanding between the scientific officers of the various countries who have the charge of measures to prevent the introduction of disease, and in conclusion said : " Any country has a perfect right to establish protection if it desires, but from every point of view we wish to keep the two matters of disease prevention and commercial protection distinct. This cannot be done unless each country has confidence in the measures adopted in other countries to check the export of diseased stocks and in the capacity and good faith of the technical officers administering such regulations. I have every hope that this conference will assist in bringing about such a mutual understanding." How much the Conference lost by the absence of Sir DANIEL HALL !

I must say in conclusion that everyone interested in producing potatos should obtain the full official report of these papers which were read before the International Potato Conference. The volume can be had from the Royal Horticultural Society, Vincent Square, Westminster, London, for 3*s*. 4*d*. post free.

SCENTED ROSES.

By E. J. Holland, F.R.H.S., President, National Rose Society.

[Read June 21, 1921; Mr. C. T. Musgrave in the Chair.]

May I commence my paper with an oft-quoted passage from Ruskin?

"Flowers seem intended for the solace of ordinary humanity. Children love them; quiet, contented, ordinary people love them as they grow; luxurious and disorderly people rejoice in them gathered; they are the cottager's treasure; and in the crowded towns mark as with a little broken fragment of rainbow, the windows of the workers in whose hearts rest the covenant of peace. Yet few people really care about flowers. Many indeed are fond of finding a new shape of blossom, caring for it as a child cares about a kaleidoscope. Many also like a fair service of flowers in the greenhouse, as a fair service of plate on the table. Many are scientifically interested in them, though even these in the nomenclature rather than the flowers; and a few enjoy their gardens."

Though in his inimitable style he gives us the truth as he saw it, I cannot help thinking that had he written seventy years later and seen the immense development of the love of flowers, and the joy of cultivating them amongst all classes of the community, he might have expressed himself rather differently.

However, as rose-lovers, we forgive him when we read on. "Perhaps few people have ever asked themselves why they admire a Rose more than all other flowers. If they consider they will find first that red is, in a delicately gradated state, the loveliest of all pure colours; and secondly that in the Rose there is no shadow except what is composed of colour. All its shadows are fuller in colour than its lights, owing to the translucency and reflective power of the leaves,"—and then he asks: "Has the reader ever considered the relations of the commonest forms of volatile substance? The invisible particles which cause the scent of a Rose leaf, how minute, how multitudinous, passing richly into the air continually!" I hope to speak further of these invisible particles. For the moment you will note that when he wrote that passage he had in his mind *Red Roses* and *Scented Roses*, and I think it must be admitted that while we may admire our yellow Roses, our pink Roses and our white Roses, not to mention the newer shades which M. Pernet-Ducher and others have given us, red is the colour we most desire in Roses, and further that one of the charms of a Rose is scent.

Everyone expects fragrance in a Rose. Everyone is disappointed to find a scentless Rose. The reason is not far to seek. For generations our forefathers, limited as they were in the choice of varieties,

had none but fragrant Roses, so that instinctively, not entirely satisfied with beauty, we require for full gratification fragrance also. Other flowers may delight us by their gorgeous colourings (no one ever puts a Dahlia to the nose to ascertain if it has perfume), but hand a Rose to a friend and almost invariably the test is immediately applied, with obvious disappointment if expectations are not realized. You may remember Foster Melliar's story of the old lady to whom when visiting his garden in company with other villagers he handed a flower of 'Baroness Rothschild,' and her exclamation "Why, they have sniffed all the scent out of this 'ere one." I notice that a writer in the last *Rose Annual* describes it as "the savage taste for the aromatic," and asks "What is this sense of smell that we put such a fantastic value upon it in connection with the Rose?" But is it a "savage taste"? And do we put upon it a fantastic value?

When practically all Roses possessed fragrance it was simply taken for granted. Now that a different condition of affairs has arisen it is not surprising to find people deploring that while immense advances have been made by cultivators and hybridists many of our modern Roses have little or no scent. Some even make more sweeping statements, based fortunately on hasty generalization. Because certain popular Roses are scentless, for instance 'Frau Karl Druschki,' many have jumped to the conclusion and airily asserted that "modern Roses have no scent." While I am free to admit that a number of our most beautiful modern Roses are nearly if not quite scentless, I can readily point to many exceptions, as for example 'Madame Abel Châtenay,' 'Richmond,' 'General MacArthur,' 'Pharisäer,' 'Hugh Dickson,' 'Lieutenant Chauré,' 'Mrs. Bertram Walker,' 'Lady Alice Stanley,' 'Ophelia,' to name only a few.

To explain the present position it is necessary for me to trace briefly the evolution of present-day Roses. From the wild species in many parts of the world all our modern Roses have been derived. Who first planted the Rose in cultivated ground must ever remain a matter for conjecture. Some degree of development must have taken place in very early days, for there are numerous references to the Rose in classical writings, and 2,000 years ago Sappho, a Greek poetess, designated it the Queen of Flowers. Then we read of the immense sums spent on Rose blooms in Roman times by Cleopatra and Nero, who perhaps are among the luxurious and disorderly persons referred to by Ruskin. A point of special interest to which I here make passing reference is that the Egyptians and the Romans appear to have had autumn-flowering Roses, whereas we in England had none but summer-flowering varieties till the last century. Whether this second flowering was natural or induced by climate and cultivation it is impossible to say. There is, however, no question that their Roses were scented.

Practically all our modern cultivated Roses owe their origin in some degree to *Rosa gallica*, *R. centifolia*, *R. damascena*, and *R. indica*. *Rosa gallica*, the French Rose, is a native of France, and grows abundantly in

other parts of Europe. It has long been under cultivation, and is prolific in the production of seed, which fact no doubt accounts for the number of French Roses introduced into our gardens. The date when it was first brought into England is uncertain. It is strongly perfumed, and it is one of the Roses to which its numerous descendants owe their scent. *R. gallica* resembles in some respects *R. centifolia*, the Provence Rose or, as we call it, the Cabbage Rose. The name "hundred-leaved" indicates that it is many-petalled. It came to us from the South of France, and since it was found in the old French province of Provence it is called the Provence Rose. It is also found in the wild state with single flowers in the eastern parts of the Caucasus.

The late Canon JEANS contributed to the *Rose Annual* of 1921 a most interesting article on the history of this Rose which he says "seems chiefly to have formed the backbone of continuity." He identifies it with the Roses mentioned by Herodotus in the garden of Midas. "Here Roses grow," says the historian, "so sweet that no others can vie with them, and their blossoms have as many as sixty petals apiece." He suggests that from Paestum, the Greek part of Italy, famous in ancient days for its Roses, this noblest of all Roses spread through southern Italy and was introduced by the Romans into Gaul, where it became known as the *Rosa provincialis* or Provence Rose. However that may be, it came to us in 1596, and for long held a first position in English gardens. The Provence Roses are deliciously fragrant.

Rosa damascena, the Damask Rose, is generally believed to have been introduced into Europe from Syria, possibly at the time of the Crusades. It was brought to England in 1573. It is not known to exist in an uncultivated state. Without question it is of great antiquity. One authority considers *R. damascena* to be merely a variety of *R. gallica*, which was distributed from France to Mesopotamia. Formerly all red Roses were termed Damask. This accounts for the fact that the common red Gallica is often described as Red Damask, which of course is misleading. There are dark Roses belonging to every group, and there are Damask Roses of various colours, even white. I wish especially to draw attention to the Damask Rose because it was for long years a great favourite in English gardens, and through it, as I will show later, was produced first Damask Perpetual and then the Hybrid Perpetual. Some authorities assert that *R. centifolia* and *R. damascena* are merely subdivisions of *R. gallica*. It should be noted that all three—*gallica*, *centifolia*, and *damascena*—were summer-flowering only, and these were the Roses which, with the Austrian Briers and a few species, until the nineteenth century graced the gardens of our forefathers. *R. centifolia* and *R. damascena* give us the true Rose scent.

The coming of the China Rose (*Rosa indica*) towards the close of the eighteenth century, with its faculty of continued or successional flowering, wrought a revolution. As the result of fertilization of *R. gallica* and Provence Roses with *R. indica*, or possibly vice versa,

hybrids were introduced. Although called Hybrid Chinese Roses, they partook more intimately of the nature of the French and Provence Roses than of their Chinese parent ; they were summer-flowering only, whereas the Chinese Roses flower from June to November. However, in the next stage, the crossing of the Damask with the Hybrid China led to a class of Roses with something of the successional flowering propensity of the China. These were called Hybrid Perpetual, because they had a second flowering to distinguish them from the summer-flowering Rose. The influence of the Damask preponderated, and it will be observed that in the evolution of the Hybrid Perpetual, *gallica*, Provence, Damask, and *indica* all played a part.

The first Damask Perpetual, named ' Rose du Roi,' afterwards ' Lee's Perpetual,' is said to have originated in the Royal Gardens of St. Cloud in 1812. After the lapse of some years, in 1825, ' Gloire des Rosamènes,' raised by M. Vibert, appeared, and these may be taken to be the forerunners of the great race of Hybrid Perpetuals. Precisely how they came about it is impossible to say. Systematic cross-fertilization was not practised. The seed heps which had been naturally fertilized by insects were gathered and the seed sown in the open. From such casual methods marvellous results were obtained. By 1840 about twenty varieties were enumerated in the Rose Catalogues. Few of these are now in existence, but in the fifties and sixties French raisers contributed such wonderful additions to our Roses as ' Jules Margottin,' ' General Jacqueminot,' ' Charles Lefebvre,' ' Alfred Colomb,' ' Dr. Andry,' ' Duke of Wellington,' ' Fisher Holmes,' ' Prince Camille de Rohan,' and ' Xavier Olibo,' which are still with us. From 1860 to 1890 the Hybrid Perpetual was at the zenith of its reign. It is true we now think, with our experience of modern free-blooming varieties, that the word Perpetual somewhat overstated the case ; nevertheless the Hybrid Perpetual had many merits : it was generally hardy in constitution, the flowers usually possessed the real Rose scent, and to this class we perforce turned for brilliant reds and crimsons.

It is necessary for us to consider the Tea-scented Roses (*R. indica odorata*). The first to be introduced to this country was a blush variety in 1810, followed in 1824 by a yellow, both from China. Both probably originated from the China Rose previously mentioned, and for some years these Roses were known as the " Tea-scented China." The term " Tea-scented " has never seemed to me very appropriate. It is said to have arisen from a fancied resemblance in the scent of these Roses to the odour of tea, or, as one writer says, to a newly opened tea-chest. I was therefore glad to find that scent experts are courageous enough to deny that the odour of tea is perceptible in the so-called Tea Roses.

As a class these Roses are not hardy—some of them are distinctly tender—they are not vigorous in growth, and their flowers are deficient in scent. They have, however, certain valuable characteristics in that they are remarkably free-flowering and the charm of their delicate shades of colouring and tinting is beyond question. Enthusiasts

proclaimed them the aristocracy of Roses. For a good many years *Hybrid Perpetuals* and *Teas* formed the two principal sections in Rose Catalogues. Indeed, classes are still reserved to Tea Roses in the Exhibitions of the National Rose Society, although some of the Roses now included under the head of Tea Roses are certainly not pure Teas.

The next stage is a most important one in the evolution of our modern Roses. Just as the Hybrid Perpetual ousted old-time favourites from our gardens, so a new Hybrid race, resulting from the crossing of the Hybrid Perpetual with the Tea, has already largely succeeded in supplanting both the Hybrid Perpetual and the Tea. This class of Roses is called 'Hybrid Tea,' a not particularly satisfactory name. It includes a large army of new Roses of very diverse character, some obviously more nearly allied to the Hybrid Perpetual than to the Tea, and *vice versa*. We have already seen that the French, Provence, Damask, and China Roses all enter into the composition of the Hybrid Perpetual. This last stage in hybridization therefore introduced a further admixture of the China or Tea element, thus securing in combination the greater hardiness of the Hybrid Perpetual with the free-flowering propensities of the Tea.

It was undoubtedly a wonderful step forward. Here was a class of Roses possessing most desirable qualities, and hybridists bent all their energies to the production of new varieties, with most remarkable results, inasmuch as this class soon contained the best Roses for almost every purpose: for bedding, for pillars, for standards, for exhibition, and for cultivation under glass. A perusal of the catalogue of one of our leading nurserymen shows that from thirty-five varieties listed in 1902 the number had increased to 220 in 1914, and of new Roses introduced since by far the greater number are classed as Hybrid Teas. In 1916 over sixty new varieties were shown for the Gold Medal of the National Rose Society on a single day.

The coming of the Hybrid Tea immensely increased the popularity of the Rose in our gardens. But as in all progress something has usually to be sacrificed, so, speaking generally, we have secured many desirable qualities: perfection in form, numberless gradations and blendings of colour, freedom and continuity of flowering over a long period, say from June to November, at the expense of perfume, and the red shades of the Damask. We must count our gains by the result on balance, and who shall say that these have not been great, even if we do, as Shelley says, "look before and after and pine for what is not"?

To some degree our Rose Shows, I think, have had an adverse influence in the matter of scent. In order to satisfy the requirements of exhibitors hybridists concentrated their attention on the development of form and size. Even colour was regarded lightly—else how could such a Rose as 'Marchioness of Londonderry' have been awarded the Gold Medal of the N.R.S.? Let me say nothing in disparagement of our Shows. The Rose world is deeply indebted to them. It must be confessed, however, that for a time the exhibition

of fine specimen blooms was mainly catered for both by the raisers of new Roses and in our Exhibitions. We were under the inspiration of such thoroughgoing enthusiasts as Dean Hole and Foster Melliar. Do we not remember that Foster Melliar openly declared that he did not consider the Rose pre-eminent as a garden plant? He thought cut Roses were difficult to arrange in water for decorative effect; his idea was that a good Rose should stand in a vase as a queen, and in his estimation the value of the Rose lay in the glory of its individual flowers. And Dean Hole, avowing himself more of a gardener than a botanist, dismissed details of classification to get on with cultural directions. We know and appreciate their spirit. Make the Rose your hobby, work at your Roses all the year round, attend yourself personally as a true amateur to all the operations in the Rose calendar, and reap your reward in magnificent blooms to grace the vases in your home and the exhibition boxes in the Show tent.

So for years it was laid down in the rules of the National Rose Society that the highest type of bloom is one which has form—size—brightness—substance and good foliage, and which is at the time of judging in the most perfect phase of its possible beauty. *Form* implied petals abundant and of good substance, regularly and gracefully arranged within a circular outline and having a well-formed centre. *Size* implied that the bloom was a full-size representative specimen of the variety. *Brightness* included freshness, brilliancy and/or purity of colour. There was nothing about scent. The rules have been modified to meet modern conditions and the introduction of many classes for decorative Roses, but there is still nothing, and it is difficult to see how there can be anything, in regard to scent, except in the directions for judging new Roses or sports.

The production of fine specimen blooms was the aim and object: we need not criticize or depreciate this stage in development. I remember that the late Mr. Mawley used to call us a Council of Exhibitors, forgetting, I think perhaps of design, that to the Shows he owed at least his early enthusiasm and the National Rose Society its existence. Times have changed: our Rose Shows are no longer exclusively, or even largely, for the purely exhibition Rose, glorious as fine individual blooms may be; our regulations are no longer limited to the form, colour, and size of single specimens, but concern decorative Roses in baskets, bowls, vases, and groups; and, further, as I have said, fragrance does enter as one of the considerations in the judging of new seedling Roses and sports.

Now, while it is comparatively easy to judge colour and form and to estimate with a fair degree of accuracy the value of a new introduction whether as an exhibition or a garden Rose or both, fragrance is rather an elusive element. Proverbially "tastes differ," and in regard to the question of scent perhaps especially is this the case. One will detect scent where another will assert there is none. Scent is so intangible, so indefinable, and not every person has an equally trained sense of smell for the appreciation of perfume.

I suppose few of us have ever asked why and how it comes about that a Rose is fragrant; so let us for a moment turn, as Ruskin suggests, to consider the "invisible particles" which cause the scent of a Rose-leaf. Why does a Rose smell? Whence is its scent? Scientists tell us that it arises from an essential oil found in the papilliform epidermal cells on the upper surface of the petals, rarely in the cells on the under side. From an examination of the epidermis of the petals it was thought at one time that both sides were equally odoriferous, but later investigations have shown that the volatile oil is secreted in and given off mainly from the tiny cells on the upper surface. It is also stated that the oil does not accumulate or take the form of drops, but is given off almost as soon as it is generated, and that the formation and dispersion by exhalation proceed almost simultaneously.

Having realised that the cause of scent is an essential oil generated in the cells on the petals of a Rose we shall readily understand, what we know from observation to be a fact, that warmth is an important factor in fragrance. So also is a moist atmosphere. Not that temperature determines whether a Rose can be classed as scented or otherwise, but that it decides the rapidity with which the oil is generated and given off into the air. Hence on cool days scent is much less evident. These considerations probably explain what has been noticed, that Roses flowering under glass give off a greater amount of perfume than those cultivated in the open air—it is largely a question of warmth. Also the petals with the tiny cells are more perfect and undamaged by wind and weather.

Something depends, too, on the age of the bloom: the petals of a Rose must be well developed before the highest degree of fragrance is attained.

It is said that cut Roses placed in a vase diffuse their fragrance more powerfully than when growing on the plant, and there is no doubt that two or three fine specimens of 'Richmond' or 'George Dickson' will scent a room. So is the scent of Roses strongly diffused in the exhibition tent, where the conditions favour the rapid secretion and dispersal of the essential oil. In illustration of the capricious nature of perfume in Roses and the extraordinary complexity of its forms, I have seen it stated that in the whole list of Roses there are not two which develop precisely the same odour, but that in the same species and even on the same plant there are not found two flowers absolutely identical in scent, and even at different times of the day an individual flower will emit a different perfume. Probably this is rather a question of degree than of actual difference, and is related to temperature, the condition of the atmosphere, and the age of the flower.

Warm climates are required for Roses cultivated commercially for the production of Otto of Roses, which is distilled from the petals. The industry is carried on in Persia, India, Turkey, extensively in Bulgaria, and in France. Since 1886 the finest Otto has been made near Leipzig in Germany by highly scientific methods, the Roses

grown for this purpose being a variety of *R. damascena* imported from Bulgaria. The manufacture of rose-water goes back to very early days.

We all know that as a rule, and for reasons which I have endeavoured to trace, red Roses are more fragrant than the lighter shades or white. It is therefore rather disconcerting to find that some recent red introductions have little or no scent. I hesitate to mention names, but as illustrations I give 'W. C. Gaunt,' 'Col. Oswald Fitzgerald,' and 'Covent Garden'—this last I found, however, in the warmth of the Tent at Chelsea, did give a slight perfume. I had hitherto classed it as unscented.

Pink Roses, in which *R. centifolia* still maintains an influence, are usually pleasantly scented, but some modern pink Hybrid Teas are unfortunately lacking. It is difficult to attempt generalization. It is, however, the "Tea" blood which accounts for deficiency in scent.

The scent of Roses is extremely varied. But if I were asked to suggest a classification of Roses according to scent I should make three groups.

I have already indicated that Roses in which *R. damascena* and *R. centifolia* have strong influence are the Roses with the true Rose scent. There is no doubt about the real Rose scent, nothing else approaches it and no adjective can describe it. Though most Roses have scent of some kind and to some degree, it is the presence or absence of the true Rose scent that we notice at once. My first class would therefore be Roses with the true Rose scent.

This is the class we wish to see in greater strength. We do not disparage the great advance in free-flowering qualities and in other respects, but we do not wish to purchase progress too dearly. In fact, we are rather greedy. In our quest for size, form, quantity, and new colourings we have to some extent sacrificed scent and constitution. Now we wish to regain scent without giving up anything. Mr. PEMBERTON asks us "to imagine a Perpetual Crimson Rambler bearing clusters in the finest stage of development of 'General Jacqueminot' or 'Horace Vernet'"! And he suggests Dark Hybrid Perpetuals with *multiflora* habit and magnificent Teas on *rugosa* bushes! It may be possible, but it seems rather against nature. And when if ever it comes to pass that everything is so perfect, our descendants will not need Rose Shows. No. Let us be a little less ambitious. Why not go back to the Damask? Why not drop a little of the Tea strain and work on the more vigorous types? We might lose something in the number of blooms, we should probably gain in vigour, hardiness in the plant, and colour and scent in the flowers. A really fine all-round crimson Rose has yet to be introduced.

My second class would include all the Roses with what may be described for want of a better word as a "fruity" scent. A typical example of what I mean is furnished by the Rose 'Mrs. Foley Hobbs.' There are many varieties of scent in this division, far removed from that of the pure Rose, yet quite agreeable. The other day a Rose ('Louis Barbier') was handed to me to name which had distinctly the odour of violets, and attempts have been made to specify Roses

having the odour of peaches, of melons, of raspberries, and so forth. The fact is that these shadowy likenesses are merely used in default of descriptive scent words to convey the impression left on the sense of smell. 'Maréchal Niel' is a Rose which would come in this category. Whence it derived its scent would be an interesting speculation. I have asked the question of several prominent rosarians. 'Cloth of Gold' and 'Lamarque' have been suggested.

My third class includes Roses with the so-called Tea scent. Again the description Tea-scented has to serve for want of anything better. The scent of Tea Roses is slight and, to me, not always particularly attractive. But there are exceptions. These are probably more apparent than real. For instance 'Gloire de Dijon' is sweetly scented; it cannot, however, be classed as a true Tea.

To one or other of these three classes we should have little or no difficulty in referring our scented Roses, and the first class is the one for those who desire the true Rose scent, and the one to receive every encouragement.

In recent years French, English, Irish, and American raisers working on systematic and scientific lines have done wonders for the Rose. Never before were there so many beautiful new varieties. And we cannot suppose that hybridists have been unmindful of scent. Mr. McGredy tells me that he has given much thought and attention to the subject, but in his efforts to raise Roses carrying the sweet perfume of the old H.P., disappointments have been more frequent than successes. His experience suggests that in crossing H.P.s and Teas scent is largely lost in the first cross, and the majority of the seedlings partake more after the seed-bearing parent than the pollen parent as regards scent. This, he thinks, is probably through his using the H.P. as the pollen parent, but in cases where the Tea Rose pollen has been used on H.P.s he finds little or no improvement so far as scent goes. The seedlings from H.P.s on Teas had better constitutions and were generally better growers than the reversed cross, and it was on this account more than any other that this line was followed.

He has only lately found in the second, third, fourth, and fifth series of crosses, when followed up carefully, a strong tendency among many of the seedlings to throw back and give the sweet perfume of the original H.P. pollen parent, and he is now securing a batch of seedlings which he says are delightfully sweet-scented, not with the Tea or "fruity" perfume one more commonly finds among new Roses, but the real Damask or true Rose scent, and he makes the welcome forecast that we may expect improvement in this respect. As we all know, Mr. McGredy obtained the Gold Medal of the National Rose Society for the splendid fragrant dark crimson Hybrid Tea 'Courtney Page' at the Autumn Show in September 1920, so that success has already crowned his efforts.

He has given me a most interesting account of the origin of this Rose and of the lines on which he is working. I feel sure he will prove justified in his belief that scent will come back again, and that

year by year we shall find more sweet-scented new Roses among the Hybrid Teas than we have had in the past, some produced no doubt by chance, but more by those who like himself follow well-thought-out lines and work on them. The process is a slow one, but so fascinating, he says, that one never thinks of the time and trouble, and he might have added expense.

To give the lovers of scent in Roses further encouragement, it is to be noted that many of the new Roses of 1920 are sweetly scented, amongst them the yellow 'Rev. F. Page Roberts'; 'Constance Casson' (a 'Gorgeous' seedling), 'Princess Victoria,' scarlet red; 'J. G. Glassford,' carmine crimson; 'Lady Maureen Stewart,' scarlet crimson; 'Vanity,' hybrid musk; 'Marjorie Bulkeley,' flesh pink; 'Hawlmark Scarlet,' 'Ariel,' copper shades; 'Mrs. John Inglis,' crimson. 'Courtney Page' has already been mentioned. It will be seen that the statement "modern Roses have no scent" needs much qualification.

Indeed, I think it can be shown that those who demand scent have really little cause for complaint. A careful selection of varieties will give them all that they can fairly ask from every section of the Rose Catalogue.

If they require Hybrid Perpetuals, 'Alfred Colomb,' 'Captain Hayward,' 'Charles Lefebvre,' 'Duke of Wellington,' 'General Jacqueminot,' 'Hugh Dickson,' 'Marie Baumann,' 'Prince Camille de Rohan,' 'Prince Arthur,' and 'Victor Hugo,' all in shades of red and crimson and with the richest Damask scent. Not all of these can vie with some modern Hybrid Teas in perfection of form and lasting qualities, and they are not so truly perpetual as the Hybrid Teas, but in a cool season and under good cultivation they are unsurpassable for colour and fragrance. Among the pink Hybrid Perpetuals 'François Michelon' and 'Mrs. John Laing' are sweetly scented.

From the legion of Hybrid Teas can be selected 'Avoca,' 'Château de Clos Vougeot,' 'Duchess of Wellington,' 'Edgar M. Burnett,' 'Florence Haswell Veitch,' 'General MacArthur,' 'George Dickson,' 'Gruss an Teplitz,' 'Hadley,' 'La France,' 'Lady Alice Stanley,' 'Lieutenant Chauré,' 'Madame Abel Châtenay,' 'Mrs. Arthur Coxhead,' 'Mrs. George Shawyer,' 'Ophelia,' 'Pharisäer,' 'Richmond Augustine Guinoisseau,' and 'Viscountess Folkestone,' all sweetly scented. It would not be difficult to name many others. Apart from this special merit of scent, several of these are among the best Roses for our gardens.

Of the newer Roses, 'Admiral Ward,' 'Charles K. Douglas,' 'Queen of Fragrance,' 'Cleveland,' 'Mrs. George Norwood,' 'Crimson Emblem,' 'Dr. Joseph Drew,' 'Hoosier Beauty,' and 'Columbia' are a few of the most satisfactory in the matter of scent.

The Pernetiana Roses, so called because to M. Pernet-Ducher we are indebted as the originator of this group, with their brilliancy of colouring are as a class rather deficient in scent. There are, however, notable exceptions—'Juliet,' 'Mrs. Ambrose Ricardo,' and the 'Queen Alexandra' Rose.

The true Tea Roses, as I have more than once mentioned, are not

strongly perfumed, though few if any of them can actually be described as scentless. 'Mrs. Foley Hobbs,' a grand Rose, is however exceedingly sweet. Possibly I shall be told that it is not a pure Tea, and here again I may mention 'Gloire de Dijon' and 'Maréchal Niel.'

Among the Japanese Roses (*R. rugosa*) 'Conrad F. Meyer' and its white sport 'Nova Zembla' are very fragrant, apart from other desirable qualities which ensure for them a place in our gardens.

To these selections I must add some of the hybrids of Wichuraiana which, with their trailing habit and suitability for arches and pergolas, have so enriched our gardens in recent years. Many of them cannot be classed as fragrant, but 'Débutante,' 'Evangeline,' 'Gardenia,' 'Léontine Gervais,' 'Joseph Billiard,' and 'Réné André' are fortunately sweetly scented.

These lists do not pretend to be complete or inclusive of all the Roses which might be mentioned. My purpose is simply to illustrate what a wealth of selection is available to lovers of scented Roses, and how laments as to absence of scent may be absurdly overdone.

I am glad to see that Mr. WALTER EASLEA, who has always devoted particular attention to the subject of fragrance in Roses, indicates by the letter F in his catalogue Roses which are specially sweetly scented, a practice which I think might well be followed by others offering Roses for sale.

In discussing this question of scent in Roses let us not lose a sense of proportion. Scent is undoubtedly an admirable and desirable attribute. Without it many feel that something is lacking in the Rose. But to say that one has no use for a Rose without scent is to overstate the case.

Should we do without 'Caroline Testout,' 'Frau Karl Druschki,' 'Augustus Hartmann,' 'Melanie Soupert' (one of the most beautiful of Roses), 'Lady Ashtown,' 'Gustave Régis,' 'Red Letter Day,' 'Lady Pirrie,' 'Old Gold,' 'Isobel,' and 'Madame Edouard Herriot' in our gardens because scent is deficient or absent?

Should we have excluded 'Turner's Crimson Rambler,' that wonderful hybrid *multiflora* which, with the hybrid Wichuraianas to follow, gave such an impetus to pillars, arches, and pergolas?

Are we to condemn magnificent exhibition Roses, faultless in colour and outline, because they do not satisfy exacting requirements in the matter of scent? Surely beauty in colour and form is worth appreciation.

If the Rose is required for bedding purposes in the garden, brightness of colouring, freedom and continuity of flowering, good habit and strong constitution in the plant must, I think, take precedence of fragrance, and in Roses for decorative effects on pillars, arches, and pergolas and the like, the question of scent is surely relatively unimportant.

Let us estimate scent at its true value. It is unquestionably a desirable attribute, and of two Roses of equal merit in other respects preference should undoubtedly be given to the one with perfume. And may I say again that the perfume we most desire is the real Rose scent of the Damask and Provence?

WALAFRED STRABO: A GARDENER OF THE "DARK" AGES.

By H. E. Luxmoore, M.A.

How far the history of gardening interests the members of R.H.S. I do not know, but I am encouraged to offer the following abstract of a rare Latin poem by Walafred Strabo, dated about 800 A.D., when the great Karl was at the height of his power. Its appeal is human as well as technical, and may help to modify our supercilious epithet for the "Dark" Ages.

In Lower Alsace is a place called Weissenburg. In the year 1870 it was the scene of a battle in which the then Crown Prince of Germany defeated General Douay on August 4. Twelve centuries before, a Benedictine Abbey had been founded there, and was already 200 years old when the monk Walafred Strabo took to gardening. As simple and perhaps as tedious, but certainly as loyal and industrious as most College Fellows or Cathedral Canons of any later day, he carried on the learning and the educational work of the great Alcuin, and he has left us the life of his favourite saint Blathmac of Iona, the vision of Wettin, and the praise and records of the Empress Judith and her great son Karl, all written in hexameters as good as or better than many which pass beneath or from the pen of the average schoolmaster of the present day. All these have been finely redacted and printed by the Teutonic industry of the unbaffled Dümmler in his great collection of the Latin Carolingian poets; and now and again for some chance reader there flashes back across eleven centuries a scene as real as Virgil's picture of the old Corycian gardener in Georgic IV. For there lies behind the monastery, in one of its outer courts before the gate, a bit of ground laboriously tilled and cared for—the delight, the pride, and the vexation of one of the most learned of the brothers. Good he is at his breviary no doubt; with his classics he is saturated. Ovid and Lucan he has read, but Virgil is his delight, and his phrasing and expressions are redolent of Æneids and even more of Georgics and Eclogues. And he is loyal and affectionate too, as most men are that care for gardening. There is no trace in him of the spite that deforms the Spanish cloister for Robert Browning, or the pettiness and evil that gave Abbot Samson so much ado at Bury St. Edmunds. In one matter indeed has he shown a more than modern wisdom. Stooping is the worst thing for the ageing gardener, and how can one escape the backache except by raising the beds? Accordingly a border of stout squared logs surrounds the beds, and within these the soil is piled to a convenient height.*

* "Areola et lignis, ne diffluat, obsita quadris
altius a plano modicum resupina levatur."

But the space is limited; part of it is hard and dry under the shadow of a roof*: what little growth it permits is ragged and mildewed: another part is starved by a high brick wall which robs it of air and sun. Still, even here nothing is quite lost, and some of your seedlings will at last take hold. Such as it is then, the garden is all his own work, and you may gather the persevering genuineness of the man from the state in which he found it. With unerring instinct he pitches on the *summum malum*, the worst enemy of the "Paestan art." Need I specify the nettle? Little do they know of the nettle who have not attacked it in the fastnesses where it has long held sway. "What is one to do? Deep down the roots are matted and linked and riveted like basketwork or the wattled hurdles of the fold."† But there is no time to lose. "I prepare to attack, armed with the 'tooth of Saturn,' tear up the clods and rend them from the clinging network of nettle-roots."‡ Again and again they reappear, but he beats them at last, and the strangled herbs begin in time to grow. Though his hands are hard and weather-beaten now, there yet remains the only other drawback to gardening besides backache—the natural shrinking from handling manure.§ He submits, and with his hands he loads the baskets for carrying it to the plot. It is a pleasanter task to give the water from the casks, drop by drop, with the hollow of one's hands,‖ for there is no rose to our water-pot¶ yet, and the full stream, "ferocior impetus," of the pitcher would wash away the seedlings. "So toil and zeal fill the hours which might have been idle, and the more one works the more one gets to know." There is the plot at last, soil well broken up by the "unca rastra," so universal on the Continent but so little used in England, and "the rich rotten dung is well dug in" ("pinguis fermenta fimi super insinuantur"). Next, annuals and perennials have their allotted space, and here is the list of what he specially grew. The English names are taken from Gerard's "Herbal" and Earle's Saxon notes.

Sage	Salvia
Rue	Ruta
Sothernwood	Abrotanum

* "Negat ingenuos holerum progignere fructus."

† "Quid facerem? tam spissus erat radicibus infra
ordo catenatis, virides ut texere lentis
viminibus crates stabuli solet arte magister."

‡ "Ergo moras rumpens Saturni dente jacentes
aggredior glebas, torpentiaque arva revulsis
sponte renascentum complexibus urticarum
erigo."

§ He is not one who—
"Callosas aere multo
detrectat fuscare manus et stercora plenis
vitat in arenti disponere pulvere qualis."

‖ "Flumina pura cadis inferre capacibus acri
curavi studio, et propriis infundere palmis
guttatim."

¶ Is there not an earthen Early British (?) water-pot with rose at Alnwick Castle?

Gourd	Cucurbita
Pumpkin	Pepones
Wormwood	Absinthium
Horehound	Marrubium
Fennel..	Foeniculum
Gladiolus	Gladiola
Luvestiche, lufestice	Lybisticum
Chervil	Cerfolium
Lilies	Lilia candida
? Clary	Sclarega
Mint	Mentha
Pennywort	Puleium
Gely flower	Vettonica
Hynd-haelethe, hyndhele ..	Ambrosia
Agrimony	Agrimonia
Catmint	Nepeta
Radish	Rafanum
Rose	

It will of course be seen that most of these are grown for use rather than ornament, and after several Walafred notes the medical or other useful property of his nursling. Fennel for the eyes "ventrisque tumorem," lilies for snake-bite, mint for the voice. Ambrosia absorbs blood in equal proportion to the quantity drunk. Abrotanum mixed "Paeoniis medellis" for fever and for gout ("Furtivae injuria guttae"). "Drink horehound hot from the fire after dinner if you are poisoned by your stepmother." (What grim light on strained relations the celibate throws here!) "For headache use an infusion of absinthium and plaster your head with a crown of the wet leaves." Thus is given that type of paragraph which rules all the old herbals and has only lately faded, perhaps not wisely, from our botanies.

Still these medicinal virtues do not absorb all his interest. He is equally alive to the domestic use of plants: *e.g.* the fullers use gladiola to give whiteness. But it is on pumpkins and gourds that there is most to say. Of the latter the seeds while tender may be used for food, or slices soaked with lard in a hot frying-pan—"ebria (why 'ebria'?—ever so often drinking in the lard?) multotiens"—will give a placid relish at dessert. I like "placidum saporem," it so exactly expresses the vegetable marrow. Thus far he carries his reader with him, but the next recipe is more obscure. "Take," he would seem to say, "not one of the long thin 'pepones,' but one of the oblong sort (which has 'oblongo scemate ventrem,' a belly of prolonged shape), something between a nut and an egg, then work it between your hands like a ball (or is it bubble?) of beauty-soap which lathers ('lomenti bulla salivam agens') and softens before it is macerated: while it sticks to your fingers as you squeeze it and rub it in alternate hands, there comes a little opening in it ('parvo fit

parvus hiatu exitus '). Expose this to the wind (' nothi vis '), then make an incision with your knife and a great quantity of juice will come out with the seed." When the " calyps penetrat " the " viscera (hujus) pomi "

> elicit humoris largos cum semine rivos
> multiplices. Tum deinde cavum per plurima tergus
> frusta manu spargens hortorum laetus opimas
> delicias conviva capit, candorque saporque
> oblectant fauces; nec duros illa molares
> esca stupere facit, facili sed mansa voratu
> vi naturali frigus per viscera nutrit."

By which I understand that after the juice has been extracted the rind must be torn into small pieces and will be delicious, for the whiteness and the flavour please the palate and you do not bite on anything hard to hurt your teeth (or set them on edge?—" stupere "), but it is easy to masticate and swallow (" facili mansa voratu ") and it cools you pleasantly inside. Yes, there is the cheerful old monk working his little melon as our boys sometimes work an orange before sucking and scattering the peel on the pavement. One feels for his poor old teeth and their trials with monastic fare, and one imagines the smile that tells of the pleasant coolness as the meal goes down.

But Walafred is not a mere utilitarian: he also notes the habit of growth of each nursling, and has an eye for its beauty too, *e.g.* the blue-green foliage of the rue, how it throws up its umbels and lets the air and sun get to the lowest stems; the suggestive fact that sage " tolerat civile malum " (whatever that may mean) and will die unless you strip off the flowers; the downy growth of allheal, its spiky racemes and hairlike foliage; the sweet smell and bitter taste of horehound, while fennel is fairly sweet both to taste and smell; the different kinds of mint, one being " praepingue," large-leaved and tall as elder, with different scent and bitter taste; while catmint is like a nettle in appearance but gives an extremely pleasant scent; notes which seem to indicate not the mere versifier of a manual but an intelligent man, observing for himself what comes within his range. Most of all is this shown by the genuine delight in his more important plants. For the three on which he chiefly dwells are his collection of Cucurbitaceae, his bulbs, and his roses. (1) The ' altipetax cucurbita ' forms a thick shade with shield-like leaves, and throws out tendrils like vines on elms (or the red-berried wild vine, briony, or smilax?) to grapple its supports, and clinging as with claws to the alders climbs aloft. " There is a tendril for each node and a double thread to each tendril, so it has two hands for climbing, and as our spinsters transfer their soft work-stuff to their spindles and from wide skeins wind the whole ball of thread, so do these thongs wrap round the stages of their supports." * Then there is the beautiful roundness of the

* " Ut nentes in fusum . . . pensa puellae
mollia trajiciunt spirisque ingentibus omnem
filorum seriem pulchros metantur in orbes,
sic vaga tortilibus stringunt ammenta catenis
scalarum teretes involvuntque illico virgas."

fruit as if turned in a lathe—" slim is the stem from which it hangs, but huge the bulk to which it bulges. Let it harden and you can make utensils of the rind, it will serve as a bushel, or pitched inside will be a jar for liquor." (2) He would describe the colour of the gladiola, the glory of purple springtime, as like the hyacinth or the darker violets; while there is a real touch of genuine feeling when he speaks of white lilies too lovely for the narrow range of his starved and meagre muse.* (3) And lastly he comes to roses, and there, like all true gardeners, cannot control himself. " Better and sweeter are they than all the other plants and rightly called the flower of flowers. Yes, roses and lilies, the one for virginity with no sordid toil "—(they spin not ?)—" no warmth of love, but the glow of their own sweet scent, which spreads further than the rival roses, but once bruised or crushed turns all to rankness. Therefore roses and lilies for our church, one for the martyr's blood, the other for the symbol in his hand. Pluck them, O maiden, roses for war and lilies for peace, and think of that Flower of the stem of Jesse. Lilies His words were, and the hallowed acts of His pleasant life, but His death re-dyed the roses."

I like this little outburst, which to me rings true of the gentle old churchman's soul, and all the more because here and there the pedantic schoolmaster peeps out, though the derivations of names are less dwelt on than in the more typical herbals. In fact, I see none save the obvious gladiola, the homonym for sage—" Letifagus (fugus ?) Salvia quam Graio dicunt Elelispathon ore "—and the queer suggestion that the poppy gets its name from the sound of the seeds being eaten. This is puzzling, as the tough capsule does not pop, and the Greek word (*μήκων*) is quite different, but it is possible that if eaten in quantities there may be something onomatopœic in it as in the English word pap.

Such, then, was the monk's garden plot at Weissenburg, such his zeal and taste, and so did he employ his leisure hours eleven centuries ago. Perhaps others besides myself remember near Florence the Certosa in Val d'Ema before its suppression: it is one of the most delightful of my Florentine memories, one of those glimpses which often suddenly come up in the mind's eye unbidden and at the oddest times—the courtyard and cloister, the kind old white-frocked monks, the flower-pots round the *fonte*, and the splashed water drying in the brooding sunshine. Even now it helps me better to picture the concluding words of Walafred's idyll. There is a similar cloister court, only round-arched, not pointed, and it leads to an orchard. Part of it is divided into beds and planted, each bed raised, as we saw, by a stockade of logs, and though part lies bare and untidy in the shade, part glows with roses and pinks and lilies among the tender greys and greens of vegetables and aromatic herbs. On one side, he says, a row of alders makes a background matted to the very top by the broad leaves and swelling fruit of climbing gourds. Beyond them,

* " jejunae macies . . . arida nostrae Musae."

ripening apples gem the mist of grey boughs and dim leafage which closes the view. Underneath is our favourite garden seat. But the standard peach is our chief pride; it takes the sun with its narrower foliage, and the globes are like clustered jewels. Everywhere is the scent of high summer; no doubt the hot air throbs with the sound of bee and cicala. The light filters through the tangle and dapples the whites and browns of the woollen frock of the old abbot who sits busy with a paper, marking it here and there, sometimes with a smile and sometimes with a shake of the head. It is Father Grimaldus reading the "Hortalus," which Walafred has just offered for his approval. He must be rather a dear old man, for children and their elders seem both to trust him. Even now some of the youngsters, a merry group from the monastery school, are round his chair. They bring him specimens of the fruit and show him how their slim fingers cannot span the swelling globes. As he looks, he thinks kindly of the gardener's toil spent on that orchard and the poet's toil on the scroll which he has been reading, and then his eyes seek out the poet himself shyly lingering in the entrance to watch what welcome his offering may win.

And so it passes, but pleasant it is to think of wise and good men, leading their simple life among the refreshments and rewards of natural labour, with happy youngsters glad to learn from them, and friends to share their toils, and Virgil for their spare minutes, and all the more anxious tasks of government and work daily and nightly hallowed by such religious service as seemed to bring them nearer to their God.*

* "Ut cum consepto vilis consederis horti
subter opacatas frondenti vertice malus,
Persicus imparibus crines ubi dividit umbris,
dum tibi cana legunt tenera lanugine poma
ludentes pueri, scola laetabunda tuorum,
atque volis ingentia mala capacibus indunt
grandia conantes includere corpora palmis,
quo moneare habeas nostri, pater alme, laboris,
dum relegis, quae dedo volens; interque legendum
ut vitiosa seces deposco, placentia firmes."

[*Walafred Strabo and his position in the literary history of the time are referred to by the Provost of Eton, Dr. M. R. James, in the Cambridge Medieval History* (1922), vol. iii., chap. xx., p. 522.]

WINTER PRUNING EXPERIMENTS WITH APPLE TREES.

By N. H. Grubb, M.Sc., East Malling Research Station.

[Read October 18, 1921 ; Mr. C. T. Musgrave in the Chair.]

At the foundation of the East Malling Research Station in 1912, the programme drawn up by the first Director, in conjunction with the Governing Body, included an extensive series of experiments on the winter pruning of Apple Trees. For this purpose a number of "maiden" (one year) Apple Trees were planted at the end of 1913, and others a year later ; these trees were thus, up to the winter of 1921–22, nine and eight years old from the bud respectively, and a year less from planting. From 1919 onwards they have yielded a considerable quantity of fruit, and it is thought that the mass of records accumulated justifies the issue of a first report.

Since much knowledge on points of vital importance in all fruit research has been gained since 1913, it will be understood that some points in relation to the trees are open to doubt. It was not known until a year or two later to what an extent the so-called ' Paradise ' stocks were mixed and wrongly named ; but as the trees were obtained from ordinary trade sources, they are strictly comparable, as far as stocks are concerned, with the trees commonly planted for commercial purposes. It has already been possible, by means of suckers, to identify a small proportion of the ' Paradise ' stocks represented ; at least four types have been found. Ultimately, it is hoped, all the ' Paradise ' stocks will be identified by means of root cuttings. There remain seven lots of trees (out of twenty) on ' Crab ' stocks ; while they are fairly representative of this class of tree, they are of course very variable, and the average of the eight trees in each group is none too safe a guide as to the effects of the different methods of pruning. There are, however, only two varieties of apple in the experiment, of which trees on ' Crab ' stock alone are available. Of five others a similar number of trees on ' Paradise ' forms a check to those on ' Crab ' ; of the remaining eight varieties in the experiment only trees on ' Paradise ' are available.

The trees were specially selected from a large number in the nurseries from which they were obtained, all being strong " maidens " of the greatest possible uniformity in height and stoutness. In this respect the trees were very much better than those commonly planted by market growers.

The trees were all cut approximately two feet high from the ground shortly after planting, and the new shoots they formed were all cut hard back and spaced in each of the two following winters. Thus to the age of three years from the bud all the trees were treated exactly alike, and any effects of the different methods of pruning subsequently employed are, up to the present, the result of six years'

treatment on the earlier planted plot, and five years' treatment on the later part.

The methods of pruning were suggested by a Committee of Fruit Growers, who met at the Research Station and discussed what plan of experiment was most likely to give results of value. At the outset it was decided that only winter pruning should be investigated, the effects of summer pruning being left for a separate experiment. The programme finally drawn up was based on the application to the trees of four methods actually in use among commercial growers.

The methods chosen may be briefly described as follows:

(*a*) "Unpruned"; only diseased and broken wood removed. This represents the practice of a large number of growers in many districts who are not yet convinced of the value of any pruning.

(*b*) "Open centre" or "regulated"; centre of tree kept open and more or less bowl-shaped; no "spurring" done except for this purpose. This is a common practice with standard and half-standard trees, and is sometimes also applied to bush trees.

(*c*) Tipped and long-spurred (referred to hereafter as "long-spur pruned"); leaders tipped ("strong growers" one-third, "medium growers" one-half, "weak growers" two-thirds), and all laterals not needed to form branches spurred to three prominent buds (figs. 24 and 25).

(*d*) Tipped and short-spurred (referred to hereafter as "short-spur pruned"); like (*c*), except that the laterals are spurred to one prominent bud. This method of spurring, or a near approach to it, is regularly practised by some large growers in several districts; it has been spoken of as the "Swanley method," but is certainly not confined to the Swanley district, or practised universally there.

Experience has led us to modify these methods to a slight extent, especially as regards the extent of "tipping." By the end of the seventh year from the planting of the older trees, it was clear that tipping two-thirds was quite unsatisfactory, and altogether too drastic treatment; since then the "weak growers" have therefore been treated like the "medium growers," and tipped one-half. The original list as drawn up by the Committee of Growers was as follows:

Strong-growing Varieties.	*Medium Growers.*	*Weak Growers.*
Newton Wonder.	Worcester Pearmain.	Lane's Prince Albert.
Beauty of Bath.	Allington Pippin.	Grenadier (Paradise).
Lord Derby.	Gladstone.	Early Victoria.
Norfolk Beauty.	James Grieve.	Bismarck.
Annie Elizabeth.	Rival.	
	Cox's Orange.	
	Grenadier (Crab).	

A rule also became necessary as to the lower limit of the length of a lateral to be spurred. For two years we have now spurred every lateral of sufficient length, except those of 3 inches or less which had

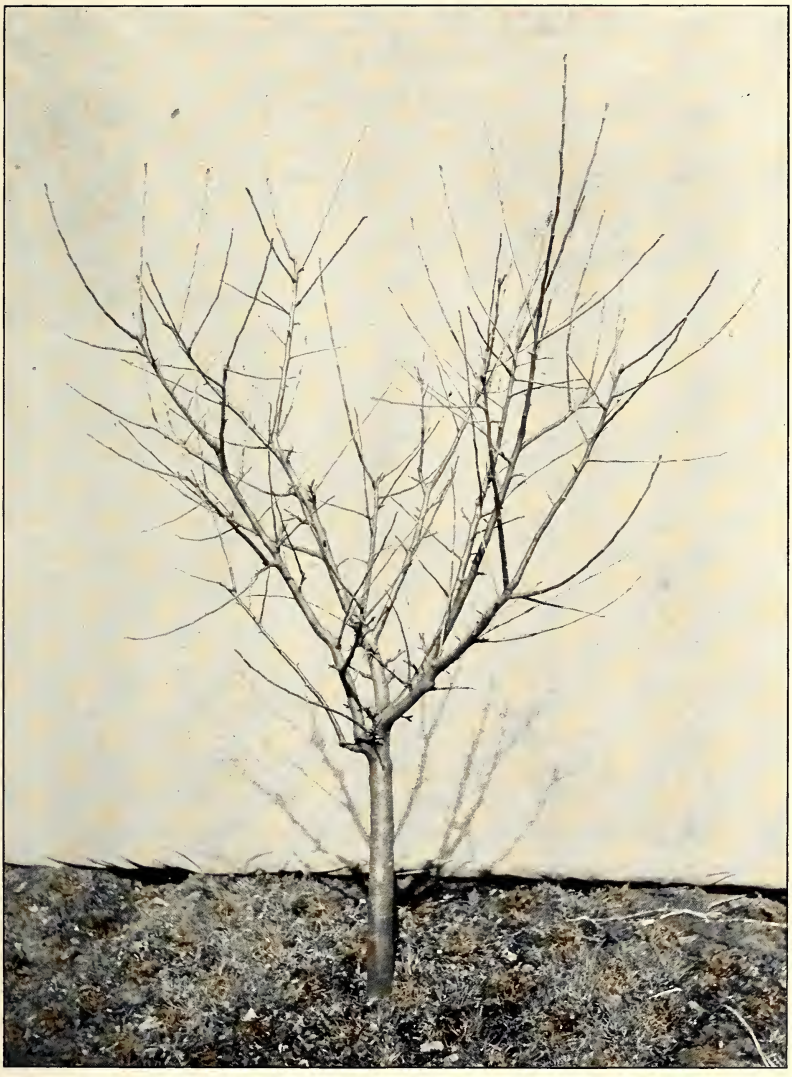

FIG. 24.—APPLE 'NEWTON WONDER,' TIPPED AND LONG-SPUR PRUNED.
Before pruning.

[*To face p.* 140.

FIG. 25.—APPLE 'NEWTON WONDER.' SAME TREE AS FIG. 24.
After pruning, showing method.

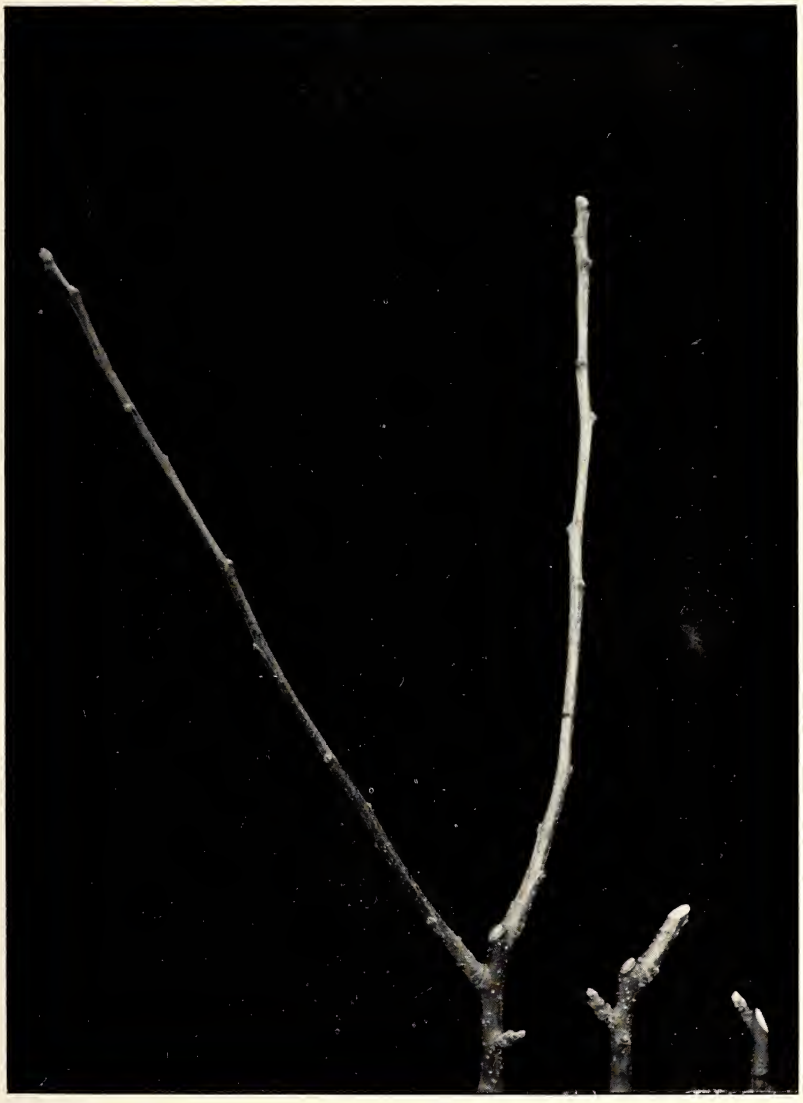

FIG. 26.—APPLE. Treatment of long-spur pruned lateral, second year.

FIG. 27.—APPLE 'LONG DARDS,' ONE YEAR AND TWO YEARS OLD.

[*To face p.* 141.

a terminal fruit bud. The " spurring " refers, of course, only to the first cut of a newly formed lateral. Subsequent treatment depends largely on the result obtained. If a definite fruit bud has been formed as a result of the first cut, the spur is cut right back to this fruit bud ; if not, or if there is any doubt, any shoots formed from the remaining piece of the original lateral are shortened to about three-fourths of an inch (fig. 26).

The application of the methods has been by no means easy, since several members of the staff have been concerned in the work. It has been found necessary to do everything possible by strict rule of thumb, instead of leaving much to the individual pruner's judgment, as is usual in commercial practice. It cannot be pretended that all variation in application of the methods has been eliminated ; but it has been reduced to a minimum, and on the average (eight trees in each group) should be negligible.

A full list of the varieties represented in the experiment has been given above. Eight trees of each variety are devoted to each method, making thirty-two trees in all ; and of five varieties, ' Worcester,' ' Grieve,' ' Gladstone,' ' Grenadier,' and ' Early Victoria,' trees on both ' Crab ' and ' Paradise ' were planted, making a total of sixty-four trees of each of these varieties. The large number of varieties, and the considerable number of trees of each, make this experiment, we believe, one of the most extensive ever undertaken on pruning.

It should be said further that none of the varieties are planted in solid blocks, but all are interplanted diagonally, two varieties together. This should largely eliminate errors that might arise in the pollination of self-sterile varieties.

Effects of Tipping and Spurring.

In discussing this part of the subject it will be convenient at first to regard the " unpruned " trees as a " control " for purposes of comparison, and to compare with them only the " long-spur pruned " trees. Later on, a few notes will be given on the relatively slight difference between the " unpruned " and the " open centre " trees on the one hand, and the " long-spur pruned " and " short-spur pruned " trees on the other.

1. *Effect on Production of Blossom.*

When the blossom is open, it is obvious at a glance that the tipping and spurring has in almost every case reduced the number of blossoms to a very large extent. Exceptions have now begun to appear, owing to the " biennial bearing " of some of the unpruned trees, but it is certainly safe to say that tipping and spurring have in every case both delayed and reduced blossoming (figs. 28 and 29). Definite figures are available for a few of the unpruned trees, and for all the long-spur pruned trees. Table I. gives such averages as can be obtained from the figures available. It will be observed that the

numbers show the average number of blossom *buds* on a tree, not actual blossoms; no attempt has yet been made to arrive at the average number of blossoms to each blossom bud; although no doubt it varies, we may perhaps roughly take it as five or six.

The counting of the buds was delayed until after the pruning of the pruned trees was completed, as many blossom buds cannot be identified until the buds begin to open, and there are therefore many cases in which a large proportion of the blossom buds were pruned away.

TABLE I.—AVERAGE NUMBER OF BLOSSOM BUDS A TREE.*

	1920.				1921.			
	Unpruned.		Long-spur Pruned.		Unpruned.		Long-spur Pruned.	
	No. of Trees.	Blossom Buds.	No. of Trees.	Blossom Buds.	No. of Trees.	Blossom Buds.	No. of Trees.	Blossom Buds.
Allington	3	1013	8	141	5	324	8	166
Beauty of Bath	3	368	8	170	5	532	8	268
Bismarck	—	—	—	—	4	488	8	2
Cox's Orange	—	—	—	—	4	603	8	126
Early Victoria (Crab)	—	—	—	—	5	185	8	91
Gladstone (Crab)	—	—	—	—	4	327	8	9
Grenadier (Crab)	3	504	8	50	5	173	8	91
James Grieve (Crab)	—	—	—	—	4	1293	8	201
Lane's P. Albert	3	1274	8	64	5	416	8	96
Lord Derby	—	—	—	—	6	381	8	94
Newton Wonder	3	890	8	139	5	117	8	139
Norfolk Beauty	—	—	—	—	4	450	7	80
Rival	—	—	—	—	4	414	8	69
Worcester-Pearmain (Crab)	3	637	8	85	5	649	8	101
Average number of blossom buds	18	781	48	108	65	454	111	110

The only case where the number of blossom buds on the long-spur pruned trees was higher than on the unpruned trees was 'Newton Wonder' in 1921. The unpruned 'Newtons' bore an exceptionally heavy crop in 1920, and several of them almost entirely failed to blossom in 1921; hence the difference. It will be seen that the six varieties counted in 1920 show on the average in 1921 a reduction in number of blossom buds from each unpruned tree; this is clearly due to the heavy crop borne by four of these varieties in 1920. The other two, 'Beauty of Bath' and 'Worcester Pearmain,' which bore only a light crop in 1920, show some increase in number of blossom buds. These points will be dealt with later.

* The averages in all Tables are given to the nearest whole number.

2. *Effect on Setting of Blossom.*

The counts of blossom buds have made it possible to get an idea of the proportion of the blossom which produces fruit, *i.e.* the "setting." This is most conveniently expressed by stating the number of mature fruits as a percentage of the blossom *buds*; the actual percentage of *blossom* setting would be roughly obtained by dividing by five or six. Table II. gives these results in detail.

TABLE II.—NUMBER OF MATURE FRUITS AS A PERCENTAGE OF BLOSSOM BUDS.

	1920.				1921.			
	Unpruned.		Long-spur Pruned.		Unpruned.		Long-spur Pruned.	
	No. of Trees.	Percentage.	No. of Trees.	Percentage.	No. of Trees.	Percentage.	No. of Trees.	Percentage.
Allington	3	10	8	22	5	49	8	50
Beauty of Bath	3	11	8	26	5	4	8	12
Bismarck	—	—	—	—	4	23	8	47
Cox's Orange	—	—	—	—	4	26	8	36
Early Victoria (Crab)	—	—	—	—	5	74	8	139
Gladstone (Crab)	—	—	—	—	4	43	8	79
Grenadier (Crab)	3	14	8	42	5	44	8	50
James Grieve (Crab)	—	—	—	—	4	8	8	12
Lane's P. Albert	3	5	8	11	5	4	8	25
Lord Derby	—	—	—	—	6	33	8	60
Newton Wonder	3	13	8	43	5	19	8	57
Norfolk Beauty	—	—	—	—	4	5	7	5
Rival	—	—	—	—	4	16	8	48
Worcester Pearmain (Crab)	3	3	8	7	5	40	8	28
Average percentage	18	9	48	25	65	28	111	46

There is but one case—that of 'Worcester' in 1921—where the percentage for the unpruned trees is higher than that for the long-spur pruned trees; in every other case it is lower, and in several cases less than half as much. The average of all varieties in 1921 shows the unpruned trees setting little more than half as large a proportion of their blossom as the long-spur pruned trees.

Another method of estimating the proportion of the blossom which sets has in a few cases been attempted. It might obviously be expected that those trees which set the higher proportion of their blossom would show at picking time a larger proportion of their fruits in clusters of two or more (*i.e.* two or more fruits from one "truss" of blossom). This indication of setting is not, however, altogether satisfactory; for fruits in a cluster, as is well known, tend to force each other off during their growth; and since the fruits of the long-spur pruned trees are nearly always larger than those of the unpruned trees, the former will be likely to lose more from this cause. (It

may here be said that a complete record of dropped apples is kept; but it is of course impossible to see for certain what proportion of the "drops" come from clusters.)

In spite of this disadvantage, of five varieties for which observations of this kind were made in 1921, four showed a considerably higher proportion of clustered fruits on the long-spur pruned trees. The exception, 'Allington,' is hard to explain; for Table II. has already shown that the percentage of blossom setting was slightly higher in 1921 on the long-spur pruned 'Allingtons'; and the fruit of this variety is moderately long-stemmed, and would not tend to be forced off to so great an extent as some of the other four varieties concerned—*e.g.* 'Newton Wonder.'

The factors influencing the setting of the blossom are undoubtedly many and complex. It would perhaps be hardly correct to say that pruning appears to be one of them, but rather that the pruning has indirectly affected the setting of the blossom by influencing one of the direct factors. If we call this factor "vigour," while we may not gain anything in actual knowledge (since we have as yet no satisfactory measure of "vigour"), the idea is at least suggestive, and leads to certain deductions of considerable importance to the pruner.

The first of these is closely in accordance with the practice of some of the best growers. If a certain minimum vigour is necessary to the setting of enough blossom to produce a crop, the failure of many old weak or stunted trees to crop, although they blossom freely, may clearly be due to their weakness. It is known that a moderate "heading back" of the branches, coupled with suitable soil treatment, will often restore such trees to a profitable condition.

A second consideration is at present too speculative to be more than mentioned. There are indications that of the long-spur pruned trees of certain varieties the weaker trees set a larger proportion of their blossom than the stronger; in other words, that there is an "optimum" vigour for setting. (The only measures of vigour available are size of tree and weight of prunings.) This, if it should prove to be a fact, will clearly affect the details of pruning methods very closely. Careful observation suggests that the too hasty cutting back of a spur, formed by shortening a lateral, to a fruit bud, may lead to the failure of the fruit bud to set fruit, and a consequent vigorous formation of wood growth which may delay the formation of the spur. Much more observation is needed before this point can be cleared up.

3. *Effect on Cropping.*

(*a*) *Number of Fruits.*—The number of fruits borne by a tree follows directly, of course, from the number of blossoms and the proportion of them which sets. In spite of the usually much higher percentage of blossom which sets on the long-spur pruned trees, they have, in every case except two, been considerably delayed in cropping

FIG. 28.—APPLE 'WORCESTER FEARMAIN,' OPEN CENTRE.

[*To face p.* 144.

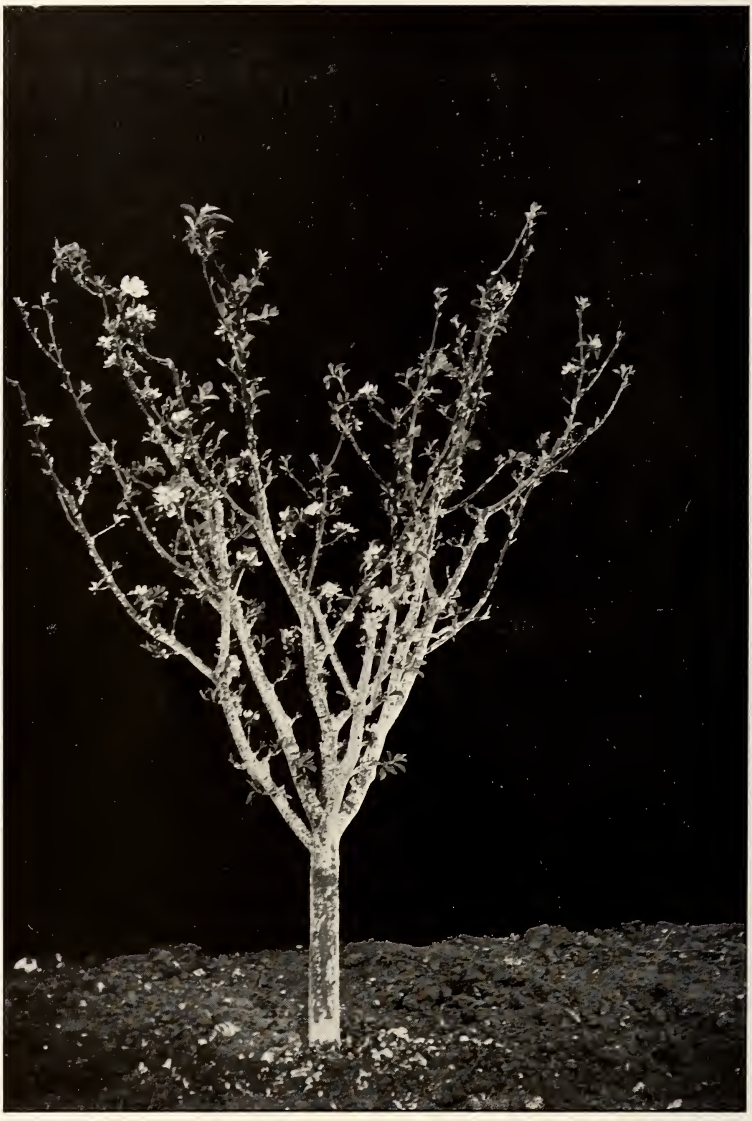

FIG. 29.—APPLE 'WORCESTER PEARMAIN,' TIPPED AND LONG-SPUR PRUNED.

Fig. 30.—Apple 'Worcester Pearmain,' open centre.
(Same tree as fig. 28.)

FIG. 31.—APPLE 'WORCESTER PEARMAIN,' TIPPED AND SHORT-SPUR PRUNED.

[*To face p.* 145.

by the tipping and spurring (figs. 30 and 31, 34 and 35). Table III. shows the average number of fruits from a tree in 1919, 1920, and 1921.

TABLE III.—AVERAGE NUMBER OF FRUITS MATURED BY A TREE. (EIGHT TREES IN EACH GROUP.)

	Unpruned.				Long-spur Pruned.			
	1919.	1920.	1921.	3-Year Total.	1919.	1920.	1921.	3-Year Total.
Allington	55	101	139	295	7	31	82	120
Beauty of Bath	11(?)	38	19	68	30(?)	42	31	103
Bismarck	18	3	100	121	0	3	1	4
Cox's Orange	54	3	157	214	4	1	45	50
Early Vic. (Crab)	73	96	228	397	5	9	127	141
,, ,, (Par.)	48	79	224	351	12	13	97	122
Gladstone (Crab)	7(?)	16	134	158	1	1	7	9
,, (Par.)	12(?)	34	226	272	3(?)	2	16	21
Grenadier (Crab)	25	83	83	191	4	20	43	68
,, (Par.)	28	70	80	178	10	28	49	87
James Grieve (Crab)	25	11	86	121	6	2	25	33
,, ,, (Par.)	8	10	93	111	8	3	48	59
Lane's P. Albert	25	41	28	94	1	8	25	33
Lord Derby	16	29	120	165	3	7	60	71
Newton Wonder	16	96	27	139	16	60	69	145
Norfolk Beauty	4	6	33	43	1	1	4	5
Rival	8	35	62	106	3	6	32	41
Worcester P.(Crab)	11	32	245	289	5	6	28	39
,, (Par.)	13	67	187	267	7	5	35	47
Average	24	44	120	188	7	13	43	63

The two exceptions to the general rule of delayed cropping of the long-spur pruned trees are 'Newton Wonder' and 'Beauty of Bath.' The latter is hardly worth considering, since none of the trees have yet produced even a moderate crop—the highest yet recorded in any one year (1920) from the long-spur pruned trees works out at less than 25 bushels per acre.

The case of 'Newton Wonder' (figs. 32 and 33), however, is extremely interesting. The difference between the two treatments in number of fruits a tree is, of course, small; it would probably be somewhat increased if the 1918 crop could be included, but unfortunately the number of fruits was not then recorded; the average weight was 10 oz. from unpruned trees and $3\frac{1}{4}$ lb. from long-spur pruned trees.

But although this result appears unique, it is simply an extreme case of a tendency present to some extent in nearly all varieties. It happened that the long-spur pruned 'Newton Wonder' trees (tipped one-third) produced a considerable quantity of blossom, even as early as the fifth year from planting—far less, it is true than the unpruned trees, except in 1921—and also that the improvement in the setting of the blossom caused by the tipping and spurring was as great as in any variety; the result being that the great preponderance

of the unpruned trees in number of blossoms did not result in a preponderance of fruit.

It happens that 'Newton Wonder' and 'Beauty of Bath' are the only two of the varieties planted in 1913–14 which have been tipped only one-third. Of the varieties planted a year later, 'Lord Derby' and 'Norfolk Beauty' are similarly tipped one-third. Neither of these, as will be seen from Table III., has behaved in the same way. The only other variety classed as "strong-growing" was 'Annie Elizabeth'; of this the trees were planted in the winter of 1916–17, and are thus still too young to have borne much fruit. It was, however, interesting to find them cropping in 1921 very much as the 'Newton Wonder' trees cropped at the same age in 1918.

A natural inference is, that if all varieties had been tipped one-third, like these "strong growers," others of them would have behaved in the same way as 'Newton Wonder,' *i.e.* would have produced a larger average number of fruits on the long-spur pruned trees. There would probably still have been a majority of varieties delayed in cropping by tipping and spurring; it is most unlikely, for instance, that lighter tipping of 'Gladstone,' 'Bismarck,' 'Worcester Pearmain,' 'Rival,' and 'Cox's Orange' would not have delayed the cropping of these varieties at all, as compared with the unpruned trees; they would probably have behaved more like 'Lord Derby' and 'Norfolk Beauty.'

(*b*) *Weight of Crop and Size of Fruit.*—From the market growers' point of view, the number of fruits, as shown in Table III., by no means gives a fair comparison between the unpruned and the long-spur pruned trees. For in every case, on an average of three years' crops, the fruit of the long-spur pruned trees has been larger than that of the unpruned trees. It follows that the average difference in favour of the unpruned trees shown in Table II. is much reduced when weight or bulk of crop is considered. Thus, while the 295 fruits borne on the average by each unpruned 'Allington' tree (total of three years) weighed 41 lb. 2 oz., the 120 fruits borne by each long-spur pruned tree weighed 29 lb. Although the greater size of the fruit of the long-spur pruned trees is often very marked, however, there are still only two varieties—'Newton Wonder' and 'Beauty of Bath'—which have borne a greater total *weight* of fruit on the long-spur pruned trees. But in any estimate of the *value* of the crops, the size would be an important factor; this will be clear from the figures of the average individual weight of all the fruit of all varieties over three seasons: unpruned, 2·69 oz., and long-spur pruned, 3·50 oz., *i.e.* nearly an ounce, or about 30 per cent. of the size of the fruit from the unpruned trees, in favour of the fruit from the long-spur pruned trees.

In many cases this difference in the size of the fruit might be ascribed wholly to the lighter crops borne by the long-spur pruned trees; but 'Newton Wonder' clearly shows that this is not the only cause. For in spite of the larger number of fruits borne by the long-spur pruned trees, the weight of these fruits averaged 4½ oz. each,

as compared with considerably under 3 oz. for the fruits of the unpruned trees. (Not well shown in figs. 32 and 33.)

It is interesting to find that two varieties, 'Lord Derby' and 'Beauty of Bath,' which in 1919 and 1920 produced slightly larger fruits on the unpruned trees, have in 1921 so far fallen into line with the other varieties that the average for the three years is now in favour of the long-spur pruned trees. From these and other cases it seems reasonable to expect that the difference will be increasingly in favour of the long-spur pruned trees as time goes on.

4. *Effect on Biennial Bearing.*

The habit of bearing crops in alternate years, so common among trees of certain varieties, is one of the difficulties which the most progressive growers are constantly trying to overcome. The ideal to aim at would no doubt be to get heavy crops in the years of general shortage; but since the years of glut and shortage do not come alternately with perfect regularity this is almost too much to hope for. But there are already indications that our pruning is tending to check this habit, even where, as with 'Newton Wonder,' the tipped and spurred trees have borne more fruit than the unpruned trees.

No satisfactory method of expressing this habit in figures, so far as I am aware, has yet been found. A considerable number of possible methods have been tried in connexion with our records, but they have all been rejected as not allowing for all the facts which must be taken into account, and not giving any real comparison between groups of trees pruned in different ways. It is necessary, for instance, to allow for the fact that each year is for some trees their "on" year, and for others their "off" year, and others again are more or less intermediate. It must be decided also whether amount of blossom or amount of fruit decides the "on" and "off" years; it frequently happens that an increase in the amount of a tree's blossom is followed by a reduction in its fruit, and *vice versa*. Usually, however, the number of fruits must be taken as the best available indication. Then there is the question: How much should be allowed for the normal increase in crop due to the growth of the tree? Again, there is the disturbance caused by the "rosy" apple aphis, a confusing factor which it is almost impossible to avoid altogether where any considerable number of trees is concerned; a bad attack will frequently prevent a tree from forming more than a few scattered fruit buds. The best that can be done at present, therefore, is to state in general terms how the pruning has affected the development of the alternate bearing habit, with examples of individual tree records.

Among the "unpruned" and "open centre" trees the habit has already become very obvious in every variety which had borne a heavy crop of fruit by 1920. The clearest of all is 'Early Victoria,' of which several unpruned trees, after cropping very heavily in their sixth year from planting (1919), had very little blossom in the following

spring. The two largest trees of this variety, one " unpruned " and one " open centre," have for the past three years taken it in turns to bear an immense crop of fruit, the former in 1919 and 1921, and the latter in 1920. In its " off " year each has produced at most two or three blossom buds and as many fruits.

The unpruned trees of ' Allington Pippin ' behaved in 1921 in the same way, and to almost as great an extent; but here the result, as shown by number of fruits, is obscured by the much higher percentage of the blossom which set in 1921 than in 1920 (see Table II.). ' Newton Wonder ' and ' Grenadier,' where unpruned, provide further examples of the habit. More than half the unpruned trees of ' Newton Wonder ' (five out of eight), after carrying a heavy crop of fruit in 1920, produced only a few blossoms in 1921; the average weight of their crop (all the eight trees) was just four times as great in 1920 as in 1921.

The long-spur pruned trees of ' Newton Wonder,' on the other hand, which in 1920 had many less fruits and a slightly smaller total weight than the unpruned trees, actually produced an increased number and weight of fruit in 1921, although their average number of blossom buds (Table I.) was a trifle less. But it is interesting to find that those three long-spur pruned trees which had the most blossom in 1920 produced comparatively few blossom buds in 1921. The point is worth presenting in detail: Table IV. shows the individual records of the eight long-spur pruned trees of ' Newton Wonder ' for 1920 and 1921.

TABLE IV.—INDIVIDUAL TREE RECORDS, ' NEWTON WONDER,' LONG-SPUR PRUNED.

Tree.	Number of Blossom Buds.		Number of Fruits.		Weight of Fruit.		Per cent. of Blossom set (as in Table II.).	
	1920.	1921.	1920.	1921.	1920.	1921.	1920.	1921.
					lb. oz.	lb. oz.		
1	62	66	1	28	5	9 5	1·6	42·4
2	90	99	82	61	29 12	19 10	91·1	61·6
3	266	30	139	9	26 10	2 7	52·3	30·0
4	168	44	46	28	13 9	8 4	27·4	63·6
5	124	201	90	125	28 1	29 11	72·6	62·2
6	218	44	77	13	20 4	4 9	35·3	29·5
7	44	319	28	173	10 3	46 7	63·6	54·2
8	145	307	14	115	4 15	27 14	9·6	37·4

The three trees referred to above are numbers 3, 4, and 6; it will be seen that these were the highest in number of blossom buds in 1920 and lowest in 1921. The question arises whether a large number of blossoms or a large number of fruits has the more influence in preventing a tree from forming blossom buds for the following year's crop. A comparison of tree 1 with tree 7, and tree 2 with tree 6, seems to show that in these cases the number of blossom buds was the more important factor; but that the number of fruits also influences the result is shown by a comparison of tree 4 with tree 8.

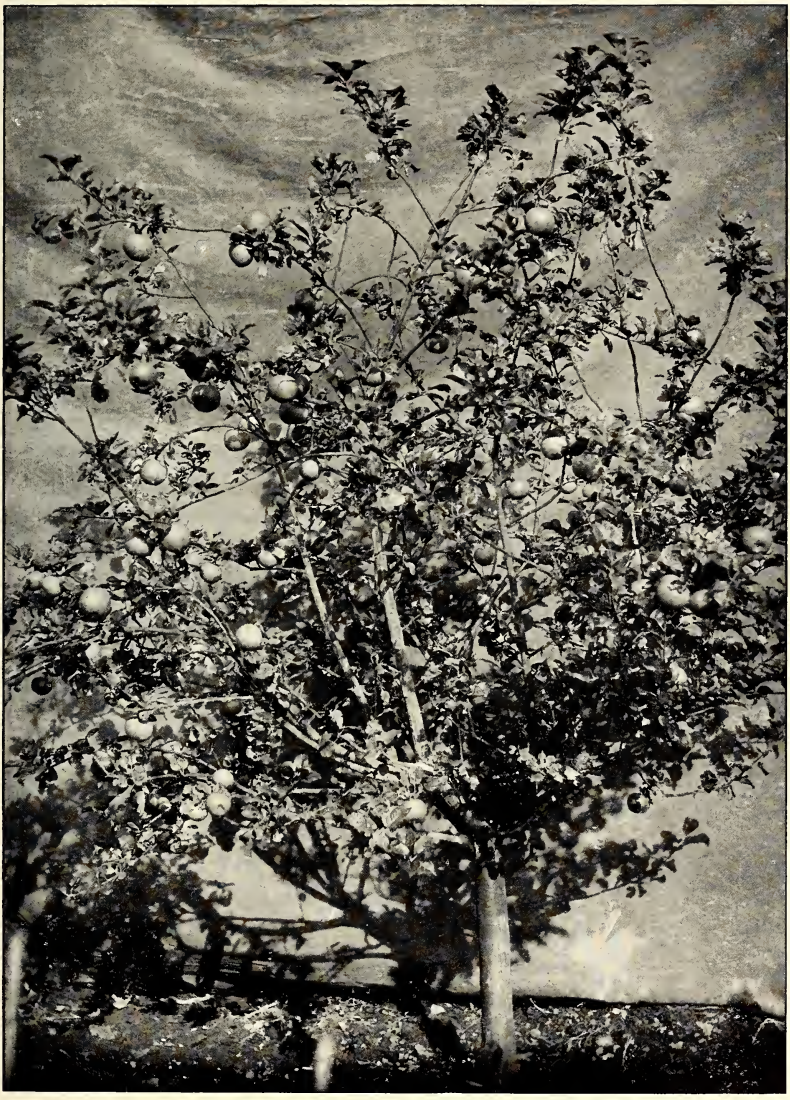

FIG. 32.—APPLE 'NEWTON WONDER,' UNPRUNED.

[*To face p.* 148.

FIG. 33.—APPLE 'NEWTON WONDER,' TIPPED AND LONG-SPUR PRUNED.

FIG. 34.—APPLE 'ALLINGTON PIPPIN,' UNPRUNED, SHOWING NATURAL HABIT.

FIG. 35.—APPLE 'ALLINGTON PIPPIN,' TIPPED AND LONG SPUR-PRUNED.
[Note great number of laterals.]

[*To face p.* 149.

The apparently greater influence here of the number of blossoms than the number of fruits in preventing the formation of blossom buds bears out the inference drawn by Roberts from his observation of mature apple trees in America (*Journal of Pomology*, November 1920). But it is questionable whether the explanation he offers—that the growth is reduced below the amount required for the formation of blossom buds—is applicable to our immature trees ; all of them made a considerable growth in 1920, including those which showed the least blossom in 1921 ; and on these trees spur growths of one or two inches without blossom buds were very frequent.

The long-spur pruned trees of ' Allington Pippin ' show signs of developing the alternate-bearing habit. Four of the eight trees had less blossom in 1921 than in 1920, but all of them bore an increased number of fruits in 1921. One tree, which produced the greatest weight of fruit in 1920, had a greatly increased number of blossoms in 1921, but this seems to have weakened it, for the increase of its crop in 1921 was smaller than that of any other of the eight trees.

At least two other varieties, ' Grenadier ' and ' Worcester Pearmain,' showed in 1921 a slight decrease in the number of blossoms of one or two long-spur pruned trees, but this may be only accidental, and is not great enough to deserve special attention.

Since winter pruning clearly does tend to check the alternate bearing habit, even when the pruned trees crop heavily (' Newton Wonder '), it should be possible to devise such a modification of pruning methods as will almost entirely eliminate the habit. But it would obviously be necessary at first to distinguish between trees in their " on " year and those in their " off " year. The object must clearly be to reduce the amount of *blossom* they carry in their " on " year; for, as we saw, it seems likely that profuse blossoming has more influence than heavy fruiting in causing the alternate-bearing habit. If the trees could be pruned hard and their spurs drastically shortened in the winter following their " off " year, and merely thinned out or lightly pruned in the alternate winter, their cropping should tend to become more uniform.

5. *Effect on Growth and Ultimate Size of Tree.*

In attempting to observe the effect of pruning on the growth and size of a tree, we at once meet with difficulty in finding a satisfactory measure of the characters to be studied. Measurements of the height and spread of the branches, while they give some indication, are far from satisfactory, owing to the very great difference in the shape of the head frequently caused by pruning. With a spreading variety like ' Lane's,' for instance, one of the objects of pruning is to keep the branches up off the ground. This is accomplished very well by current methods, and it results in a rounded or slightly upright head, as against the very flattened and drooping head of the unpruned tree. Such measurements as we have so far made give so poor an idea of the

comparative size of the trees, as judged by casual observation, that they are hardly worth tabulating. In discussing this point it will therefore be best to state the observed results in general terms.

Other investigators have found that any pruning tends to check root action, and consequently reduces total wood growth. At Woburn, for instance, Mr. Pickering found in general that the unpruned trees were almost always considerably larger than even those lightly pruned. But there was at least one exception. In his Fifteenth Report (p. 67), Mr. Pickering says: "The trees which were not pruned formed on the average only 83 per cent. as much new wood as those which were pruned annually. But the explanation of this is evident, for in this case the absence of pruning has increased the blossoming power of the trees to such an extent (from 2½ to 6½ fold) that the growth has been affected, and has been reduced even below that of the pruned trees. Growth and fruiting, or even blossoming, are antagonistic to each other. . . ." This is precisely the effect which is now becoming apparent amongst our trees. The unpruned trees of most varieties have cropped much more heavily than the long-spur pruned trees, and in several cases their heavier cropping has reduced their growth so much that the long-spur pruned trees are obviously catching up to them in size of head, and in one or two cases are already considerably larger.

Some of our varieties show this effect so plainly that it is surprising to find only this single mention of the phenomenon in a Report on experiments so long continued as were those at Woburn. The only explanation of the difference which I can suggest is the irregular bearing of the Woburn trees caused by spring frosts, referred to in the same Report (p. 78).

Those of our varieties in which this more rapid growth of the tipped and spurred trees is most obvious are not uniformly those which have borne the heaviest and most regular crops on the unpruned trees. 'Early Victoria,' for instance, of which the unpruned trees began to bear heavy crops in their sixth year from planting (a year sooner than any other variety), shows it less clearly than 'Lane's,' which has not yet cropped as heavily as 'Early Victoria,' either pruned or unpruned. 'Newton Wonder,' again, of which the long-spur pruned trees have cropped more heavily than the unpruned trees, shows it more distinctly than 'Allington.' Of two varieties, 'Lane's Prince Albert' and 'Early Victoria,' the long-spur pruned trees are clearly larger-headed than the unpruned trees. Of 'Grenadier,' the two series of trees are probably about equal in size. But the long-spur pruned trees of several other varieties, as well as these three, appear to be increasing in size of head more rapidly than the unpruned trees; we may expect within two or three years to add to the above-named three varieties, 'Worcester Pearmain,' 'Cox's Orange,' 'Newton Wonder,' and 'Norfolk Beauty.' On the other hand, four varieties, 'Bismarck,' 'Gladstone,' 'Lord Derby,' and 'Beauty of Bath,' appear to show a reverse tendency, the unpruned trees still showing signs of growing

more rapidly than the long-spur pruned trees. Of the four varieties whose leaders are tipped one-third on the tipped and spurred trees (the trees of 'Annie Elizabeth' were planted three years later and cannot be included), two, 'Newton Wonder' and 'Norfolk Beauty,' appear to be increasing in size of head more rapidly where tipped and spurred, and the other two, 'Beauty of Bath' and 'Lord Derby,' show the opposite effect. Since one of each of these pairs has cropped well and the other badly, it seems likely that the effect of pruning on the size of the tree, at least up to the eighth year, differs with different varieties, and that no general rule can be laid down.

6. *Effect on Production of Laterals and Furnishing of the Branches.*

The effect of "tipping" on the production of lateral shoots is again a matter of varietal idiosyncrasy. One might naturally expect that those varieties which "furnish" their branches badly when not tipped would produce fewer laterals when tipped than other varieties. 'Lord Derby' makes the smallest number of laterals, yet it "furnishes" its branches as well as any variety, whether tipped or not. 'Bismarck,' again, which "furnishes" its branches very badly, makes a considerable number of laterals.

No counts of laterals have yet been made, and the number produced is not usually of any great importance, at least to the grower; but in one case, that of 'Allington,' it affects pruning methods very closely. Here the tipping has led, as it has done wherever the writer has seen 'Allington' closely tipped, to an enormous formation of lateral growths, not only from the wood of the previous year, but from the spurs and from adventitious buds on the older wood. The pruning of 'Allington,' indeed, is one of the grower's problems. One cannot leave a bush 'Allington' without any tipping at all, for the natural habit is so spreading and the branches are so slender (when not tipped) that the first heavy crop of fruit brings them right down on to the ground; and further, the fruit soon becomes very small if no tipping is done. Yet when the leaders are tipped one-half, as ours have been, the result is a hedge (fig. 35). Some growers have actually top-worked bush 'Allingtons' because of the hopeless result of tipping. Yet the problem, I believe, is easily solved. Tipping must be done for some years after planting to keep the branches up off the ground; but when the tree is due to come into bearing, say about the sixth or seventh year, the tipping should almost, if not entirely, cease, until the crops of fruit are heavy enough to keep the growth in check. Then a moderate tipping may begin again, and may increase in proportion to the crop.

The "furnishing" of the branches by tipping is a matter of less importance, and concerns relatively few varieties. In our conditions only three of our fifteen varieties furnish their branches badly enough naturally to need tipping for this reason alone. Of these the worst is 'Bismarck' (fig. 39), and the other two, 'Worcester' and 'Newton,'

leave enough of their wood bare to affect the cropping power of the untipped trees to a slight extent. It is of course a more serious matter with bush trees, where the total length of bearing wood is limited, than with standards, where a concentrated crop is less important. It may be expected that our tipped trees of the three varieties named above, when they come into full cropping, will, apart from other causes, be capable of producing more fruit on a tree of equal size than the untipped trees, simply because their branches are better furnished with spurs.

7. *Effect on Susceptibility to Certain Diseases.*

Since the sixth year after planting (1918 and 1919), it has been evident that the tipped and spurred trees are far less affected by certain fungus diseases than the untipped trees. The more important of these diseases are: Apple Scab or Black Spot (*Venturia inaequalis*), Apple Mildew (*Podosphaera leucotricha*), and Common Canker (*Nectria ditissima*). The percentage of fruit of the unpruned and long-spur pruned trees attacked by Scab is shown for certain varieties in Table V. It should be noted that the fruits recorded as "scabbed" usually include a good many not badly enough affected to be appreciably reduced in market value. All that show a recognizable infection, however slight, are included.

TABLE V.—PERCENTAGE OF FRUIT ATTACKED BY SCAB.

	1919.		1920.		1921.	
	Unpruned.	Long-spur Pruned.	Unpruned.	Long-spur Pruned.	Unpruned.	Long-spur Pruned.
Allington . .	30	2	82	54	1	1
Bismarck . .	69	No fruit	44	42	3	0
Cox's Orange .	34	0	(32)	(33)	6	4
James Grieve (Crab)	46	3	31	14	17	5
,, ,, (Paradise)	43	0	56	21	10	2
Newton Wonder .	59	9	33	36	9	3
Worcester P. (Crab)	37	34	66	44	14	3
,, (Paradise)	70	22	38	7	13	1
Rival . . .	—	—	—	—	6	2
Average . .	45	10	48	31	9	2

The difference in favour of the long-spur pruned trees is so great and so uniform that there is clearly a very considerable effect from pruning. There are but two cases—'Newton Wonder' and 'Cox's Orange' in 1920—where the proportion of scabbed fruit was greater on the long-spur pruned trees, and of these, one case ('Cox's') is doubtful, since there were very few fruits on any of the trees.

It has been suggested that the difference is mainly or entirely due to the cutting out of centres of infection in the pruning. This no doubt has in some cases a good deal of effect, but only in the case of those

FIG. 36.—APPLE 'NEWTON WONDER,' UNPRUNED, SHOWING NATURAL HABIT IN WINTER.

[*To face p.* 152.

FIG. 37.—APPLE 'WORCESTER PEARMAIN,' UNPRUNED.
Note many 'long dards.'

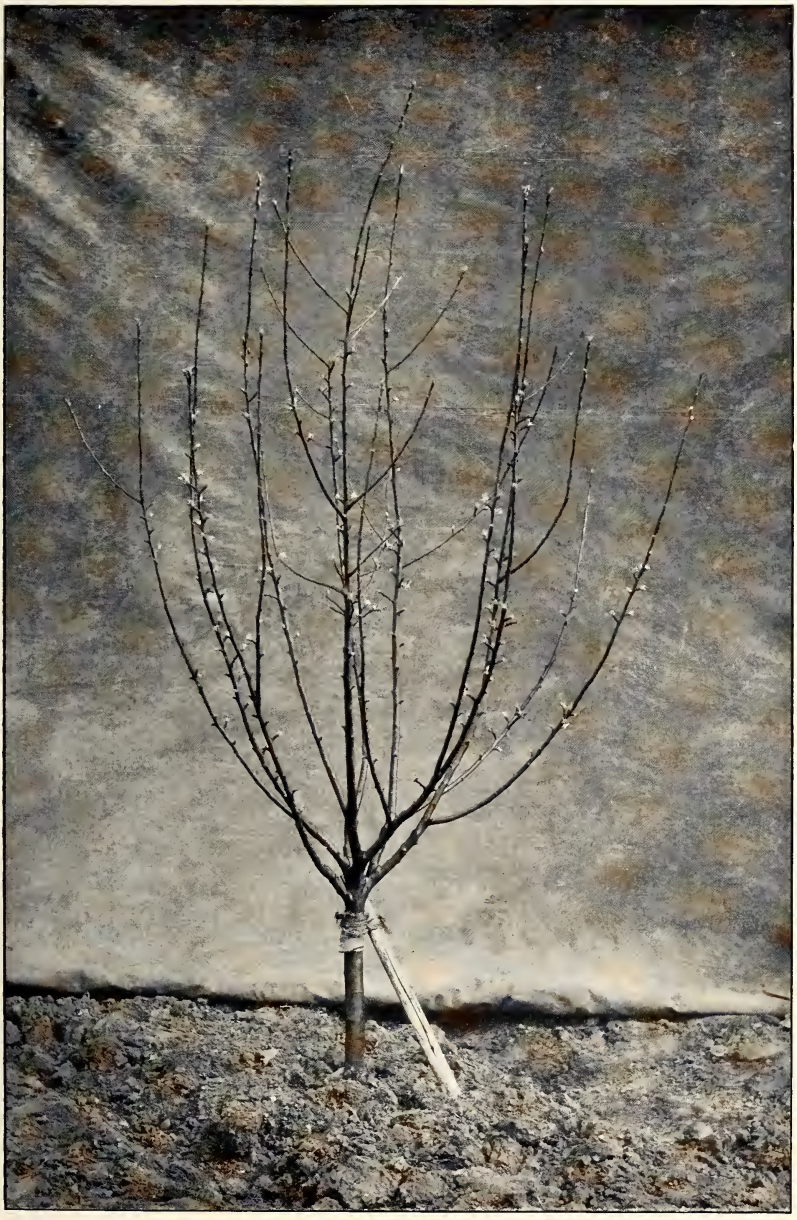

FIG. 38.—APPLE 'LORD DERBY,' OPEN CENTRE.
Note many spurs, no axillaries.

FIG. 39.—APPLE 'BISMARCK,' OPEN CENTRE.
Note few spurs, many axillaries and terminals.

[*To face p.* 153.

varieties whose wood becomes badly infected by the fungus. 'Allington,' 'Bismarck,' and 'Newton Wonder' appear so far to be extremely resistant to this form of infection; it has been difficult to find a single scab pustule even on the wood of the unpruned trees. So far as one can judge, the unpruned and long-spur pruned trees of these varieties have an equal chance of infection. It is worth noting, also, that even with 'Cox's Orange' the scab pustules are usually much less numerous on the wood of the long-spur pruned trees than on the unpruned trees, even before the pruning is done.

In the case of mildew, of every variety examined the unpruned trees had at least three times as many wood infections as the long-spur pruned trees, and in some cases more than ten times as many. Here again it might be thought that the difference is mainly due to the cutting out of centres of infection in the pruning; but all wood infections have been cut away from all the trees, pruned and unpruned, each winter, and the new mildewed shoots similarly removed each May; this would at least tend to equalize chances of infection.

The case of canker again shows that the difference in susceptibility is not solely due to the cutting out of sources of infection in the pruning. Many of the unpruned 'Worcesters' had, in the winter of 1920–21, a very large number of bud infections of canker, in some cases running into the hundreds. Generally there were older, spore-producing infections, which had obviously acted as centres of the new bud infections; but in a few cases, especially of 'Grieve,' there were numerous new bud infections even where no old spore-producing cankers could be found. One or two of the long-spur pruned trees had old spore-producing cankers, yet on none of them could more than a single bud infection be found, and most had none at all. This difference in the case of canker may be partly due, judging from the observations recorded by Wiltshire,* to the markedly later leaf-fall of the long-spur pruned trees. But if this were the chief cause one would expect to find numerous bud infections on the long-spur pruned trees in the spring; actually they seem to be no more numerous than in the autumn.

One can only conclude, I think, that the greater freedom of the long-spur pruned trees from these diseases is largely due to their greater power of resistance to infection. It remains to be seen whether, and to what extent, this greater power of resistance is brought about by a thicker cuticle or differences in the structure of the tissues.

Effect of "Open Centre" Pruning.

The differences between the "unpruned" and "open centre" trees are as yet small, but some of them are significant, and most of them may be expected to increase as the trees get older. This is the more likely, since the method of pruning the open centre trees was considerably modified in the winter of 1920–21. Previous to that time

* *Annals of Applied Biology*, viii. 3 and 4, November 1921.

no spurring at all had been done; the centre was kept to some extent open by cutting clean out all strong shoots growing inwards. The modified method involves a considerably more severe pruning; the effort now is to leave the main branches at approximately the same distance apart as those of the tipped trees, and to long-spur prune all superfluous shoots, so that the sole difference between the open centre and the long-spur pruned trees shall be the tipping of the latter. Allowance has to be made, of course, for the fact that the branches of the open centre trees are much more pulled down by the weight of fruit than those of the long-spur pruned trees; this fact makes the method difficult of application to such varieties as 'Allington,' 'Lane's,' 'Cox's Orange,' and to a less extent 'Early Victoria' and 'Grenadier.'

The effects of the open centre pruning may be grouped in the same way as those already described. No counts of the blossom buds of the open centre trees have yet been made, and we have thus no means of finding the percentage of blossom setting. But the percentage of fruits found at picking in clusters of two or more gives us, as before, an indication of it. These figures are shown in Table VI.

TABLE VI.—PERCENTAGE OF FRUITS FOUND AT PICKING (1921) IN CLUSTERS OF TWO OR MORE.

	Unpruned.	Open Centre.
Allington . . .	48	49
Bismarck . . .	36	46
Cox's Orange . .	38	44
Newton Wonder . .	31	42
Rival	18	29
Average . . .	34	42

The higher percentage on the open centre trees, though slighter on the average than that of the long-spur pruned trees, occurs in every case, and is too considerable to be disregarded. It seems very probable that the setting of the blossom is more complete on the open centre trees.

The same conclusion follows from casual observation. It has seemed fairly obvious at sight that the open centre trees of most, if not all, varieties have produced considerably less blossom on the average than the unpruned trees; yet in ten cases out of nineteen, they have on a three years' average produced a larger total number of fruits. It is worth while to note which varieties show this heavier cropping of the open centre trees to the greatest extent. 'James Grieve,' 'Allington,' 'Lane's Prince Albert,' and 'Beauty of Bath' show the largest gains, while 'Gladstone,' 'Rival,' 'Early Victoria' and 'Grenadier' show (in *number* of fruits, not all in *weight*) the reverse tendency. The case of 'Early Victoria' is rather curious, the difference in favour of the unpruned trees being an indirect effect of biennial bearing; in 1919 and 1921 the unpruned trees had most fruits, while in 1920 the open

centre trees were ahead ; and the crop of 1921 was so much heavier all round than previous crops that the unpruned trees are considerably ahead on the three years' average. There is every indication that the crop of 1922 will put the open centre trees again in the lead. Biennial bearing, however, does not account for the difference in the case of 'Grenadier' ; here the unpruned trees, especially those on 'Paradise,' have been consistently in the lead, for which no satisfactory explanation can be offered.

It should be said that although in average *number* of fruits the open centre trees of all varieties, taken together, are slightly behind the unpruned trees, in average total *weight* of fruit they are slightly ahead. This points to another effect of the open centre pruning, the usual increase in the size of the fruit.

Of all the varieties only one, 'Lord Derby,' has consistently produced smaller fruits on the open centre trees ; two or three others have done so once or twice, but on the three years' average the fruits from the open centre trees are larger, except those of 'James Grieve' on 'Crab.' In several cases the difference is very small ; but of 'Newton Wonder' the individual fruits from the open centre trees have averaged throughout nearly 40 per cent. heavier than those from the unpruned trees, a difference amounting to more than one ounce a fruit.

The apparent influence of the stocks may here be referred to. When every allowance is made for the mixture of various types of 'Paradise,' and the evidently large variation amongst the seedling 'Crabs,' it is still of interest to find that, of all the five varieties concerned, the trees on 'Crab' are larger, on the average, than those on 'Paradise' ; and this in spite of the fact that the smallest individual trees of two varieties, 'Early Victoria' and 'Gladstone,' are on 'Crab.' Further, of four varieties, 'Early Victoria,' 'Grenadier,' 'James Grieve,' and 'Worcester Pearmain,' the unpruned and open centre trees on 'Crab' have yielded the greater total number of fruits. In the case of 'Worcester' this is entirely due to the much heavier crop of the trees on 'Crab' in 1921, those on 'Paradise' having previously been ahead ; but of the other three varieties the result has been consistent for three years. With the long-spur pruned trees this result is reversed, except in the case of 'Early Victoria' (Table III.). Until more is known of the types of 'Paradise' concerned, it will be best not to draw any general deduction from this result.

It is not yet possible to judge whether the open centre trees are growing more or less rapidly than the unpruned trees. In actual dimensions a number of varieties are larger where unpruned, and an approximately equal number where pruned on the open centre system. In several cases where the open centre trees are now smaller they appear to be catching up in size, but in other cases they are falling further behind. It is not worth while to present any figures on this point until some definite effect of pruning can be detected.

In at least two cases, 'Allington' and 'Newton Wonder,' where the unpruned trees have strongly developed the biennial bearing habit,

the open centre trees are distinctly less alternate and more regular in their bearing. But with 'Early Victoria' the habit seems to be quite as marked among the open centre trees as among the unpruned trees. It is hardly to be expected, in any case, that the habit will, on the average, be appreciably checked by open centre pruning; the result with 'Allington' and 'Newton Wonder' is probably accidental.

The difference between the open centre and unpruned trees in regard to disease is as yet very slight. On the average the fruit of the open centre trees is slightly less affected by scab than that of the unpruned trees, and one would expect this difference to increase as the trees get older. In regard to mildew and canker the differences noticed are probably entirely due to the cutting out of possible places for infection in the open centre pruning; the open centre trees have nearly always a slightly smaller number of infections.

Effect of Short-spur Pruning.

It has already been pointed out that the only difference between the "long-spur pruning" and "short-spur pruning" methods lies in the length of lateral left at the first spurring, *i.e.* the first time it is cut. There are, of course, other differences between individual trees, but these should on the average be no greater then those between individual trees in the same group.

The most obvious result of short-spur pruning as compared with long-spur pruning is the reduction of the blossom. Table VII. shows this as far as blossom counts are available.

Table VII.—Average Number of Blossom Buds per Tree.

Type of Pruning.	1920.		1921.	
	Long-spur.	Short-spur.	Long-spur.	Short-spur.
Allington	141	73	166	89
Beauty of Bath	170	90	268	165
Bismarck	—	—	2	7
Cox's Orange	—	—	126	52
Early Victoria (Crab)	—	—	91	52
,, ,, (Paradise)	—	—	82	54
Gladstone (Crab)	—	—	9	11
,, (Paradise)	—	—	13	8
Grenadier (Crab)	50	33	91	60
,, (Paradise)	—	—	78	34
James Grieve (Crab)	—	—	201	141
,, ,, (Paradise)	—	—	219	133
Lane's Prince Albert	64	51	96	78
Lord Derby	—	—	94	61
Newton Wonder	139	68	139	116
Norfolk Beauty	—	—	80	32
Rival	—	—	69	13
Worcester Pearmain (Crab)	85	78	101	99
,, ,, (Paradise)	—	—	93	67
Average	108	65	106	67

The only exceptions to the rule are 'Bismarck' and 'Gladstone' on 'Crab'; the numbers in the case of the former are so small, owing to the cutting away of nearly all the "axillary" blossom buds in pruning, that the result is probably accidental; in the latter case the result is more than reversed by the trees on 'Paradise.' It may be taken, then, that in our conditions short-spur pruning always tends to reduce the amount of blossom, at least up to the eighth year, and often to a very large extent.

But in spite of this effect, there are four cases (other than 'Bismarck' and 'Gladstone' on 'Crab') where the short-spur pruned trees have in three years borne a slightly larger total number of fruits; these are 'James Grieve' on 'Crab,' 'Worcester Pearmain' on both 'Crab' and 'Paradise,' and 'Lane's Prince Albert.' It is clear that the short-spur pruned trees have in these cases set a larger proportion of their blossom. Percentages calculated as in Table II. show that this is the case, especially in 1921; actually we find that the same is true of 'James Grieve' on 'Paradise' and of 'Lord Derby,' and to a very slight extent of one or two other varieties. The fact that both 'James Grieve' and 'Worcester Pearmain' show this result on both 'Crab' and 'Paradise' suggests that it is not merely accidental; more probably it is in some way connected with the idiosyncrasy of the varieties, for 'Allington,' 'Gladstone,' 'Newton Wonder,' and 'Norfolk Beauty' show the reverse effect to quite as great an extent.

Whether the "short-spur pruning" increases or reduces wood growth as compared with "long-spur pruning" is uncertain. The weight of prunings might be taken as an indication (allowance being made for the larger proportion of each lateral cut away from the short-spur pruned trees); and since in a majority of cases the weight of prunings has for two years been less from the short-spur pruned trees, it seems likely that there is frequently some reduction of wood growth. But since in every case of a variety on both 'Crab' and 'Paradise' the results from the two lots of trees contradict each other, little attention can be paid to the results as a whole. The most extreme difference occurs in the case of 'Allington,' where the weight of prunings from the short-spur pruned trees has been nearly 40 per cent. greater than that from the long-spur pruned trees. Since 'Allington,' when tipped, forms many lateral shoots from adventitious buds on the older wood, it seems possible that the closer spurring has actually increased the wood growth and the number of laterals of the trees; but the result might equally well be ascribed to the lighter cropping of the short-spur pruned trees.

One other result of short-spur pruning deserves mention. With some varieties a large proportion of the laterals, when cut to one prominent bud, as in short-spur pruning, fails to produce even a "short dard" and dies right out, often leaving considerable lengths of wood without any spurs. 'Cox's Orange' and 'Lane's' are the worst varieties in this respect, while 'Worcester' and 'Grieve' are less seriously affected.

' Derby,' ' Gladstone,' and one or two others hardly ever show a trace of this effect ; the shortened laterals practically always make either a new lateral or a " short dard."

Natural Habit in Relation to Pruning.

Several references to the individual habit of varieties of apples have already been made. The differences between different varieties in habit of growth and bearing have become so striking that careful observations have been made of each variety ; it is desired to emphasize these differences as strongly as possible, and to show the existence of very considerable losses due to rule-of-thumb pruning. In spraying their trees growers have been forced to recognize that each variety is a separate entity, with its own relation to both diseases and spray fluids. Similarly with pruning, growers who wish to get the best results must allow for the fact that a method admirably adapted to one variety may be hopeless when applied to another.

Habit of Growth.

Few growers nowadays fail to realize that a variety of spreading or drooping habit must be pruned differently from a very erect-growing variety. It will hardly be necessary, therefore, to give the commonly understood directions for keeping the branches of a spreading variety up off the ground, and for opening up the head of an erect variety. But for the benefit of those readers whose experience is limited, it will perhaps be worth while to give a classification of the varieties we have here, in this connexion. The habit noted is that of the young tree ; it is frequently much altered later in life by the pulling down of the branches by the weight of the crops.

Very erect—' Annie Elizabeth,' ' Lord Derby ' (fig. 38), ' Worcester Pearmain ' (fig. 37).

Moderately erect—' James Grieve,' ' Early Victoria,' ' Cox's Orange,' ' Rival.'

Intermediate—' Bismarck ' (fig. 39), ' Grenadier,' ' Newton Wonder ' (fig. 32).

Moderately spreading — ' Beauty of Bath,' ' Gladstone,' (' Bramley ').

Very spreading—' Lane's Prince Albert,' ' Allington ' (fig. 34), ' Norfolk Beauty.'

But there are other factors of " habit of growth " quite as important to the pruner as erectness. Such are stoutness of branches, as affecting the degree to which the branches are bent down by the fruit ; natural furnishing of the branches with spurs ; and to a less extent the number of laterals formed.

The stoutness of the branches has much influence on the amount of " tipping " required for the various purposes—*i.e.* temporary or permanent trees. The furnishing of the branches, again, affects the amount of " tipping " required, except for those growers who are

able to adopt the " knife-edge ringing " method recommended by Barker and Lees * ; for the long bare branches of the untipped trees of certain varieties are obviously undesirable where a long-lived permanent tree is required.

Those of our varieties which most require " tipping " in order to make the branches stouter and more able to hold themselves up under a crop are ' Allington ' (fig. 34), ' Lane's,' and ' Cox's ' ; and, to a less extent, ' Derby ' and ' Grenadier,' the latter chiefly on account of its tip-fruiting habit. Varieties failing to furnish their branches with spurs, and requiring tipping on this account, are ' Bismarck ' (fig. 39), ' Worcester ' (fig. 37), and ' Newton Wonder.' It does not follow that varieties not named in these two lists require little if any tipping for permanent trees ; but there undoubtedly are such varieties, and ' Norfolk Beauty ' comes nearer to this category than any other of our fifteen. ' Bramley ' (not included in our experiment) is certainly another ; for although it makes bare branches while young, if not allowed to get too thick-headed, it will often clothe them with spurs or laterals as it gets older. Neither does it follow that varieties which need tipping on account of either of these points must necessarily be closely tipped when required for short-lived " fillers." Here, as already mentioned, quick cropping is more important than shape of tree ; and much (in shape of tree) must be sacrificed on this account.

Habit of Fruiting.

In habit of fruiting we find even more extreme differences between varieties than in habit of growth. But these differences, though obvious enough to any trained eye, are by no means easy to express either in words or figures.

In counting the blossom buds a classification has in all cases been made, as a guide to the natural habit of the variety ; the classification is, of course, of little use on the " tipped and spurred " trees, since so much of the blossom is cut away in pruning ; the results are therefore presented only for the unpruned trees. Table VIII. gives the figures for three classes of blossom buds distinguished on an arbitrary basis ; " terminals " are those at the ends of shoots of the previous year 2 inches long or more ; " axillaries " are those formed in the axils of the previous year's leaves (not terminal) ; and " spurs " are all the rest, *i.e.* those at the end of shoots less than 2 inches long.

It will be seen that a majority of the varieties have formed in these two years a considerable number of " terminals " and " spurs," and few " axillaries " ; and further, that seasonal changes may vary the proportions of the three classes to a considerable extent. But the extremes, ' Bismarck ' (fig. 39) and ' Lord Derby ' (fig. 38), are so widely separated that one would hardly expect seasonal differences

* *Annual Reports*, Agricultural and Horticultural Research Station, Long Ashton, 1919, 1920.

ever to make either approach at all closely to the other; 'Derby,' on this classification, makes practically nothing but "spurs," and 'Bismarck,' up to the present, has hardly succeeded in making any "spurs" at all. It is to be expected, of course, that 'Bismarck,' as it gets older, will make a considerable number of "spurs"; but unless its growth were much reduced, it would probably still make many "terminals" and "axillaries."

The "tip-fruiting" of 'Worcester' (fig. 37), 'Grenadier,' 'Beauty of Bath,' 'Gladstone,' and 'Norfolk Beauty' is fairly well brought out in the table. The 1921 results suggest that 'Newton Wonder' should be included here also; but the trees were almost all in their "off" year, and had very little blossom of any kind; the 1920 pro-

TABLE VIII.—CLASSES OF FRUIT BUDS OF UNPRUNED TREES, AS PERCENTAGE OF TOTAL.

	1920.				1921.			
	No. of Trees.	Terminal.	Axillary.	Spur.	No. of Trees.	Terminal.	Axillary.	Spur.
Allington	3	8	9	83	5	16	8	76
Beauty of Bath	3	31	6	63	5	30	10	60
Bismarck	—	—	—	—	4	24	73	3
Cox's Orange	—	—	—	—	4	8	11	81
Early Vict. (Crab)	—	—	—	—	5	26	1	73
Gladstone (Crab)	—	—	—	—	4	46	10	44
Grenadier (Crab)	3	19	7	74	5	50	4	46
James Grieve (Crab)	—	—	—	—	4	19	29	52
Lane's P. Albert	3	7	12	81	5	15	4	81
Lord Derby	—	—	—	—	6	1	2	97
Newton Wonder	3	12	14	74	5	49	6	45
Norfolk Beauty	—	—	—	—	4	39	4	57
Rival	—	—	—	—	4	17	19	64
Worcester P. (Crab)	3	28	18	54	5	35	10	55

portion is thus a much better indication of the variety's natural habit.

Of the five varieties mentioned above, some at least require special care in pruning on account of this tip-fruiting habit. Most growers are already aware that the "dards" of 'Worcester Pearmain' (properly "long dards" or *brindilles couronnées* (fig. 27)) should, on the young tree, be left uncut wherever they will not make the head of the tree too thick. Of the other varieties in our experiment which have a large percentage of terminal fruit buds, these terminals are mostly on much longer shoots than those of 'Worcester.' It follows that a larger proportion of them must usually be cut out in pruning. But in all such cases, except perhaps 'Grenadier,' they should be left, wherever possible, at least until the tree is making plenty of spurs.

The terminal fruit buds of 'Grenadier' are mostly at the end of long shoots, often those required for leaders; usually they will form one or two large fruits, and the weight of these very quickly ruins the

shape of the tree. It is usually advisable to cut away most of these terminals, or at any rate to leave only those on shoots not required for leaders.

It is tolerably certain that the tipped and spurred trees actually produced in all cases a much larger proportion of "axillary" fruit buds than the unpruned trees; this would have appeared if the pruning could have been delayed until all the blossom buds were recognizable. Most varieties produce "axillary" fruit buds mainly on shoots longer than one foot or 18 inches; and as the number of such shoots is far greater on the tipped and spurred trees the proportion of the various classes would be affected. 'Lane's' is here to some extent an exception; it often produces a terminal and three or four axillary fruit buds on shoots only 3 or 4 inches long.

The question arises, to what extent is the natural habit of a variety, whether in growth or fruiting, altered by local conditions of soil or climate? Our evidence on this point is still rather limited; but as far as it goes it tends to a fairly definite conclusion—that if there is any change at all, it is due more to a "telescoping," *i.e.* shortening or lengthening, of the parts, than to any radical change in natural habit. Thus, while 'Bismarck' seems everywhere to preserve its capacity to make, in a favourable season, a very large number of "axillary" fruit buds, there may be soils where its growth is so restricted that they are seldom conspicuous, even on young trees.

Some varieties, again, may be more or less prone than they are here to make much bare wood by failing to furnish their branches with spurs; this influence may be partly climatic or mainly due to soil conditions; but, whatever the cause, it seems probable that all varieties tend more or less in the same direction.

It is suggested, therefore, that although different local conditions do have a very great effect on a particular variety, if one studies the habit of a variety and the best way of pruning it in one set of conditions, one can apply one's knowledge to the pruning of the same variety in a totally different set of conditions, by making allowances for obvious differences in rate of growth and other details.

In conclusion, it is desired to emphasize once more the importance of these differences in the habit of different varieties, and the extreme desirability of a close study by growers of each variety which they grow on any large scale, in order to avoid the heavy losses resulting from the failure to make use of natural habit in pruning.

Summary.

Winter pruning experiments have shown, up to the seventh and eighth year from planting, that—

1. "Tipping" always delays or reduces blossoming, at least until the biennial bearing habit reduces the blossom of the untipped trees.

2. In practically every case the tipped trees set a larger proportion of their blossom than the unpruned trees.

3. In spite of this, tipping has delayed cropping, except in the case of two varieties, by a considerable period.

4. In nearly every case the fruit of the tipped trees is larger than that of the unpruned trees, often to a very considerable extent.

5. Tipping has checked the biennial bearing habit, but in one or two cases the habit is now beginning to appear amongst the tipped trees.

6. The tipped trees of several varieties are increasing, in size of head, more rapidly than the unpruned trees, and in one or two cases are already larger. Of other varieties, the unpruned trees are still growing more rapidly.

7. The tipped trees are much less affected by scab (black spot), apple mildew, and common canker than the unpruned trees.

8. The effects of "open centre" pruning are in general similar to those of tipping, but much less marked. The open centre trees probably set more of their blossom than the unpruned trees; their fruit is larger and slightly freer from scab. The cropping of some varieties is delayed or reduced by open centre pruning; of others it is increased.

9. "Short-spur pruning" always tends to reduce blossoming, at least up to the eighth year. But in several cases the "short-spur pruned" trees have set a larger proportion of their blossom than the "long-spur pruned" trees, and in one or two cases have produced a larger total number of fruits. Of some varieties the laterals often die when short-spur pruned, leaving the wood bare.

10. It is essential to adapt methods of pruning to the habit of growth and fruiting of each variety; failure to do this often results in long-delayed cropping and heavy loss.

CONTRIBUTIONS FROM THE WISLEY LABORATORY.

XXXIX.—Comparative Cropping of Apple Trees Propagated from Parent Trees of Good History and Bad History.

By A. N. Rawes, Officer in charge of Fruit Experiments.

The object of this experiment, which was begun in 1913, was to ascertain whether or not Apple Trees propagated by buds or scions taken from trees that had more or less regularly carried good crops gave better results than those propagated in a similar manner from trees of the same variety, growing under the same conditions, that had as regularly carried only very poor crops. It will be apparent to even the casual observer that such differences between trees of a variety present themselves to some extent in almost every plantation and garden, and it is a problem of importance to nurserymen and growers alike whether or not such differences are transmissible, and whether the cropping habit peculiar to the parent tree is exhibited in the young trees propagated from them.

Excellent material was at hand for carrying out this experiment, since for many years previous to 1913, and subsequently, individual trees of varieties contained in the large collection of Apples growing near the Meteorological Station in the Gardens at Wisley, had shown very marked differences in their cropping habits.

An examination of the records of these trees showed that it was of common occurrence to find one tree of a variety cropping heavily year after year, whilst another tree of the same variety, growing within a few feet and of exactly the same age, would be as regularly carrying very poor crops. Furthermore, this difference could be traced back almost to the time the trees first commenced to bear fruit, the trees being now about twenty years old.

This difference between trees of the same variety existed in many instances in our plantations.

The trees compared appeared in each instance to be in perfectly normal health, and equally free from disease or other obvious causes that might affect the normal fruiting, and we were satisfied that in no way could these differences be rightly attributed to differing cultural methods or soil conditions, all trees of each variety in the collection being treated as nearly as possible in the same manner throughout.

Four varieties were selected for the experiment. In each, one tree showed consistently good cropping habit and one consistently poor cropping habit, the varieties being 'Cox's Pomona, 'Ecklinville Seedling,' 'Duchess of Oldenburgh,' and 'Egremont Russet.'

Buds or scions from each of these trees were worked on to both

Crab and Dwarfing stocks, the budding being done in August 1913 and the grafting in April 1914. Unfortunately, we were not then able to obtain standard types of stocks, such as are obtainable at the present time, and the use of which would perhaps have made the results more convincing if not more reliable. However, the stocks were kept under close observation when growing in the nursery bed, and "rogued" and "selected," so that those used were as uniform in character and vigour as was then possible to obtain.

When planted in their permanent quarters in the Experimental Plantation in the winter of 1914–15, the trees were so arranged that those of Good History alternated with those of Bad History. Their subsequent general treatment was that usual for plantation trees, but great importance was attached to the treating of one and all in exactly the same manner throughout.

From the time of planting, careful observations have been made upon the behaviour of the trees each year.

From the first it was noticeable that trees in each set were showing marked differences in vigour, but this was no more apparent among the trees of Good History than among those of Bad History, and, although this difference has been observed throughout, on the average of several trees there has been little, if any, difference in the total behaviour of trees from the two parent trees of each variety.

The trees of Good and Bad History commenced to bear fruit much about the same time. As was to be expected, those on the Crab stock were a little later in coming into bearing than those on the Dwarfing stock, but it was not observed that trees of Good History were any earlier or later in coming into fruiting than those of Bad History on the same stock.

The records of the numbers of fruits carried by each tree show that very wide differences are again to be found between the trees of each variety in both groups—*i.e.* those of Bad History and those of Good History. To illustrate this point the numbers of fruits carried by trees of 'Cox's Pomona' on the Crab stock are interesting. There were twenty-five trees of Good History and twenty-five of Bad History on this stock, and the figures show the total fruits carried by each tree.

Good History Trees.—112, 97, 94, 93, 87, 82, 80, 79, 66, 62, 62, 55, 54, 42, 37, 36, 34, 32, 27, 16, 16, 13, 12, 7, 4.

Bad History Trees.—230, 154, 148, 129, 83, 75, 75, 62, 58, 55, 54, 42, 33, 33, 32, 18, 14, 14, 14, 10, 9, 8, 8, 3, 0.

Thus we have the extremes of 112–4 with an average of 52 fruits for each tree with the Good History trees, and the extremes 230–0 with an average of 54 with those of Bad History, and much the same variation between individual trees of each group. The wide variation between individuals so commonly apparent in collections of trees is well shown by the behaviour of the trees of this variety.

and was similarly demonstrated by trees of the other varieties in the experiment. From these figures it will be seen that the trees are not behaving in the same manner as did the parent trees, and from the first year of cropping it has been apparent that all the trees of Good History were not regularly carrying good crops, neither were the trees of Bad History all carrying poor crops. In fact, on the average of several trees, much the same quantity of fruit was borne by both groups, as is clearly shown by the average of 52 and 54 from twenty-five trees of each parent.

The other varieties on the two kinds of stocks behaved in very much the same manner, as is illustrated by the curves on the opposite page. These curves show the relative fruiting of each tree, the dotted lines representing the trees of Bad History, and the unbroken lines the trees of Good History.

The extremes and average number of fruits from each group for the trees shown on the charts are :

Fig. 40.—'Egremont Russet' on Crab stock. Good History trees, 158–0, with average of 78 ; Bad History trees, 184–2, with average of 76.

Fig. 41.—'Egremont Russet' on Dwarfing stock. Good History trees, 152–2, with average of 82 ; Bad History trees, 177–4, with average of 78.

Fig. 42.—'Duchess of Oldenburgh' on Dwarfing stock. Good History trees, 156–10, with average of 74 ; Bad History trees, 141–7, with average of 74.

'Cox's Pomona' on the Dwarfing stock and 'Duchess of Oldenburgh' on Crab behaved in the same manner, although rather less fruit was carried by these. Unfortunately, the majority of the trees of 'Ecklinville Seedling' in both stocks have suffered so badly from the attacks of the Brown Rot fungus (*Monilia fructigena*) that reliable observations on their cropping have been rendered impossible.

Sufficient evidence is available from the other three varieties, however, to say with certainty that the trees of Good History have not yielded better crops of fruit than those of Bad History, and that the differences observed in the cropping habits of the parents have not been passed to their progeny.

It is interesting to note at the same time that the Good History trees did not bear better quality fruit, or fruit in any way superior to that carried by trees of Bad History ; much good and indifferent fruit was borne by both, and varied with the season and individual trees, but on the whole that from the Bad History trees was equally as good as that from the Good History trees.

It may be safely assumed, therefore, that such differences between trees of a variety, as the habit of carrying good or poor crops, are not transmissible when trees exhibiting them are propagated from vegetatively.

Apparently with the idea that such differences will be reproduced

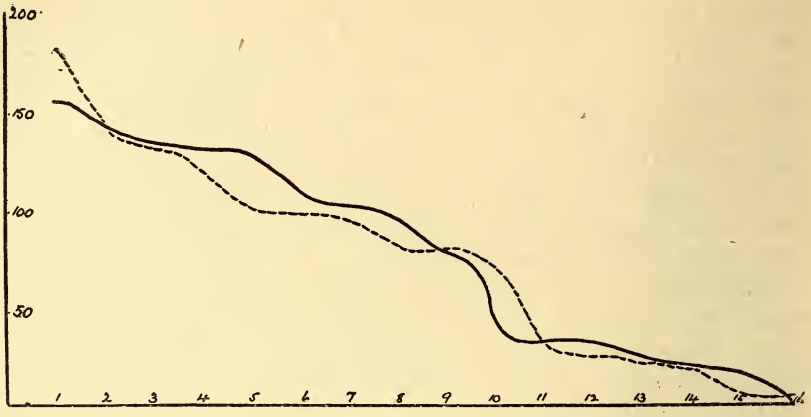

FIG. 40.—'EGREMONT RUSSET' ON CRAB STOCK, 32 TREES.

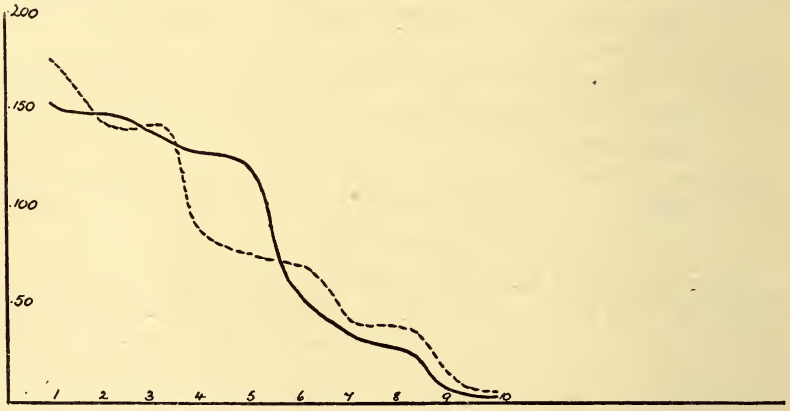

FIG. 41.—'EGREMONT RUSSET' ON DWARFING STOCK, 20 TREES.

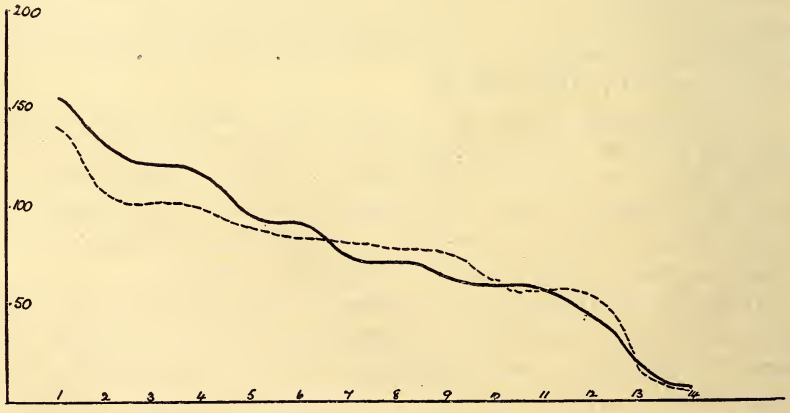

FIG. 42.—'DUCHESS OF OLDENBURGH' ON DWARFING STOCK, 28 TREES.

Fruiting of progeny of (1)—Trees of Good History; (2) ---- Trees of Bad History.

in the young trees propagated from them, bud selection of a kind is frequently advocated and sometimes practised by nurserymen and others with the object of improving, or at least maintaining, the cropping powers of the variety. This idea is based upon the supposition that, by continually selecting buds or scions from the trees that regularly carry good crops, there will arise a "fixed" good-bearing type of that variety, whereas, if, on the other hand, trees be so propagated by materials secured from trees that regularly crop very poorly, the result will be a gradual deterioration of the variety, and the loss of the original cropping powers.

Methods of selection have without a doubt played a very important part in the improvement of all kinds of plants, but it must be remembered that such improvements almost always follow hybridization and seed selection. Reasoning suggesting that like improvements will follow bud selection, such as propagating only from vigorous and heavy-cropping trees of a variety, or even selecting large buds for budding, stout shoots for scions, etc., is invalid.

In one instance, that of hybridization and seed selection, we have the combination of characters from two parents, a combination that is seldom exactly reproduced in any two seedlings, so that great variations and possible improvements are to be expected. In the other we have the bud or scion which has inherited all the characters of the parent tree, no more and no less, being an actual part of it, which characters will be present in the tree resulting, and only suppressed or intensified by external causes. Differences between individual trees are therefore due not to heredity but are acquired and fluctuating characters due to environment and stock, and as such are not likely to be transmissible. No doubt were it possible to grow trees of a variety exhibiting such wide differences under precisely the same conditions as the original tree of the variety, no variation whatsoever would be observed.

The trees in this experiment have been grown under almost exactly the same conditions of soil and situation, and it is unlikely that in this instance environment has played any part in causing the wide differences exhibited between the trees, and it may be correctly assumed that the real cause lies in the great variation among the stocks.

Much diversity of opinion has existed on this matter for many years, but comparatively recent research in other countries, reported since the commencement of this experiment, has been followed by a decided leaning to the opinion that, whilst several kinds of variation may be met with, some of which taking the form of "bud sports" etc. may be perpetuated when propagated vegetatively, the very great majority of variations exhibited among individual trees of a variety in the plantation and garden are not transmissible.

Further evidence in support of this opinion is added by the result of this experiment.

That great care must necessarily be exercised, however, in propagating only from healthy trees will be obvious, for buds and scions

are a ready means of carrying such diseases as Brown Rot, Scab, Mildew, and the like, and in this way much infected stock is no doubt raised.

But so long as the tree be healthy and free from disease, it matters little how it has behaved with regard to actual fruits borne, for such variations from the normal characteristics of the original tree of the variety are not transmissible, and grown under suitable conditions and upon suitable stocks the trees will reproduce the original vigour and cropping powers of the variety.

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FIG. 43.—VERTICILLIUM WILT OF TOMATO.
(1) Tomato plant inoculated with Verticillium albo-atrum.
(2) Control plant remaining healthy.

[*To face p.* 168.

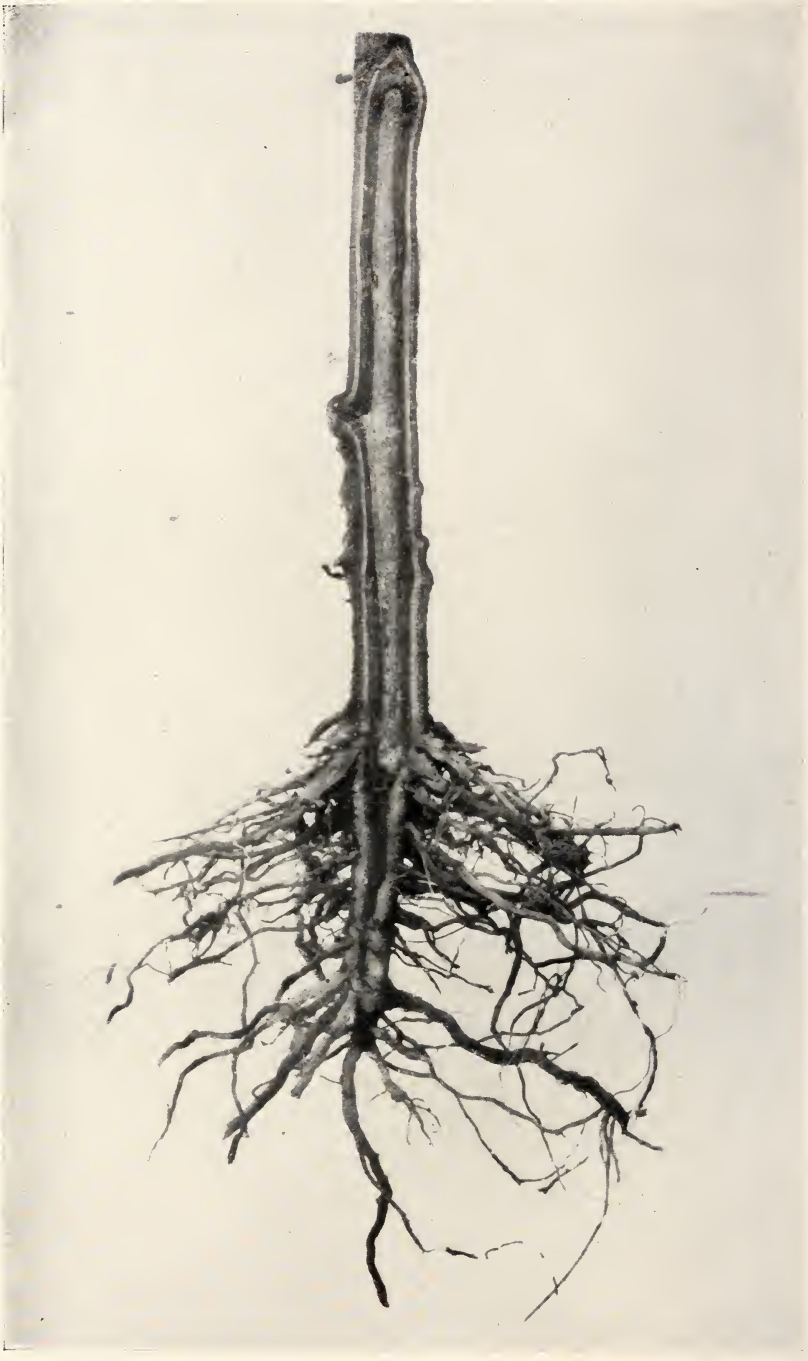

FIG. 44.—SECTION OF TOMATO STEM ATTACKED BY VERTICILLIUM ALBO-ATRUM, SHOWING THE DARKENED WOOD.

FIG. 45.—'STRIPE' DISEASE OF THE TOMATO.

FIG. 46.—'DAMPING OFF' OR 'FOOT-ROT' OF TOMATO SEEDLINGS.
(1) Seedlings grown in highly infected soil, treated with 'Cheshunt Compound.' All healthy.
(2) Seedlings grown in the same soil not treated. All diseased.

[*To face p.* 169.

TOMATO DISEASES.

By W. Bewley, D.Sc., Director of the Lea Valley Experimental Station.

[Read November 15, 1921; Mr. W. A. Bilney in the chair.]

Of all crops grown under glass, the tomato is probably one of the most susceptible to disease. In districts where large areas are devoted almost entirely to the cultivation of this plant under commercial conditions, the losses caused by disease amount to many thousands of pounds. To those who realize the high cost of production of this crop, the importance of controlling all diseases, which are slowly but surely reducing the growers' profits, is obvious.

The Experimental and Research Station, situated at Cheshunt in Hertfordshire, is placed in the heart of the great tomato-growing industry which has spread along the valley of the Lea. At this station, problems connected with the cultivation and diseases of tomatos and other glasshouse crops are being investigated, and it is the aim of this paper to describe the many diseases which have been studied there.

From the time the young plant emerges from the seed until the gathering of the last fruits, the tomato may be attacked by one disease or another. One of the earliest of these is that popularly known as "Damping off" (fig. 46) of the seedlings. In this case the young plants, while still in the seed-box and barely an inch in height, are attacked by a fungal parasite at the ground level. The tissues soften and collapse and the seedling falls over. At times the plants may escape infection in the seed-box, but may be attacked after being potted into "60" pots or even when planted out in the house, when the disease is generally known as "Foot Rot" or "Blackleg." (Fig. 46.)

The disease is caused by a number of different fungi, but mainly those belonging to the genus *Phytophthora* and especially *Ph. cryptogea* Pethybridge and *Ph. parasitica* Dastur. The disease organisms are carried from one season to another in the soil, water, seed-boxes, and pots. They are not present in all soils, but exist as a definite infection in some. Infected soil is readily cleansed by sterilizing with steam, formaldehyde, or by baking; infected seed-boxes and pots by sterilizing with steam or formaldehyde; and infected water by thoroughly renovating, cleaning, and deepening the well. The great importance of having a pure water supply cannot be too firmly impressed upon the minds of all cultivators of plants, for all methods of sterilizing soils must be useless if copious infection is carried with each watering. In 1920 the writer and Mr. W. Buddin, M.A.,* made an extensive examination of nursery water

* For a full account of this investigation see *Annals of Applied Biology*, vol. viii. No. 1, June 1921.

supplies in the Lea Valley by carefully filtering large volumes of water. Our results showed that deep artesian wells were free from contamination, but shallow wells, brooks, and ponds were frequently polluted with fungal and bacterial parasites.

While sterilization of the propagating soil is extensively practised by the more advanced growers, there are those who do not find it convenient to adopt such methods, and who desire some fungicide which may be applied to the soil round the growing plant and which will destroy the fungus without injuring the plant. As the result of investigation at Cheshunt, such a compound has been devised and has proved highly satisfactory in the Lea Valley. For convenience it has been named "Cheshunt Compound." Finely ground copper sulphate and fresh ammonium carbonate are intimately mixed in the proportions of two parts by weight of the former and eleven parts of the latter. The mixture should be stored in a tightly stoppered jar for forty-eight hours, after which the solution is prepared by dissolving ½ oz. of the mixture in 1 gallon of water. The solution may be applied to the seed-boxes, pots, or ground in which plants are growing, and will destroy the fungal parasites without injuring the plants. It must be understood, however, that plants which have been already attacked will receive no benefit from the solution, but will eventually die. They may be saved only by cutting off the tops above the diseased part and treating as cuttings.

The next disease of importance attacks the bottom truss at a time when it is commencing to ripen, and is known as "Buck-eye Rot" or "Black Rot." The lesions take the form of brown and grey patches with darker brown concentric rings, and somewhat resemble the eye of a large animal.

The disease is caused by a fungus, *Phytophthora terrestria* Sherbakoff = *Ph. parasitica* Dastur. The disease organisms are splashed up from the soil in the process of watering, and are held in a film of water between the fruits of the bottom trusses.

Here the conditions are very suitable for infection, and the fungus readily penetrates into the fruit. In nurseries where this disease occurs it is advisable to mulch early and so prevent the disease organisms from being splashed on to the plants. For this purpose a straw mulch is eminently suitable. The rapid progress of the disease is to a large measure due to the ideal conditions of humidity which prevail round the base of the plant, and careful attention to temperature and ventilation will do much to check the disease, by keeping the bottom truss and leaves as dry as possible. Diseased fruits must be removed immediately, for the fungus spreads along the branches of the truss back into the main stem, where it soon causes the death of the entire plant.

Later in the season "Stripe Disease" * and "Sleepy Disease" †

* For a more detailed account of this disease see *Annals of Applied Biology*, vol. vi. Nos. 2 and 3, Dec. 1919.

† For a more detailed account of this disease see *Annals of Applied Biology*, vol. ix. No. 2, 1922.

appear. The former can readily be identified by the long dark brown or black sunken furrows or " stripes " which are produced on the stems and petioles. The fruits show light or dark brown sunken patches with round or irregular outline, which vary from a few spots near the calyx to many spots scattered promiscuously over the entire surface. The leaves develop yellow patches which soon turn dark brown and extend so that the greater part of the leaf surface becomes browned and much distorted.

" Stripe " disease (fig. 45) is produced by *Bacillus lathyri* Manns and Taubenhaus, which is also responsible for " Streak " of the Sweet Pea and other leguminous plants. The organism is carried in the soil and water and also in the leguminous weeds that surround so many nurseries. In the glasshouses it is readily spread from plant to plant by the workers engaged in pruning and tying, and it is highly probable that certain sucking insects are instrumental in this way also.

Experiments conducted at Cheshunt have shown that there are considerable differences in the relative susceptibility of different varieties of tomatos to this disease.

The relation between manurial treatment and the incidence of the disease has also been studied, and it has been shown that increasing amounts of nitrogen without potash produced an increasing susceptibility to the disease, while increasing amounts of potash without nitrogen gave a corresponding increase in resistance to it. Where potash and nitrogen were used together there were indications that the potash counteracted the effect of the nitrogen. These results are fully confirmed by observations on commercial nurseries, where it has been found that plants growing rapidly and making large amounts of soft sappy growth are readily attacked by " Stripe," while slow-growing harder plants are free from disease.

Watering with sulphate of potash solution or dressing with the solid compound has almost invariably caused " striped " tomato plants to grow away clean.

In view of the transmission of the disease from one plant to another by means of the pruning knife, it is necessary to sterilize this instrument after pruning a diseased plant and before passing to a healthy one. This may conveniently be effected by wiping the blade of the knife with a rag soaked in 2 per cent. Lysol or similar disinfectant.

" Sleepy Disease " of the tomato is found throughout the whole of the British Isles, where tomatos are grown, and while a large number of different fungi are responsible for one form or another of this disease, the most important pathogen in this country is a fungus, *Verticillium albo-atrum* Reinke and Berthold, but under exceptionally high-temperature conditions another fungus, *Fusarium lycopersici* Sacc., may be the cause. *Verticillium* wilt (fig. 43, 44) first appears about the middle of April and increases in intensity up to the middle of May, when it reaches its maximum. In normal summer temperatures the attacks die down towards the second half of June, July, and

August, but reappear at the end of September. *Fusarium* wilt occurs at the height of the season, usually in July and August.

The term "Sleepy Disease" aptly describes the appearance of the diseased plants. They are usually stunted in habit, but not invariably so, and the internodes are badly developed, especially near the top, where the leaves form a rosette. When conditions are most favourable to the fungus, the symptoms appear quite suddenly. The plants may be perfectly turgid and green with no signs of yellowing, when, without any warning, the leaves become limp and droop. During the night the plants may recover their turgidity, only to wilt again as the morning advances. The plants wither from the base upwards and finally die. On cutting open the stem of a diseased plant the wood is seen to be discoloured, the colour varying from light to dark brown. The discoloration of the stem may be traced to the root, and the point of entrance of the fungus into the plant may be distinguished by the intense browning at that point. The disease organisms hibernate in the soil or compost from season to season and infect the young roots as they develop. The fungus destroys the cortex at the point of entrance and, entering the wood, passes up into the stem. Here it is found solely in the woody parts. When the plant dies the fungus leaves the vessels and, penetrating the cortex, forms at the base of the stem a white external growth. This is the active fruiting stage, and the spores are readily blown about, enabling a rapid spread of the fungus.

Experiments at Cheshunt have shown that plants grown "hard" are more susceptible to the disease than the softer succulent types, and consequently varieties like Kondine Red show a strong susceptibility. Considerable attention has been paid to the temperature relations of *Verticillium* wilt, and it has been found that temperatures between 60° F. and 75° F., with an optimum of 70–73° F., are favourable to the rapid progress of the disease, which below 60° F. and above 75° F. is exceedingly slow, while suitable shading counteracts the effect of low temperatures. It has been found that wilted plants recover when the average temperature is raised to 77° F. and they are shaded. Based on these results, a method of controlling *Verticillium* wilt, by enforcing suitable cultural conditions, has been devised and tested with promising results.

As soon as the wilt appears and it is proved that *Verticillium albo-atrum* is the pathogen, the average temperature of the houses should be raised above 77° F. by suitably increasing the boiler heat, regulating the ventilation, and by closing down the houses from two to four hours in the middle of the day. A light dressing of whitewash on the glass makes the conditions still more favourable for the plants. As little water as possible should be given to the roots, as heavy watering merely aggravates the wilting, but a light overhead damping helps the wilted plants to recover. The plants should be encouraged to make fresh roots above the original diseased ones, by placing fresh soil round the base of the plant.

In one case 68 per cent. of the plants in a nursery were showing symptoms of wilt before the above methods were enforced, but a fortnight after only 10 per cent. remained wilted. In view of the fact that low spring temperatures are favourable to infection by *Verticillium* some advantage might be gained by planting later than normally, so that the higher summer temperatures may arrive by the time the plants have reached a suitable stage for infection.

Perhaps the most familiar disease of the tomato is that commonly termed "Mildew," which is caused by *Cladosporium fulvum* Cke. The term is an unfortunate one, as the fungal growth on the leaves is typically brown in colour, while the "Mildews" are typically white. The disease first appears as a pale grey mould in isolated spots on the under side of the leaf, but it soon turns brown, spreads over the leaf, and causes desiccation and death. Spores are produced in abundance, and under favourable conditions the disease spreads with alarming rapidity. The fungus usually attacks the old leaves first, but in bad cases even the young leaves are attacked. High temperatures and a saturated atmosphere favour the disease; and, therefore, a most important factor is ventilation. In most glasshouses the amount of ventilation given is not sufficient to stop the spread of the disease, and strong measures have to be taken. As soon as the fruit has been removed from the bottom four trusses, the leaves up to the fourth truss must be removed to allow the air to move freely through the plants, and as the tops develop they must be kept well pruned for the same purpose. Full ventilation should be given when the disease appears, and in bad cases it is frequently necessary to leave the doors open if possible. Dusting or vaporizing with sulphur is of considerable value in checking the disease. Spraying with liver of sulphur has also proved valuable, where spraying is possible, but under normal commercial conditions it is not possible to spray the plants after they have reached a height of 4 feet or so.

A fungus of considerable economic importance is *Botrytis cinerea*, which produces a stem rot and a fruit rot. The damage which it does to the stems is largely assisted by the carelessness of the practical man. The fungus grows as a saprophyte upon dying, badly pruned leaf-bases, and thus gains entrance to the main stem through which it ramifies. The stem tissues are destroyed, causing the death of the plant above this point. By carefully cutting away with a sharp knife the unwanted leaves, a clean flat wound close to the main stem is made, which rapidly heals and offers no foothold for *Botrytis* spores. The removal of the leaves from the lower portions of the plant is also necessary, for this prevents a stagnant moist atmosphere from accumulating round the wounds and so assisting spore germination. Once the fungus has entered the plant, the latter may be saved only by cutting out the tissue containing the fungus. In the case of *Botrytis* the browning of the plant tissue occurs ahead of the fungus, and hence by removing the brown portions of the stem the entire fungal growth

is removed. The wound should then be painted with a very strong solution of copper sulphate. Much can be done to check the spread of the disease by correct defoliation and regulation of the humidity; but in very bad cases it may be necessary to spray the lower parts of the plant with a 2 per cent. solution of calcium bisulphite, which is a specific for *Botrytis*.

A soft rot of green tomato fruits caused by *Botrytis* frequently appears towards the end of the season. At this time there is a tendency on the part of the grower to reduce the boiler heat and give less ventilation, which leads to the persistence of a film of moisture on the plants until well into the day. Under these conditions the fungus readily gains entrance to the soft portions of the fruit and a soft rot rapidly appears.

Other fruit rots caused by various species of *Fusarium* and *Penicillium*, as well as by *Bacillus carotovorus* and another undescribed bacillus, occur during the season.

Several root-rotting fungi attack the tomato plants during the season and cause death to take place prematurely about the end of August. Among these may be mentioned several species of *Fusarium* and a new species of *Sclerotium*. In the past very little attention has been paid to these root diseases, but they are now under investigation.

Blossom-end rot of tomato fruit is universally found in tomato-growing areas. A dark brown sunken patch appears near the style and increases rapidly in size, spreading deep into the tissues. The affected tissues harden and assume a dark brown or black colour. The outer tissues become leathery and the fruit flattens. The malady is not caused primarily by bacteria or fungi, but appears to be physiological in origin. Plants that are growing rapidly are most susceptible, and either continued excessive watering or a sudden check in the water supply may produce the disease. This latter appears to be the most common cause of the disease, and careful attention to the conservation of the correct amount of water in the soil has generally been successful in preventing the trouble.

Mosaic disease of the tomato is rapidly becoming one of the most important diseases of this crop. The symptoms show themselves as a mottling of the leaves, in which yellow patches alternate with those of dark green. The yellow patches turn brown and dry up. Finally the lesions spread over the whole surface and the leaf dies. The disease is highly infectious, being carried from one plant to the other by the hands of the workers and by sucking insects. To spread the disease it is necessary only to transfer a little juice from a diseased plant to a healthy one. Merely crushing a diseased leaf between the fingers and then crushing a leaf on a healthy plant is sufficient to transmit the disease. Under normal conditions disease symptoms appear in eight to ten days after inoculation. Mosaic disease is at present but little understood, but its investigation is now being carried out.

CONTRIBUTIONS FROM THE WISLEY LABORATORY.

XL.—Experiments on Green Manuring for Light Soils.

By H. J. Page, M.B.E., B.Sc., A.I.C.

The growing scarcity of animal manure is a matter which most directly concerns the horticulturist. Keeping no stock himself, the gardener has to obtain his manure from outside sources. These sources are twofold: the farm and the town stables. The first source is failing; more land under the plough on the one hand, and a diminished number of stock on the other, combine to reduce very considerably the surplus of farmyard manure which the farmer has to sell after supplying his own needs. The alternative source, the town stables, which formerly supplied a large proportion of the horticulturist's needs, is also rapidly failing, for, in the face of the increasing use of motor transport, the horse is disappearing from the roads. Although the point has not yet been reached where the amount of animal manure available to the horticulturist (taking the country as a whole) is negligible, yet the relation of the demand to the supply is shown in a very great, and in some cases almost prohibitive, increase in the price of dung. Moreover, the position is likely to become steadily worse as time goes on. Further, the gardening and agricultural industries are not evenly distributed over the country, so that although in some districts there may still be enough cheap farmyard manure, in others it has always been scarce, and is now almost unobtainable except at the cost of heavy freight charges.

For the proper maintenance of its fertility the soil must be well supplied with organic matter. The intensive methods of cultivation practised by the horticulturist are specially exhausting to the soil, so that while he is the first affected by the growing scarcity of dung, he is more in need of it than any other cultivator. It is, therefore, a matter of the utmost importance to provide some other source of organic matter. Supplies from many of the alternative sources that suggest themselves are either too scarce and expensive, or only available in special districts (*e.g.* seaweed). Others which may later become of great importance are "artificial farmyard manure" (straw manure) and activated sewage sludge. There remains, however, a method of supplying organic matter to the soil which is capable of almost universal application, and which has been known since the earliest times—namely, green manuring.

Hitherto green manuring has not been widely practised in this country; this is no doubt partly due to the fact that, in general, dung was until recently relatively plentiful, so that the need for an alternative source of organic manure did not generally arise; but

in other countries green manures are widely used, notably in many tropical countries where animal manure is scarce or unobtainable.

The literature of green manuring is extensive, and it is not proposed to review it in detail here. The benefits to the soil of burying a green crop are well known ; not only is a wealth of humus-forming material added to the soil, with the consequent beneficial effect on the texture of the soil and on its water-retaining and drought-resisting qualities, but also much of the nitrogen which would otherwise have been leached out of the soil and lost is stored up in the green crop, to be restored to the soil when the crop is buried ; if the green crop is a leguminous one a considerable further addition is made to the nitrogen of the soil by the activities of the nodule-bacteria which " fix " atmospheric nitrogen and pass it on to the green crop. Although, in a general sense, these facts are well known, much work is needed to determine the best practical methods of green manuring in this country. These methods will necessarily vary widely according to a variety of factors, such as the type of soil, the climate, the time of the year, and so on.

The results reported in this paper were obtained in the first year of an investigation which was started by the author at Wisley in 1919, with the double object of demonstrating the value of green manuring on a light soil, and of ascertaining the most suitable crops and the best methods of applying them on such a soil, in horticultural practice. This investigation at Wisley is intended to go on for a number of years.

In those tropical countries where green manuring is widely practised, leguminous crops are almost exclusively used ; such crops would certainly be expected to have a decided advantage over non-leguminous ones by virtue of the extra nitrogen added to the soil by equal amounts of organic matter, provided that the soil conditions are constant. That the soil type is a factor of importance in this connexion is demonstrated by the results of the experiments carried out in this country at Rothamsted by Hall,* and at Woburn by Voelcker.† On the heavy Rothamsted soil a leguminous crop, vetches, gave better results than a non-leguminous crop, mustard. At Woburn, on a light sand, the opposite was found. The main object of the original scheme of experiments at Wisley was to test this point, but circumstances suggested the division of the experiment into two parts, in which the green crops were buried in early winter and in spring respectively ; so that it was also possible to compare the relative values of these two times of application.

Outline of Experiment.

The soil of the experimental plot was light sand (Bagshot sand). It contained less than 0·1 per cent. of calcium carbonate, and about

* *Journ. Bd. Agr.*, **17**, p. 969 (1911).
† See *e.g. Journ. R. Agr. Soc. Eng.*, **73**, p. 304 (1912).

2 per cent. of organic matter (loss on ignition). Its mechanical analysis was as follows :—

Fine gravel . .	3·3	Silt . . .	8·0
Coarse sand . .	49·1	Fine silt and clay	8·0
Fine sand . . .	30·2	(Clay about 2 per cent.)	

The plot had been uniformly treated for many years, and had received no organic manure since 1915. It was situated on a slight slope downward from S.W. to N.E., and was fairly uniform in character, the soil being if anything slightly heavier at the lower end. Its reserve of lime was so small that it was on the verge of acidity. It was not, however, practicable to give it a dressing of chalk before sowing the green crops.

The total area of the plot was 0·28 acres. It was divided into forty-eight plots, each 15 feet by 17 feet (about one rod), and sown with the crops at the rates and distances shown in Table I., each crop thus being grown on four plots. The plots were arranged in chessboard fashion, to eliminate as far as possible errors due to possible lack of uniformity in the soil, as shown in the following plan, in which the crops are designated in accordance with Table I.

Plan showing arrangement of plots.

34′

48 C	46 L2	44 N4	42 L4	40 N2	38 C	36 N1	34 L1	32 N5	30 L3	28 N3	26 L5	24 C	22 L2	20 N2	18 L4	16 N4	14 C	12 N1	10 L5	8 N5	6 L3	4 N3	2 L1
47 L1	45 N3	43 L3	41 N5	39 L5	37 N1	35 C	33 N4	31 L4	29 N2	27 L2	25 C	23 L5	21 N3	19 L3	17 N5	15 L1	13 N1	11 C	9 N2	7 L4	5 N4	3 L2	1 C

360′

Table I.

Key No. (See Plan)	Name of Crop.	Quantity Sown.		
		Plot.	Acre.	Dist. of Drills.
N 1	Mustard, Sutton's White . . .	2 oz.	20 lb.	Broad-
N 2	Rape, Sutton's	1 oz.	10 lb.	cast
N 3	Rye, Carter's Finest	1 lb.	160 lb.	4″
N 4	Oats, Carter's Winter	1 lb.	160 lb.	4″
N 5	Turnip, Dawkin's Early White Stone .	1 oz.	10 lb.	9″
L 1	Black Medick, Sutton's Yellow Trefoil .	3 oz.	30 lb.	4″
L 2	Clover, red, Sutton's Canadian . .	2 oz.	20 lb.	4″
L 3	Clover, crimson, Sutton's Early Red Trifolium	3 oz.	30 lb.	4″
L 4	Lupine, annual, Sutton's Blue . .	8 oz.	80 lb.	9″
L 5	Vetch, Carter's Common Winter Tares .	12 oz.	120 lb.	6″
C	Control. No green crop . . .	—	—	—

The crops were sown on August 20 and 21, 1919; all came up well except lupines, which germinated very badly (less than 20 per cent.).

As was to be expected, the non-leguminous crops made most

progress at first, especially mustard, while vetches were the best of the legumes. It was originally intended to dig in the whole of the crops in early winter, but on the upper and slightly lighter half of the plot the growth was so poor that it would have been manifestly unfair to treat it in the same way as the lower half. The experiment was therefore divided into two parts. The crops on the lower half (Plots 1–24) were dug in between December 4 and 12 (this part is subsequently referred to as the "Autumn Section"), while those on the upper half (Plots 25–48) were given a light dressing of basic

TABLE II.

Weights of Second Thinnings of Turnips, June 17, 1920.

Green Manure.	Autumn Section.			Spring Section.		
	Plot.	Weight.	Mean.	Plot.	Weight.	Mean.
		oz.			oz.	
Mustard . .	12	10	14	36	24	29
	13	17		37	34	
Rape . . .	9	3	4	29	27	25
	20	4		40	22	
Rye . . .	4	11	9	28	16	38
	21	6		45	59	
Oats . . .	5	12	11	33	39	39
	16	9		44	39	
Turnip . .	8	nil	2	32	12	21
	17	3		41	30	
Black Medick .	2	3	5	34	19	(19)
	15	7		47	Lost	
Red Clover . .	3	5	6	27	31	46
	22	7		46	61	
Crimson Clover .	6	7	6	30	44	53
	19	4		43	61	
Lupine . .	7	4	6	31	26	27
	18	8		42	27	
Vetch . . .	10	9	7	26	30	43
	23	5		39	55	
Control . .	1	3	8	25	15	18
	11	14		35	20	
	14	10		38	20	(20)
	24	6		48	Lost	

slag (8 cwt. to the acre) and left to grow on during the winter (this part is subsequently referred to as the "Spring Section"). In the late winter and early spring the superiority of the crucifers over crimson clover and vetches rapidly disappeared on this section; though rye was still among the biggest crops; red clover and yellow trefoil made relatively little growth. The crops on this section were dug in on April 8–10. On May 12 and 13 the whole plot was then sown with a six-weeks' garden turnip (Early White Stone) at the rate of 7 lb. to the acre, in drills 18 inches apart, running at right angles to the length of the plot. In the seedling stage the turnips suffered a severe attack of flea beetle, but by prompt preventive measures this was kept in check and the crop passed successfully to the rough-leaved stage. The crop on the spring section

soon showed a superiority over the autumn section, and this became continually more marked as growth progressed.

The crop was thinned to half distance on June 7 and 8, and to 10 inches between plants on June 16. The second thinnings from each plot were weighed, and the weights (Table II.) give some idea of the relative sizes of the crops at this stage.

The crop was harvested in the third week of July.

At intervals throughout the experiment soil samples were taken and analysed for moisture, organic matter and nitrates, and counts of bacterial numbers were made. The green crops on each plot were sampled for yield and analysis before digging in, the yield being estimated from the weight of cleaned fresh tops and roots from an accurately measured representative square yard. The turnip crop on each plot was weighed both as whole plants and as roots alone. The produce from each of the ten rows on the plot was separately weighed, all plants within one foot of the ends of rows being excluded; while, in computing the true yield, the two outer rows were also excluded. The " edge effect " was thus eliminated.

Results.

The *yields of green crops* in each section of the experiment are shown in Tables III. and IV.

TABLE III.

Autumn Section.

YIELDS OF GREEN CROPS AT TIME OF DIGGING IN.

Sown August 20–21, 1919. Dug in December 12–14, 1919.

Crop.	Plot.	Fresh Tops.		Ash-free dry matter (roots included).	
		Tons per acre.	Mean.	Cwt. per acre.	Mean.
Mustard . .	12	4·5	5·6	21·4	
	13	6·7			
Turnip . .	8	3·6	4·2	18·8	
	17	4·7			
Oats . . .	5	—	3·6	16·0	
	16	3·6			
Vetch. . .	10	4·5	4·3	14·9	
	23	4·0			
Rape . . .	9	5·6	4·2	14·7	
	20	2·8			
Rye . . .	4	—	2·9	11·9	
	21	2·9			
Crimson Clover .	6	—	1·7	5·7	
	19	1·7			
Red Clover . .	3	—	0·4	2·9	
	22	0·4			
Black Medick .	2	—	0·5	2·5	
	15	0·5			
Lupine . .	7	—	0·4	1·9	
	18	0·4			
Control (Weeds) .	1	—	0·8 (incl. roots)	2·2	

Table IV.

Spring Section.

Yields of Green Crops at Time of Digging in.
Sown August 20–21, 1919. Dug in April 8–10, 1920.

Crop.	Plot.	Fresh Tops.		Ash-free organic matter (roots included).	
		Tons per acre.	Mean.	Cwt. per acre.	Mean.
Crimson Clover	30	17·3	17·0	43·5	
	43	16·7			
Rye	28	7·0	8·4	38·2	
	45	9·7			
Rape	29	11·2	10·4	35·1	
	40	9·5			
Turnip	32	7·0	7·8	25·0	
	41	8·6			
Vetches	26	9·2	8·6	23·3	
	39	8·1			
Red Clover	27	2·7	3·9	14·2	
	46	5·0			
Mustard	36	2·8	2·8	13·7	
	37	—			
Oats	33	1·8	2·7	13·0	
	44	3·5			
Black Medick	34	1·4	1·4	8·4	
	47	—			
Lupine	31	—	—	—	
	42	—			
Control (Weeds)	25	2·2	2·2 (incl. roots)	5·8	

These figures clearly show the superior yield of the non-legumes in the autumn. The five non-leguminous crops produced an average of 16·6 cwt. per acre of ash-free organic matter against only 6·5 for the four legumes (neglecting lupines), of which only vetches made a growth comparable with the non-legumes. In the spring, of course, the growth was much greater, and although as a whole the non-legumes still led, the margin was small, the average yields of ash-free organic matter in cwt. per acre being respectively 25·0 and 22·4. Moreover, crimson clover is head of the list by a big margin. It will be noticed that in two cases the spring figures are less than the autumn ones. In the case of mustard this is due to the fact that the crop was in full flower in the late autumn, and when turned under in the spring was dying down. In the case of oats the wet weather in the winter caused the green tops to rot away, so that the spring figure represents almost solely new growth made in the late winter and early spring, and does not include the decayed remains of the first growth; in a more fortunate season no doubt the figure for oats in spring would more nearly approach that for rye.

The *yields of turnips* obtained on the plots green manured with the above green crops are shown in Tables V. and VI.

Table V.

Yields of Turnips (whole plants) after Green Manures.

Mean Weights per Row (Ten Rows per Plot).

After:—	Spring Section.						Autumn Section.					
	Plot.	Weight.		Mean.			Plot.	Weight.		Mean.		
		lb.	oz.	lb.	oz.			lb.	oz.	lb.	oz.	
Mustard	36	10	8	10	7		12	11	10	12	0	
	37	10	6				13	12	6			
Rape	29	14	6	12	4		9	8	10	7	6	
	40	10	1				20	6	2			
Rye	28	14	6	15	9		4	13	7	13	4	
	45	16	12				21	13	1			
Oats	33	13	8	13	4		5	14	15	12	12	
	44	13	0				16	10	8			
Turnip	32	9	8	11	8		8	4	9	8	11	
	41	13	8				17	8	11			
Medick	34	7	10	8	4		2	5	6	5	5	
	47	8	13				15	5	3			
Red Clover	27	16	2	17	7		3	8	8	8	5	
	46	18	12				22	8	1			
Crimson Clover	30	23	15	23	9		6	10	3	8	1	
	43	23	3				19	5	15			
Lupine	31	10	5	10	11		7	8	5	7	5	
	42	11	1				18	6	4			
Vetch	26	20	13	21	11		10	12	4	11	14	
	39	22	9				23	11	7			
Control	25	9	4	8	3		1	5	4	7	10	
	35	7	9				11	10	3			
	38	8	0				14	7	15			
	48	7	15				24	7	1			

Table VI.

Yields of Turnips (Roots only) after Green Manures.

Mean Weights per Row (Ten Rows per Plot).

	Spring Section.						Autumn Section.					
	Plot.	Weight.		Mean.			Plot.	Weight.		Mean.		
		lb.	oz.	lb.	oz.			lb.	oz.	lb.	oz.	
Mustard	36	6	10	6	14		12	6	8	6	13	
	37	7	2				13	7	2			
Rape	29	8	12	7	6		9	4	4	3	12	
	40	6	0				20	3	4			
Turnip	32	5	4	6	10		8	2	0	3	8*	
	41	8	0				17	4	15			
Rye	28	9	5	10	0		4	7	12	7	5	
	45	10	12				21	6	14			
Oats	33	9	2	8	9		5	8	11	7	4	
	44	7	15				16	5	13			
Vetch	26	10	8	11	4		10	6	8	6	5	
	39	12	0				23	6	1			
Crimson Clover	30	12	9	12	3		6	5	15	4	11	
	43	11	13				19	3	6			
Red Clover	27	10	3	10	12		3	4	13	4	12	
	46	11	5				22	4	11			
Medick	34	4	11	5	2		2	2	11	2	13	
	47	5	8				15	2	15			
Lupine	31	6	9	6	13		7	4	7	4	1	
	42	7	1				18	3	11			
Control	25	5	10	5	2		1	2	10	4	9	
	35	4	15				11	6	2			
	38	5	5				14	5	1			
	48	4	9				24	4	5			

* This is from one plot only.

The agreement between duplicates, although good in the majority of cases, is in others not so good. It will, however, be found, on comparison of these cases with the yields of green crop for the corresponding plots (Tables III. and IV.), that the differences in yield of turnips between duplicate plots were usually preceded by similar differences in the amounts of green crop turned in on these plots.

Table VII.

Summary of Results.

(The order of green crops in each section is that of their relative green-manurial value in these trials.)

Green Crop.	Fresh Green Crop. Tons per Acre.	Dry Organic Matter Buried (incl. Roots). Cwt. per Acre.	Turnip Yield.				Remarks.
			Whole Plants.		Roots only.		
			Tons per Acre.	Percentage of Control.	Tons per Acre.	Percentage of Control.	
Spring Section							
Crimson Clover	17·0	43·5	20·4	287	10·5	239	
Vetch . .	8·6	23·3	18·7	263	9·7	220	
Red Clover .	3·9	14·2	15·1	213	9·3	206	
Rye . .	8·4	38·2	13·4	189	8·6	195	
Oats . .	2·7	13·0	11·4	161	7·4	168	This crop rotted off in winter.
Rape . .	9·3	35·1	10·6	149	6·4	145	
Turnip . .	7·8	25·0	9·9	140	5·7	130	
Lupine . .	..	..	9·2	130	5·9	134	
Mustard .	2·8	13·7	9·0	127	5·9	134	This crop was dying down.
Control .	2·2 (incl. roots.)	5·8	7·1	100	4·4	100	Fresh crop = weeds.
Black Medick	1·4	8·4	7·1	100	4·4	100	
Autumn Section							
Rye . .	2·9	11·9	11·4	173	6·3	162	
Oats . .	3·6	16·0	11·0	167	6·3	162	
Mustard .	5·6	21·4	10·4	158	5·9	151	
Vetch . .	4·3	14·9	10·3	156	5·5	141	
Turnip .	4·2	18·8	7·5*	114	4·3*	110	*Figures from one plot only.
Red Clover .	0·4	2·9	7·2	112	4·1	105	
Crimson Clover	1·7	5·7	7·0	106	4·0	103	
Rape . .	4·2	14·7	6·4	97	3·2	82	
Lupine . .	0·4	1·9	6·3	95	3·5	90	
Black Medick .	0·5	2·5	4·6	70	2·4	62	
Control .	0·8 (incl. roots.)	2·2	6·6	100	3·9	100	Fresh crop = weeds.

Table VII. shows the cropping results in relation to those recorded in Tables III. and IV., and affords the most convenient general summary of the cropping results obtained.

Considering first the autumn section, it will be noticed that the

plots manured with rye, oats, mustard, and vetches have given very similar yields, between 50 per cent. and 75 per cent. above the control. Of the remainder, it is not immediately apparent why the yields from the plots manured with black medick should be less than the control, but this needs confirmation before speculation is justified. The results for the spring section show a very marked increase over those for the autumn section. Here the plots manured with crimson clover and vetch have given yields well ahead of all the others, though the plots manured with red clover, rye, oats, rape, and turnip all give distinctly bigger yields than the controls. On the average, the spring green-manured plots give about 50 per cent. bigger yields than the autumn-treated ones. It is to be noticed that corresponding to the partial dying down of the mustard before the spring application, the yields of turnips show a slight decrease. This is the only case of a smaller yield after spring treatment.

A rough idea of the relative green manurial value of equal amounts of organic matter from the different green crops is given by Tables VIII. and IX., in which are shown the ratios of the excess of yield after each green crop, over the control to the excess of amount of organic matter buried by that crop, over that buried on control.

In these tables—

Y = Turnip yield (whole plant) from plots manured with green crop.

Yc = Turnip yield (whole plant) on control plots.

R = Turnip yield (roots only) from plots manured with green crop.

Rc = Turnip yield (roots only) on control plots.

OM = Ash-free organic matter buried on plots manured with green crop.

OMc = Ash-free organic matter buried on control plots (weeds).

Table VIII.

Ratio of increase in Turnip Crop to ash-free organic matter buried.

Autumn Section.

	$\frac{Y - Yc}{OM - OMc}$	$\frac{R - Rc}{OM - OMc}$
Mustard	3·8	2·0
Rape	—	—
Turnip	0·9	0·4
Rye	9·6	4·8
Oats	6·3	3·4
Vetches	5·8	2·5
Crimson Clover	2·2	0·6
Red Clover	15·0	5·0
Black Medick	—	—
Lupine	—	—
Control	—	—

Table IX.

Ratio of increase in Turnip Crop to ash-free organic matter buried.

Spring Section.

	$\frac{Y - Yc}{OM - OMc}$	$\frac{R - Rc}{OM - OMc}$
Mustard	4·8	3·8
Rape	2·4	1·4
Turnip	2·9	1·4
Rye	3·9	2·6
Oats	(11·9)	(8·3)
Vetches	13·2	6·0
Crimson Clover	7·1	3·2
Red Clover	19·0	11·7
Medick	—	—
Lupine	—	—
Control	—	—

In the autumn section it is seen that equal weights of organic matter are most effective in the order—red clover, rye, oats, vetches, mustard, crimson clover, turnip. Again, in the spring section, weight for weight, red clover is easily the most effective, followed by vetch and crimson clover. The figure for oats is not trustworthy owing to the dying-off and resprouting of the tops already mentioned. Of course, these relations do not express the *practical* value of the different crops, for which the actual yield of turnips must be taken (Table VI.), but they afford an interesting preliminary analysis of the results. It is not intended that any special mathematical significance should be attached to the actual ratios; not only are the data too scanty for statistical treatment, but also the magnitude of main crop yield depends on other factors besides organic matter and the curve for the relation of yield to any one factor, in this case organic matter, would not be linear, the ratio being lower where the actual values of Y–Yc and OM–OMc are high.

It is, however, amply demonstrated by these results, that mere bulk of green stuff turned under is by no means the only important factor in determining the relative value of different crops as green manures, at any rate in a moist season. From other results to be dealt with below, it will be seen that the amount of nitrogen in the green crop had an important bearing on the results obtained.

The *main conclusions* to be drawn from these cropping results are:

(1) The superiority of spring green-manuring over autumn digging in.

(2) The superiority of a quick-growing leguminous crop like crimson clover or vetches over a non-leguminous one like mustard, rape, or rye, for turning under in the spring.

That is to say, the results do not support those of Voelcker, but

agree rather with those obtained on the heavy Rothamsted soil by Hall. This, however, certainly cannot be taken as definitely refuting Voelcker's conclusions, for his experiments extended over a number of years, and the author's so far cover only one season. Moreover, the winter and spring of 1919–1920 were abnormally wet, so that the conditions supposed by Voelcker to have acted against the full utilization of the extra nitrogen in the leguminous crop, *i.e.* an insufficient supply of moisture, or some allied effect, can hardly be supposed to have occurred in this experiment; it may well be that the author's results will be reversed in a dry season. There can, however, be no doubt that under suitable moisture conditions the more nitrogenous legumes are usually better green manures for immediate effect than the less nitrogenous non-legumes, even on light soils, but until the Wisley trials have been repeated for several years on the same plots it must be left an open question whether the more lasting effects in building up the soil humus and improving the texture of the soil are similarly related.

It must also be pointed out that Voelcker's experiments differed from the author's in another important respect. The green crops at Woburn were grown during the spring and summer, and turned under in early autumn, their effect being measured by the yield of winter wheat harvested in the succeeding year, whereas the author's green crops were autumn-sown, and were turned in before spring-sown roots. The methods of green manuring in the Woburn and Wisley experiments were thus so different as to make comparison of the results a matter of some difficulty.

That the relative values of different green crops in the author's experiments were determined in no small degree by the amounts of nitrogen in them, is strongly indicated by the results shown in Tables X. and XI., where the amounts of nitrogen added to the soil by turning under above-ground portions of the different green crops are shown, based on analysis of samples of these crops, the yields of turnips being also again shown for comparison.

Table X.

Spring Section.

Amounts of nitrogen added to the soil by turning under green crops.

Green Crop.	Nitrogen in Green Crops. lb. per acre (mean).	Yield of Turnips (Roots). Tons per acre (mean).
Crimson Clover	182	10·5
Vetch	112	9·7
Red Clover	67	9·3
Rye	73	8·6
Rape	58	6·4
Turnips	48	5·7
Mustard	20	5·9
Black Medick	11	4·4

Table XI.

Autumn Section.

Amounts of nitrogen added to the soil by turning under green crops.

Green Crop.	Nitrogen in Green Crops. lb. per acre. (mean).	Yield of Turnips (Roots). Tons per acre (mean).
Rye	50	6·3
Oats	68	6·3
Mustard	49	5·9
Vetch	78	5·5
Turnip	74	4·3
Red Clover	9	4·1
Crimson Clover	22	4·0
Rape	67	3·2
Lupine	9	3·5
Black Medick	6	2·4

In the spring section, where the green crops were turned in only a short time before the sowing of the main crop, it is seen that the yields of turnips obtained decrease with the amount of nitrogen added to the soil. (The apparent exception of mustard is probably partly to be explained by the fact that a considerable part of the nitrogen in this crop is not accounted for by the analyses, owing to the crop having been dying down at the time of turning in, and having previously shed a large part of its leaves, whose additional nitrogen would have been added to the soil.) The case is somewhat different with the autumn section; here the yields of turnips bear no relation to the amount of nitrogen added to the soil in the green crops. This is without doubt to be explained by the long interval which elapsed between the turning in of the green crops in early December and the sowing of the turnips in the following May. The rainfall during the intervening five months was considerable, and without doubt a large part of the nitrogen originally turned under in the green crops was lost by nitrification and leaching. This explains the proved smaller effect of the green manures in the autumn section, as compared with those in the spring section, where the opportunities for such leaching were very much less. The results would also appear to indicate that the rates of decomposition of the buried green crops varied considerably, so that the amount of available nitrogen in the soil during the growth of the main crop bore no direct relation to the amount of nitrogen turned under in the green crop five or more months before.

These considerations find strong support in the nitrate estimations which were carried out on the soils of the green-manured plots. Typical results of these estimations are shown in Table XII., and the turnip yields obtained from the plots in question are included again for purposes of comparison.

TABLE XII.

Nitric Nitrogen in Soil; Sampled on May 27, 1920.

Autumn Section.			Spring Section.		
Green Crop.	Nitric N. ppm.	Turnip yield tons per acre.	Green Crop.	Nitric N. ppm.	Turnip yield tons per acre.
Rye	4·0	11·4	Crimson Clover	22·6	20·4
Oats	4·1	11·0	Vetches	26·1	18·7
Mustard	5·1	10·4	Red Clover	10·0	15·1
Vetches	4·3	10·3	Rye	13·6	13·4
Turnip	(7·4)	(7·5)	Oats	7·1	11·4
Crimson Clover	3·4	7·0	Rape	5·6	10·6
Rape	4·9	6·4	Turnip	9·5	9·9
Control	3·5	6·6	Control	6·9	7·1

In every case, the soil from these plots had been found on April 9, 1920 (after heavy rain) to contain less than 0·5 parts per million of nitric nitrogen, so that the above amounts of nitrates were produced during the seven weeks after that date.

There is thus a good general parallelism between the nitrate content of the soil and the yield of turnips obtained. The figures for the plots green-manured with rape and with turnip are abnormal, and may indicate some special effect when the green manure crop is the same as, or closely allied to, the main crop, but careful investigation would be needed to establish this point. A similar, but less complete, parallelism was obtained between bacterial numbers and turnip yield, especially in the spring section, but the method of bacterial counts available at the time was unsatisfactory, and, moreover, many of the results had to be subsequently discarded owing to the daily fluctuations in bacterial numbers which are liable to occur in soils.* These fluctuations are such as to render non-comparable the results of bacterial counts made on samples not taken on the same day.

Advantage was also taken of the few dry spells during the growth and decomposition of the green crops in the soil, to test the soils for any difference in moisture content. It was unfortunately not possible to take samples below the top 9 inches, so that the results are of somewhat limited value, but as far as they go there was no indication of any extra drying effect of vetches or the other leguminous crops. Indeed, if anything, the *non*-leguminous crops seemed to leave the top soil drier than the others.

Unfortunately this aspect of the subject—the physical effect of green manuring on soil texture and moisture content—was largely excluded from consideration in the author's trials, owing to the exceptionally wet season, which presented no opportunities for studying the behaviour of the plots during drought, and it has been

* CUTLER, CRUMP, and SANDON, *Phil. Trans. Roy. Soc.* in press, July 1922.

shown that, under the wet conditions obtaining, the nitrogen supply was probably a dominant factor.

But there is no doubt that the physical effect of green manuring, especially on light soils, is one of the most important of its effects, and merits closer investigation. The actual growth of green crops may deplete the soil moisture by transpiration, and by keeping light showers off the soil, and their burial may break the capillary channels too low; but when decomposed they give rise to humus material which has a profound effect on the texture of the soil, rendering light soils more water-retaining and drought-resisting, and heavy soils more open and less liable to water-logging. The "direct" effects of green manures on plant growth—*e.g.* the supply of nitrogen and other nutrient elements—though important, can all be fulfilled by artificial manures, but the physical effects can only be attained by the addition of organic matter, and, now that dung is so scarce, green manuring seems to offer the greatest possibilities as a source of this organic matter.

Although the author is now no longer at Wisley, the trials, of which the first year's results are here reported, are being continued there; the author is also continuing and extending the work at the Rothamsted Experimental Station, and it is hoped that as a result of this work it will be possible to indicate the best methods for the application of green manures to both light and heavy soils, under the variety of different conditions obtaining in horticultural and agricultural practice.

In conclusion, the author's thanks are due to the Director of Wisley, Mr. F. J. Chittenden, for much valuable advice in planning and carrying out this investigation, which was aided by a grant from the Development Commissioners; to Dr. F. V. Darbishire, for his assistance in sampling and analysing the crops; and to Mr. J. Wilson, for his practical supervision of the crops.

THE AWARD OF GARDEN MERIT.

By F. J. Chittenden, F.L.S., V.M.H.

As announced in the Annual Report, the Council of the Royal Horticultural Society has just established a new award especially intended to mark plants of proved and outstanding excellence for garden use. It is to be known as the "Award of Garden Merit," and will be bestowed by the Council on the recommendation of the Wisley Garden Committee, generally, but not necessarily exclusively, to plants which have been thoroughly tried at Wisley. It may be given to plants long grown in our gardens as well as to more recent introductions, provided they are of outstanding merit in their class and do not require very special treatment to bring out their excellences.

The awards made so far are given below, together with such notes upon them as our Fellows may find useful.

1. Hamamelis mollis (fig. 47).

Award of Garden Merit, January 31, 1922.

This Chinese species of a genus represented by *Hamamelis arborea* and *H. japonica* in Japan, and *H. virginiana* and *H. vernalis* in America (all of them now growing in British gardens), was introduced in 1879 by Maries to Messrs. Veitch's Coombe Wood Nursery, but did not become well known for a long time. It is the finest of the genus, both in flower and foliage, and particularly valuable in the shrub border in January, when it produces its delightfully fragrant golden-yellow flowers in profusion in clusters along the base of last year's twigs. The long narrow petals are straight (not crumpled, as in other members of the genus), rich golden yellow except for the reddish base, and set in a red-brown calyx, smooth within and hairy without. The bush grows to 6 feet or 8 feet in height (possibly more), and has stout spreading branches. It is accommodating as regards soil, but grows best in good loam. When young a little leaf soil aids it, but later it can fend for itself. It requires no pruning unless to correct a slight tendency to sprawl. It would be easy to err, however, in attempting to confine it too rigidly, for its spreading habit is one of its charms. It grows well at Wisley, both in the open and in the light shade of oaks.

2. Crocus Tomasinianus.

3. Crocus speciosus.

Awards of Garden Merit, February 22, 1922.

These two species of Crocus are both good doers, and will, with ordinary care, increase rapidly in any well-drained British garden.

Their only enemies are field mice and pheasants. Both plants produce seed freely and multiply by the formation of so many small corms that so long as their foliage is allowed to remain until it becomes brown (about the end of April) permanence and increase are assured. The only attention they require is an occasional replanting when they become too thick. The one brightens the garden in the early spring, the other tones the browns and reds and yellows of the dying year.

Crocus Tomasinianus flowers, as a rule, just before most forms of *C. vernus*, and about the same time as the old Dutch yellow Crocus. It has a slender grace that most of the Dutch forms of *C. vernus* lack, and is, when open, of a clear and delicate colour, described by Maw as sapphire-lavender and by Bowles as amethystine-violet. No Dutch crocus, except the one I hold the most beautiful of all, 'Margot,' is so tender and pleasing in shade. When closed the flowers of most forms are of various shades of grey.

Crocus Tomasinianus is a variable plant, especially, perhaps, in the colour of the buds, but there is a deep purple variety, a pure white, and a particularly pleasing one called 'pictus,' with flowers marked at the tips with a darker blotch, below an apical white spot.

This beautiful species does well in many places at Wisley, in the open and in the light shade of shrubs and trees, but does not prove quite so happy as many in the grass. Its best place is on the higher parts of the rock garden, where it may seed down and gladden the early days of dull February with drifts of lavender-violet, which will not interfere in the least with the flowers that are to follow after. It should be planted in August or September, and seed should be sown in the open as soon as ripe, to germinate with the growth of the corms in the spring.

Crocus speciosus flowers in September and October, and is the most reliable and showy of all the autumn-flowering species, unless it be *C. nudiflorus*, great drifts of which form one of the beautiful autumn features of Wisley, and which, though so abundant in its easily accessible native home, is scarcely known in the nurserymen's catalogues.

C. speciosus should be planted in July. It will grow in short grass, where, as at Wisley, it may be left alone for years, and every year will give stretches of blue among the green of the grass and the brown of the falling leaves, without any further care. It will grow under light shade and in the open, and is proper for the herbaceous border and the lighter shrubbery, the grassy bank, the rock garden, the edge of the wide woodland walk, and the field garden. A strong and vigorous flower, it is calculated to withstand all reasonable buffetings of autumn.

In its typical form it is beautifully pencilled with blue on a pale lilac ground, but varies much in colour and size, and numbers of names have been given to more or less distinct forms, the most remarkable of which are the variety *Aitchisonii*, the giant of the species, and flowering later than the type, collected by Mr. H. J. Elwes in the

East (for while *C. Tomasinianus* is more Western in its distribution, *C. speciosus* stretches away into Armenia, and perhaps into Persia); van Tubergen's var. *Artabir*, intermediate in colour and season between var. *Aitchisonii* and the type; var. *globosus*, a bluer, later-flowering variety, and some white and grey forms, which Mr. Bowles has raised which are still rare, but rarely beautiful in their blue pencilling on a white ground and therefore preferable to the better-known pure white form, which is rather starry in shape.

NEW OR NOTEWORTHY PLANTS IN THE SOCIETY'S GARDEN, II.

3. Buddleia alternifolia *Maxim* (fig. 48).

As long ago as 1880 *Buddleia alternifolia* was described by Maximowicz,* but it was not introduced to English gardens until the late Mr. Reginald Farrer found it on his Kansu journey in 1914. He sent home seeds under his number F100, and many plants were raised at Wisley and elsewhere, and many of these seedlings and cuttings from them have been distributed from Wisley at the annual distributions since 1917.

He thus described it: †

> It is found occurring down the little tributary which joins the Blackwater at Naindzai, ranging sporadically up that district as far as Lodanee, and with a big outburst below Tan Ch'ang in the Nan Ho Valley; it prefers steep dry banks and open warm places, where it grows like a fine-leaved and very graceful weeping-willow, either as a bush or a small-trunked tree, until its pendulous sprays erupt all along into tight bunches of purple blossom at the end of May, so generous that the whole shrub turns into a soft and weeping cascade of colour. It ought to do well in England, but will probably take time before it shows the full elegance and profusion of its lovely character.

Farrer learned to appreciate its charms on that journey, for he praises it more than once, *e.g.*, "the lovely cousin, who sweeps in long streaming cascades from all the loess cliffs about Naindzai, like a gracious small-leaved weeping-willow when it is not in flower, and a sheer waterfall of soft purple when it is." ‡

"The weeping Buddleia is still in lavish waterfalls of purple beauty." ||

It is cultivated by the Chinese about Naindzai and Siku, but a little farther north it is a hedgerow plant among the cornlands, though not reaching to any great elevation.

It has proved absolutely hardy in England, and very distinct from other Buddleias in the characters which Farrer emphasizes, and especially in its narrow alternate grey willow-like leaves and its habit of flowering along the shoots of the previous year. It needs pruning, like a Forsythia or black-currant, to induce the formation of the long slender-curving wands on which its flowers are to be produced, but, apart from that, little attention. It is growing at Wisley on dry banks and borders, and on the side of the large pond in "Seven Acres," and is perhaps best there. Its roots go far down, with little branching, and it is therefore not very easily transplanted when large, though it may

* Maximowicz, in *Bull. Acad. St. Peters.* xxvi. (1880), p. 494, from specimens collected in Kansu on the southern side of the Hoangho, and elsewhere in that district.

† Farrer, *Journal R.H.S.* **43**, p. 63.

‡ Farrer, *On the Eaves of the World*, **1**, p. 252 (1917).

|| *loc. cit.* vol. **2**, p. 3.

FIG. 47.—HAMAMELIS MOLLIS.

[*To face p.* 192.

FIG. 48.—BUDDLEIA ALTERNIFOLIA AT WISLEY.

FIG. 49.—CLEMATIS TANGUTICA VAR. OBTUSIUSCULA AT WISLEY.

FIG. 50.—ROSA HELENAE.

[*To face p.* 193.

recover after apparent death from this treatment. It is easily rooted from cuttings of half-ripe shoots, and should be in every garden where shrubs are valued and where a situation can be found for it to display its ultimate ten feet of height and wide spread of branches.

4. Buddleia variabilis var. nanhoensis.*

In the same Kansu journey Farrer found many forms of *Buddleia variabilis*, and in the vicinity of Kwanting in the Nan-Ho valley, he found forms with smaller leaves than usual and with longer spikes, and he collected seed which he sent home under the number F424 in the hope that the form he saw might be constant. He speaks, too, of this species "growing especially neat and small, and dainty-leaved and brilliant" † in pure river silt, but it is not clear whether he collected seed from the forms growing there, and he apparently thought they owed something of their daintiness to their position. "Dainty" is not an adjective we can properly apply to the magnificent forms so well known in gardens under the names *Veitchiana*, *magnifica*, and *Wilsoni* which make such large growth and are so robust in every way. Still less can it be applied to the type which Dr. Henry found near Ichang, and which was the first form to be introduced, for that was weak in the stem, sprawling in habit, and had poor spikes of flowers, but it can certainly be applied to the seedlings raised from Farrer's seeds, for growing alongside 'magnifica' it proves to be indeed "neat, and small, and dainty-leaved." Its flowers vary in shade in different plants, but the best are as good as the best of any other variety. The difference in stature is apparently constant but it is not secured at the expense of grace, and its habit is similar to that of *Veitchiana* with erect, arching branches on a smaller scale, so that it forms a neat, rounded bush about 3 ft. 6 in. high, and is of such a size that one may confidently plant it in even the small garden where its late flowering (July onwards) should render it an acquisition among flowering shrubs of moderate size. The same hard pruning of the previous year's growth may be practised with this as with the larger varieties. So distinct is it that it is deserving of a distinctive name.‡ It has been distributed widely from Wisley during the past three years under the name 'Buddleia sp. Farrer 424 and 242.'

5. Clematis tangutica var. obtusiuscula Rehder and Wilson (fig. 49).

Yellow is not a common colour in the genus Clematis, but several collectors have sent home seeds of yellow-flowered forms from China during recent years, and of these the best is the subject of this note.

* Frutex 1–1½ m. altus; ramuli erecti graciles; folia lanceolata, ad cir. 12 cm. longa et 2-4·5 cm. lata.

† See *Journal R.H.S.*, **42**, p. 64.

‡ Farrer gives the varietal name 'Nan-Hor' in *On the Eaves of the World*, 2, p. 319, and we have latinized it.

Clematis orientalis from the Caucasus and Persia, extending thence into Northern China and Manchuria, was introduced in 1731. It has ovate pointed sepals, downy inside, and glabrous shoots. Lindley described and figured a very closely allied form in the *Bot. Mag.* t. 4495 under the name *Clematis graveolens*, but this is probably only a minor variation of a variable plant, with rather larger somewhat downy leaves, less glaucous than the typical *C. orientalis*.

An allied plant *C. glauca* Willdenow, also from Northern China and Kansu, has been called *C. orientalis* by Finet and Gagnepain, but it is quite distinct by its sepals being woolly at the margins only. It has been referred as a variety to *C. orientalis* by some botanists—e.g. Hooker as *C. orientalis* var. *obtusifolia* and Maximowicz as var. *glauca*, but deserves a separate name. E. H. Wilson introduced a fine form of it from Szechwan when collecting for Messrs. Veitch, more vigorous than the type form with bronzy-yellow flowers produced usually rather late in England, but from August onwards in its native hot, dry, rocky places. This is *Clematis glauca* var. *akebioides*.

Clematis tangutica was figured in the *Bot. Mag.* t. 7710 under Maximowicz's name *C. orientalis* var. *tangutica*, and by André in *Rev. Hort.*, 1902, p. 528. The figure in *Bot. Mag.* shows the sepals narrowly pointed and the typical plant has this character, making the flowers less bell-like than in the var. *obtusiuscula* and thinner. André's figure shows them blunter, but his description gives a somewhat greater length to them than our plant usually shows. The type which is native in Central Asia was introduced to Kew from St. Petersburg in 1898, but Wilson, Purdom, and Farrer all sent home seeds of the variety from Szechwan and Kansu, and its broader, more bell-like flowers make it, I think, a superior plant. With us at Wisley it grows in full sun and spreads vigorously over the ground or climbs over supports, bearing, from July onwards, as Farrer describes it in Kansu, "innumerable blossoms that hang in the mass like big Fritillaries of pure unchequered gold." The flowers are solitary on 4- or 5-inch stalks and later in the year they turn into " by far the most beautiful and wild whirligigs of snowy silk that even this Struwelpeter Family produces." While I cannot subscribe entirely to this last quotation of Farrer's, bearing in mind the wonderful sight of our own " old man's beard," yet these fruits add not a little to the charm of this most vigorous plant. Its downy young foliage and shoots and peduncles distinguish it from *C. orientalis* and *C. glauca*, and its flowers $3\frac{1}{2}$ to 4 in. across are more handsome than either, downy on the outside of the sepal, not within. The variety was given an Award of Merit when shown at Vincent Square in 1913 by Mr. F. Stern, but Farrer's seeds have given somewhat less vigorous plants with thinner flowers than the earlier collector's plants possessed. Both seedlings and seeds of the best form have been widely distributed from Wisley during the last few years under the name *C. tangutica obtusiuscula* and also seeds and seedlings from Farrer's collections Nos. 307 and 342. The

seedlings begin to flower at an early age and the plant is a decided acquisition among yellow-flowered climbers.

6. Rosa Helenae Rehder and Wilson * (fig. 50).

Rosa Helenae is one of a group of vigorous climbing roses which have come to us from China and which (apart from their probable value in hybridizing) are suitable for planting near hedges or in semi-wild places where they may ramble at will. Some like *R. longicuspis* (*R. lucens* of some catalogues, *R. Willmottiana*) are not quite to be depended upon as hardy at Wisley, but *R. Helenae* has not suffered in the least, and has flowered profusely, giving masses of fragrant white flowers in July, followed by large ovoid fruits orange-red or scarlet and about ¾ in. long. The rose belongs to the group Synstylae, and was included in his species *Rosa floribunda* by Rolfe. The characters by which it can be recognized among its allies are as follows : Shoots up to 10 to 15 feet in length, thick, glabrous, and purplish brown when young, armed with numerous spines. Leaves with 5 to 9 leaflets, acute or acuminate, and about 1½ to 4½ in. long, sharply serrate, deep green and glabrous above, grey and hairy on veins beneath ; stipules entire occasionally with stalked glands on margins ; flowers in many-flowered corymbs, white, fragrant, and about 1½ to 2 in. across ; fruits as described above.

7. Blue Primroses.

Wisley and Blue Primroses are so closely connected that it seems desirable to place on record the contents of a letter relating to them sent by the late Max Leichtlin to Mr. P. D. Williams and dated January 15, 1904. Correspondence had been in progress in some of the garden papers concerning the blue primroses which were then coming to the fore, and which had apparently been raised independently by Mr. G. F. Wilson at Wisley, by Mr. R. Dean at Ealing, and by Max Leichtlin at Baden Baden. We have been able to discover no exact details as to the way Mr. Wilson first secured his blue strain which led to the selection of ' Scott Wilson,' and perhaps this note may induce someone who has information on the matter to send it to us. Leichtlin's strain is still growing at Lanarth in Mr. Williams' garden, and fine forms of the Wisley strain of Blue Primroses are continually appearing in the Wisley garden. The main difference in the two appears to be in the smaller eye possessed by Max Leichtlin's strain, and his remarks are therefore particularly interesting.

Referring to a letter he had written in the *Garden*, Max Leichtlin says, " I simply wished to state that we were workers of the same strain, only by a different method, and by fertilizing the old blue Polyanthus I came quicker to the matter ; after this trial I also took to the system of selection and did not try other crosses. I certainly never ventured to give advice to Mr. Wilson who was a cultivator

* Rehder and Wilson in *Plantae Wilsonianae* 2, p. 310 (1915).

far superior to myself. The Primroses of Messrs. Veitch came either from Mr. Wilson, or from Mr. Dean at Ealing, who raised a 'true blue.' I have never sent any to Messrs. Veitch. Mr. Wilson produced his strain from seedlings of Scott Wilson and he again selected seed from these and so got his blue race. Whether what I presently cultivate are superior I am unable to say because I was not for some years on a spring visit to England, but I cannot imagine that any purer blues can be seen than among mine. What, now, is to be done is the completion and production of forms close to a circle and the watching of the new breaks.

"What I alluded to as a new break is an indigo-coloured flower, striking by the eye which is brownish yellow and very small. . . ."

COMMONPLACE NOTES.

EXPEDITIONS TO NEW GUINEA.

We are informed that Mr. L. B. Conolly and Mr. N. McNeill are contemplating an exploring expedition to New Guinea and other Pacific Islands, and are hoping to spend two years in the former island, crossing it and exploring especially the regions near the Dutch border and making scientific collections there. Fellows interested in the enterprise may obtain information from Mr. McNeill at 29 Newman Street, Oxford Street, W. 1.

CYPRIPEDIUM FAIRRIEANUM.

Many growers experience difficulty with this beautiful species, and perhaps none has had greater success than Mr. W. H. St. Quentin, of Scampston Hall, Rillington, York. Mr. St. Quentin has very kindly sent us the following information, partly communicated by his late gardener, Mr. F. Puddle, and partly supplied by himself.

In potting this plant, two distinct layers of compost are used. The lower layer consists of two parts of Osmunda fibre or peat, one part calcareous loam, one part silver sand, and half a part crushed crocks. The upper layer is of two parts Osmunda fibre, one part Kent loam, two parts Sphagnum, and one part silver sand. It was found that the plants grew better with Sphagnum on the soil surface, but this would not grow in contact with calcareous loam, hence the two layers. The calcareous loam referred to came from the top spit of a limestone (oolite) hill. This limey loam was tried in various proportions, and the conclusion we came to was that, though this Cypripedium is decidedly a lime-lover, one part was sufficient proportion, and better than a larger one. This may possibly be due to its being rather "greasy" and retentive if used too freely.

After potting, the surface of the compost is kept moist with a sprayer until the plants become established, after which they are watered moderately at all times. We think they are sometimes overwatered, even in the growing season, though our seedlings enjoyed an atmosphere in which the niveum section grew well. The summer temperature ranged between 65° and 75°, and the winter between 55° and 65°; but we believe our imported plants were better when we kept them with Odontoglossums in a cooler house at a rather lower temperature in winter.

BOOK REVIEWS.

"Bulb Gardening." By Mary Hampden. 8vo. 221 pp. (Butterworth, London [1921].) 7*s*. 6*d*. net.

This is No. 3 of the Home Garden Books. The author has cast her net wide, for she includes rhizomatous Irises and even "Spiderworts" (*Tradescantia* sp.), but we cannot blame her for giving more than her title promises; and she omits few really good kinds of bulbous plants whether they be hardy or tender. We could, however, wish that directions had been sometimes more explicit. It is of little use saying that all peat-loving Lilies do well among Azaleas unless the peat lovers are definitely marked, and the selections given are not always those to which we should subscribe. *Lilium Krameri* is a beautiful thing, but ought not to be included where *L. rubellum*, one of the most beautiful of all, is omitted. *L. superbum* should always be included where *L. pardalinum* is happy, and it is surprising to find *L. regale* omitted from a popular list, as surprising as to find *Colchicum speciosum* left out or *Lilium giganteum* suggested as a pot plant. It is true that Crocus leaves tied in knots look unnatural, but we fear as much harm may be done to them by burying their leaves under fibre or earth to keep the beds tidy as by cutting them off early. We might find many other faults in this readable book, but it will serve a good purpose if it encourages new gardeners to grow bulbous plants.

"The Vegetable Garden: Illustrations, Descriptions, and Culture of the Garden Vegetables of Cold and Temperate Climates." By M. M. Vilmorin-Andrieux. English edition by W. Robinson; 3rd ed., with Addendum by W. P. Thomson. Large 8vo. xix + 805 pp. (Murray, London, 1920.) 25*s*. net.

An addendum mentioning many of the newer varieties of vegetables adds to the value of this book, which has become very well known to many interested in vegetable gardening through this English translation, the first edition of which appeared in 1885. It is indispensable to those who wish for a knowledge of the characteristics of varieties of vegetables, and in this direction it is unsurpassed.

"How to Prune Roses and Fruit Trees." By O. Thomas. 8vo. 32 pp. (Country Life, London, 1921.) Paper 9*d*. net.

Mr. Thomas creates a good impression in the reviewer's mind at the outset by recommending the knife in place of the sécateurs as pruning tools, and he goes on to give clear directions as to the general treatment to be adopted in pruning all the common types of roses and fruits. The process of spur-forming when summer pruning is not resorted to might have been made a little more clear.

"The Coco-nut." By Edwin Bingham Copeland. Ed. 2. 8vo. xvi + 225 pp. (Macmillan, London, 1921.) 20*s*. net.

The author has made a close study of the requirements of the coco-nut and of the physiology of the plants and the diseases and pests attacking it (the description of these occupies two-fifths of the book). The treatment of the seed, seedlings, and mature plantations is fully discussed, and the most economical methods of handling the products are fully gone into. The book is well illustrated from photographs.

"Common Plants." By Macgregor Skene. 8vo. 271 pp. (Melrose, London [1921].) 6*s*. net.

We have seldom read a more enlightening book upon the physiology and ways of life of plants than this. The story of plant life and behaviour is built up around common plants in a masterly manner, and advanced students of botany may read it with the same degree of pleasure and as great advantage as the unlearned. We commend it to all our readers.

"Sweet Peas: How to excel with them." By Horace J. Wright. 8vo. 32 pp. (Country Life, London, 1921.) Paper covers. 9*d*. net.

This little booklet is full of sound advice carefully set out in plain language and in proper sequence. It clearly indicates not only the right procedure but also where mistakes are likely to be made, and it does it all in a very pleasant fashion. We heartily recommend it as a guide to all who desire to grow these popular plants.

" Water Plants : a Study of Aquatic Angiosperms." By Dr. Agnes Arber. 8vo. xvi+436 pp. (University Press, Cambridge, 1920.) 31*s.* 6*d.* net.

Living things that gain a livelihood outside the ordinary run of life always appeal to the curious, whether their curiosity be of the kind called " mere," or of that more reasonable type that desires to inquire in order to understand. Among flowering plants there are no more interesting phases of life and growth than those connected with the ease or difficulty with which they are able to obtain water, and no responses more wonderful than those developed by plants when they are growing in conditions of extreme ease or extreme difficulty in this direction. Water plants are, perhaps, doubly attractive because there are both the difficulty of obtaining sufficient air and the interference of the water with the supply of light, and both these difficulties are met, the first completely, the second partially, by the development of special structures. Problems of distribution, of over-wintering, often of pollination and the like, need a different solution in the water from the same problems on land. All these and many more are dealt with by the author in a masterly fashion, and she has made the book especially valuable to students by the very copious bibliography, extending to 72 pages, with which it is furnished. A large number of line drawings add to the value of the book, which is well indexed. It is a pity that the price puts it beyond the reach of many students.

" Practical Gardening : for Pleasure and Profit." Ed. by W. P. Wright. 6 vols. 8vo. 367 + 365 + 367 + 359 + 370 + 376 pp. (Educational Book Co., London, 1922.) Art vellum £4 5*s.* ; art canvas £5 14*s.*

This is an important addition to the long list of English books dealing with gardening. Its " get-up " is excellent ; paper, type, printing, and illustrations are all alike very good indeed. Most important of all, Mr. Wright has gathered round him a large number of able writers whose authority none can dispute, and together they have produced a book which is a veritable mine of information, and which is furthermore pleasant and easy to read, as well as encyclopædic in treatment. The specialist in any particular section will not, as a rule, learn much, perhaps, on his particular subject, for generally only plants of proved position in our gardens are dealt with, but the perspective is good, and the amateur and general practitioner alike will find it most valuable ; while the beginner in commercial horticulture cannot afford to neglect it.

The work is too long to review in detail, but no branch of horticulture has been slurred ; and the chapters on horticultural science which form a part of the first volume will serve as an introduction to ideas which often are entirely outside the purview of those who work in gardens, but which would do much to enlighten and clear the way for the overcoming of difficulties if they were absorbed.

" The Rose Encyclopaedia." By G. T. G. W. Henslow. 8vo. 441 pp. (Vickery Kyrle, London, 1922.) 12*s.* 6*d.* net.

This little book is of a convenient size, seven inches by five inches, neatly bound in dark-blue cloth with gilt lettering, with fifty photographs of roses and one of the author. For those who desire to preserve in permanent form advertisements of the kind that are wont to appear in the gardening press, the purchase of this book will accomplish their purpose.

Opening the book at random one finds on the right-hand page a portrait of a rose, on the left-hand a full page advertisement of Court Florists. A second experiment gives much the same result, except that the left-hand page is occupied with the merits of somebody's fertilizer, while at a third attempt are found the special productions of a nurseryman extolled. Any hope that one might improve matters by tearing out the advertisement page is foiled by finding the letterpress of the volume on the back of the advertisement.

This letterpress contains the usual chapters dealing with cultivation and selection to be found in most rose manuals. It is fairly complete, but strikes one on the whole as rather a careful compilation than a work of much originality. Some chapters are open to criticism as rather superficial. Thus we find early in the book a chapter on the History of the Rose, which is dismissed in four pages. It begins with the Bible and Homer and after a reference to Sappho and Suetonius the author has evidently got tired of the subject and has little more to tell us. In the next chapter on " Poetry and the Rose," the author's ideas on the subject seem limited to a few indifferent rhymes of his own.

A chapter on " Soils and their Preparation " is well written and is followed by one on Manures. This begins promisingly, but before we get far we find the

author less interested in describing the action of manures than in recommending the preparations advertised in his book. Again, the treatment of roses under glass affords an excellent opportunity to call attention to the wares of advertisers of greenhouses and hot-water apparatus, of which full advantage is taken. A considerable part of the book is taken up with a series of plans and planting schemes with illustrations, which may be found useful to those laying out new rose gardens. These schemes appear to have been prepared by various nurserymen who, with perhaps one notable exception, have prefaced their description with an account of the firm and its achievements.

The book ends with a long descriptive list of roses in commerce. The preparation of this list must have given the author some trouble, for it contains short descriptions of over 2,000 varieties. The author calls it a dictionary of roses, and says he has excluded those which he has found to have passed out of commerce.

The idea of collecting the roses for the time being in commerce is a good one and might be of interest historically, though the list before us contains a few that are little grown in this country, and is not complete if roses advertised by Continental and American growers are to be included. The class to which the rose belongs, the raiser, and year of introduction are sometimes given, but often omitted. Nowadays there are so many names representing two or more varieties that this information, when attainable, should always be supplied. We have, for instance, at least three 'Queen Alexandras,' two varieties called 'Coronation,' one a H.T. and the other a Wichuraiana, and there are several similar cases.

The advertising character of the book is a great drawback in considering it as a literary production, but for those who can get over this disadvantage there is matter in it which is worth reading if only it were better framed.

"A New British Flora: British Wild Flowers in their Natural Haunts." By A. R. Horwood. Six vols. 8vo. Col. plates. (Gresham Publishing Co., London, 1919.)

This work is one dealing in the first place with the commoner British wild flowers, and in the main taking them in the order of their homes—woods, fields, and so on. It is abundantly illustrated by both coloured plates and reproductions of photographs, and the beginner will find it useful in identifying the plants he commonly meets, but often the language used is very technical, and often, too, the book reads more like a commonplace book into which everything has been put as it was met with, and which is now emptied of its facts without digestion.

"Insect Transformation." By G. H. Carpenter, D.Sc. 8vo. x + 282 pp.; 124 figs., 4 plates. (Methuen & Co., London.) 12*s.* 6*d.* net.

This book is intended to be of service to both serious workers and beginners in entomology. The information given is a compilation of many modern authors' recent researches in this important branch of insect study. Students will find the running bibliography in the text of great use.

There are eight chapters, most of which are devoted to the several groups of insects. Chapter vi. gives a recent system in the classification of the order "Insecta," with its ever-changing grouping of the families. Most of the examples given in this book are British insects, except in those families where there are no British representatives.

The economic entomologist is considered in Chapter vii. on the "Surroundings of Growing Insects," showing as it does, amongst other things, the danger of wild host-plants carrying over insect pests. On p. 205 we read that the Codling Moth lays her eggs on the young twigs! Surely the eggs are usually laid on the young fruit or on the surrounding leaves.

The last chapter gives a *résumé* of the subject under discussion, the problems of transformation, parallel instances of metamorphosis in Amphibians, Sea Urchins, Starfishes and allied families, and, finally, the links with the past in the form of fossil insects and their comparison with our present-day species.

This book is of more use to the serious student than to the amateur, and it should find a place in the library of every keen entomologist.

"British Insect Life." By E. Step, F.L.S. 8vo. v + 264 pp.; 32 plates, with 248 figs., and coloured frontispiece. (T. Werner Laurie, London.) 10*s.* 6*d.* net.

This book is intended as a guide to the youthful entomologist who is just commencing to study this branch of natural science.

The fourteen chapters are each devoted to one group of insects, the most

popular orders being taken first, *i.e.* the Butterflies and Moths. The text is clearly written and the type clear, with but few printer's errors. A weak point lies in the plates, as, although the figures are clear, there is no numbering of them on the plates themselves, which to the uninitiated would prove a serious drawback, *e.g.* Plate 18, Figs. 11 and 12. Again, why is valuable space occupied on Plate 16 by the presence of two non-British insects?

It is to be expected in a book of this size on such a large subject that descriptions should be vague, but the author has included all the most commonly met with species, with notes as to their general life histories and habits.

Probably in a book intended for the young naturalist the author's point of view that the use of hydrocyanic acid gas against White Fly is to be deprecated (p. 182) is a sound one, as this gas is of too deadly a nature to recommend to the amateur.

The inclusion of *Anoplura* (Sucking Lice) with the *Hemiptera*, and *Mallophaga* (Biting Lice) with the *Platyptera*, is rather curious, but the question of orders and their components is a much vexed one. However, this book is very worthy to be placed in the hands of the young entomologist to stimulate further interest in this absorbing study of the world's largest group of animals.

"Home Landscapes." By W. Robinson. 4to. 78 pp. and many photogravure plates. (John Murray, London, 1920.) £3 3*s*. net.

We reviewed the letterpress of this book and the earlier plates in our JOURNAL (vol. xli. p. 139), and have nothing to add to what is there written, for no change whatever has been made in it, either in contents or "get-up." This edition differs from the former only in the addition of a number of very fine plates by the same clever photographer, Mr. George Champion, representing some of the most beautiful English houses with their immediate surroundings by photographs reproduced in the best possible style.

"The English Flower Garden." By W. Robinson. Ed. 13. 8vo. xii + 796 pp. (John Murray, London, 1921.) 30*s*. net.

No book on flower gardening is better known and none more highly valued than this, and a new edition embodying all the old features (but with certain reductions in size) and including revisions of the lists of worthy plants is an event in the history of garden literature which is worthy of note, for it gives an added length of life to the best book on garden flowers. It is needless to speak highly of it, and we can but regret that its price has had to be doubled, and that one of its revisers, Mr. E. H. Jenkins, on whom fell the task of bringing up to date the information regarding the herbaceous plants mentioned in the volume, has passed away before he could see his work widespread over the country, as it is bound to be.

"The Forests of India." By E. P. Stebbing, M.A. 8vo. 548 pp. (John Lane, London, 1922.) 42*s*. net.

Amongst several works on the forestry and timber of British India that have been published, the present book (vol. i.) stands far ahead of any other, and may justly be considered the most comprehensive and valuable that has yet appeared on the subject. The author was fortunate in having access to the Cleghorn Library, in the University of Edinburgh, the various books and papers in which contain a vast amount of reliable information on Indian forests. Dr. Cleghorn's work was especially valuable, particularly in connexion with forest conservancy, and his book on "Forests and Gardens of Southern India" (1861) forms an invaluable record of the vast amount of work that was initiated and carried out, often in the face of great difficulties, by this pioneer of forest administration and protection. The introduction of forest conservancy in Burma, initiated by Brandis, is equally brilliant work that was accomplished under somewhat similar conditions to those of Cleghorn. Ribbentrop's "Forestry in British India," published in 1900, was for long a standard book on this subject, while other useful works were those of Brandis, Gamble, and, later, Troupe (1921), all of which writers have contributed largely to our knowledge of the trees, timber, and forestry of that part of the Empire. The present work, which extends to 548 pages, is divided into four parts, of twenty-eight chapters, with a like number of beautifully executed illustrations. Part I. contains an exhaustive and highly interesting account of the forests of India, with a complete account regarding the formation of a company in London in 1599 for the purpose of starting a voyage from this country to the East Indies; also the early history of the country and its influence on the forests, which is closely bound up with that of the ancient inhabitants. It is rather remarkable that as late as

1860 the great mass of forest-covered hills occupying Central India was unknown to British officials. The present volume deals with the history of the forests over a period of approximately sixty years, or down to 1864, at which date the first Inspector-General of Forests in India was appointed, and the forest service called into being. The first beginning of forest conservancy was from 1850 to 1857, and an account of the operations in Burma, the Punjab and Western Himalaya, from the reports of Dr. Falconer and Dr. McClelland, are interesting reading. Equally interesting is it to trace through the pages of this sumptuous volume the gradual, though slow, rise and progress of forestry in India, which is principally due to the indefatigable work of such men as Cleghorn, Brandis, and others. Regarding the native woods by far the most valuable work is the "Manual of Indian Timbers," by Gamble, in which, as far as possible, the author gives a detailed account of the various woods, with special reference to such as were of interest from an economic point of view. Teak is probably the most widely known and appreciated of Indian timbers, of which considerable quantities are regularly sent to the markets of this country. Chapter XVII. contains a detailed account of the Indian Mutiny and its effects on the forests of Central and Upper India, during which period some of these suffered so severely as to practically disappear. Within a few years damage was done that will take half a century to repair. Dr. Cleghorn's work in Madras during 1858 to 1864 is well summed up in a public resolution by the Government of India in 1865, in which it justly designated Cleghorn as the "Founder of Forest Conservancy in India." The progress of forestry in India, and the steps by which that progress has been achieved, are all clearly and consecutively outlined in the four parts into which the first volume of this thoroughly exhaustive work is subdivided, and forms so readable and interesting an account of the great work that has been so successfully accomplished that the reader will await with longing interest the publication of the second volume.

"A Short Manual of Forest Management." By H. Jackson. 8vo. 69 pp. (Cambridge University Press, 1921.) 7*s*. net.

The author in his preface states that the object of this manual is to present a brief and simplified text-book on forest management, based on a purely practical foundation. Brief it certainly is, consisting of but sixty-nine pages, but with the statement that the work is simple or based on a purely practical foundation we cannot agree, and we feel certain that not one forester in fifty will either understand or care to fathom the various formulæ and annexed tables, particularly those with reference to mensuration and increment. Neither is it correct to say that the standard works on this subject present for student and public a formidable appearance, or contain an exposition of high theory which is not capable of practical application to the forest conditions of our own country. The public appreciation of such works as "The Forester," by Brown and Nisbet, now in a third edition, or "Webster's Practical Forestry," now in a sixth edition, with several reprints, surely testify to the fact that the contents of such are neither formidable nor highly theoretical. Rather the reverse, as rules for the management of our home woods and plantations have had the widest circulation in this country when drawn up by the practical forester, less so by the University Professor, whose writings are naturally more of a technical kind, and best suited for the student of a School of Forestry. The manual, which is nicely got up and printed, contains nine chapters, these being subdivided into fifty-seven headings, which include amongst others condensed notes on field work, methods of treatment, and British estate forests. So far as it goes, for it consists of only two pages, the chapter on British estate forests contains sound advice and to the point; while under "Various Objects of Management" we wish that the author had dwelt more fully on the vexed question of game in relation to forestry. That "game-preserving is not altogether incompatible with economic forestry" requires some qualifying, as our own experience on three of the most extensive wooded properties in this country, as well as that of 99 per cent. of foresters, has been that forestry and game-preserving, from a purely commercial point of view, cannot successfully go hand in hand. Though the practical British forester will find little to interest him in this manual, yet its contents should prove useful in the School of Forestry, where condensed working plans of certain types of forests are in demand.

"Landscape Gardening." By O. C. Simonds. 8vo. 338 pp. (The Macmillan Co., New York, 1920.) 31*s*. 6*d*. net.

This work on landscape art is well worthy of inclusion in the growing national library of technical literature in America.

"The purpose of this book," writes the author, "is to help make our Country more beautiful—our Country referring specially to the United States." The greater part of his writing refers to public spaces, where "one may walk without feeling that he is trespassing," and he covers carefully all the ground usually dealt with in essays of this nature.

Even if the chapters devoted to "Home Grounds" appear somewhat elementary to the student of landscape gardening in England, they will, like the remainder of the book, repay perusal. Indeed, it is good for us to read carefully the well-written American books on landscape gardening. Although some of the wisdom strikes us as homely, one often finds in an elaborate exposition of matters which you think you have known from your cradle an aspect which has never struck you before, or has never been expressed so plainly by an English writer.

American books are necessarily written for a public which in large measure is unsophisticated in garden art, and the writers are obliged to cover much ground which we should take for granted. They are careful investigators of the best that the world can offer in practice and in theory, and prove by such productions as the present that their garden work is in process of reaching the perfection already attained by American architecture. Mr. Simonds writes with great facility and is a master of his subject.

"Villa and Cottage Gardening: specially adapted for Scotland, Northern England, and Ireland." By A. Sweet, revised by G. M. Taylor. Ed. 10. x + 238 pp. 8vo. (Walter Scott Publishing Co., London [1921].) Paper boards, 1*s.* 6*d.*; cloth, 2*s.*

Dealing mainly with northern conditions which limit to some extent the kinds of plants worth planting, this little book will, no doubt, be valued there as the outcome of northern experience. A perusal of the directions given shows, however, that almost the whole of it might have been written word for word after experience in the south, to the equal advantage of southern gardeners.

"The Chemistry of the Garden." By H. H. Cousins. 2nd rev. ed. xx + 147 pp. Sm. 8vo. (Macmillan, London, 1920.) 2*s.* net.

After a life of twenty-four years, this most useful guide to the manuring of garden plants is too well known and too highly valued to need repetition of the praise it so greatly deserves.

Revision has been rendered necessary because of the march of knowledge, and this revision the book has received, not so as to alter its character, but so as to increase its usefulness. We cordially commend it to all, and especially to those gardeners, amateur and professional, to whom it is at present unknown.

"The Flora of Natal and Zululand." By J. W. Bews, M.A., D.Sc. 8vo. vi + 348 pp. (City Printing Works, Pietermaritzburg, 1921.) 15*s.* net.

This little book comprises a brief history of botanical exploration in Natal and Zululand; a bibliography of works dealing with this flora; a key to the families included, and under each family a key to the genera, followed by a localized list of species without descriptions or references thereto (though the author's name is given), but generally with the native name.

The flora is a large one, for 3,786 species distributed through 901 genera are enumerated.

"An Anthography of the Eucalypts." By Russell Grimwade. 4to. (Angus and Robertson, Sydney, 1920.) 52*s.* 6*d.*

Seventy-nine reproductions of photographs representing nearly as many species of Eucalyptus, short notes on each, a brief introduction, and an index comprise this book. The photographs show as a rule leaves, flowers, and fruits, and are beautifully reproduced in green or brown tones, and should be of great value in furthering the object the author had in view—to facilitate the identification of species by those unlearned in botany. A few of the plates fail in artistic beauty because of the badly damaged leaves, eaten by insects or torn by storms, but most are examples of excellent specimens, and show the critical characters of flower and fruit very well. The notes describe the range and main characters of the bark, leaves, etc.

"Strasburger's Text-Book of Botany." By Dr. H. Fitting, Dr. Ludwig Jost, Dr. H. Schenck, Dr. G. Karsten. Translated by Dr. W. H. Lang. Ed. 5. 8vo. xi + 799 pp. (Macmillan, London, 1921.) 31*s.* 6*d.* net.

That four editions of this book have been exhausted in England and thirteen in Germany shows the value of it for students' use, and indeed there is no better text-book in the English language. It has largely been rewritten, and complete new sections appear, so that the four original authors' work (Strasburger, Noll, Schenck, and Schimper) has been largely superseded, but the same general idea runs through the book and the same standard of excellence has been maintained with every part of the work brought up to date. It is doubtful whether the coloured figures of plants (especially of poisonous and officinal plants) add much to the value, although they must add considerably to the cost, of the book.

"Pot Plants." By W. Truelove. 8vo. 31 pp. (*Country Life*, London, 1921.) Paper, 9*d.*

A very useful little book, full of sound hints for the amateur and the beginner in plant cultivation.

"How to win Prizes at the Vegetable, Fruit, and Flower Show." By A. Keep. 8vo. 94 pp. (Pearson, London, 1921.) 1*s.* 6*d.*, stiff covers.

Whether exhibitor or not, the allotment holder and small cultivator of vegetables, fruits, and flowers will be able to learn much from this useful little book.

"Illustrations of the Flowering Plants and Ferns of the Falkland Islands." By Mrs. E. F. Vallentin. With descriptions by Mrs. E. M. Cotton. 4to. 64 coloured plates. (Lovell Reeve, London, 1921.) £4 4*s.* 0*d.* net.

The flora of the Falkland Islands may be considered well known to taxonomic specialists, but a considerable need has been felt for an illustrated handbook for the use, more especially, of residents in the Colony. It is therefore additionally unfortunate that, owing to a serious breakdown in health, Mrs. Vallentin was unable to complete an illustrated flora of her native land. The single volume issued contains 64 plates, with one or occasionally two species of representative Falkland plants on each. An entire plant or typical branch is represented in colours, and is accompanied by valuable detailed dissections. The general style recalls the well-known *Botanical Magazine* plates. Short descriptions of the families, genera, and species are provided by Mrs. E. M. Cotton.

The work contains many of the characteristic plants of the Falkland Islands, and must prove of great use to local naturalists, and also to taxonomists and geobotanists who have to investigate at second hand problems involving the Falkland Islands flora. One notices at once, on looking through the plates, the absence of trees, the small number of shrubs, and the dominance of herbaceous perennials. The general vegetation is best described as a steppe, often merging into a heath, with many of the plants evergreen. The best recent accounts of the Falkland Islands vegetation are to be found in the works of Skottsberg (see *Kew Bulletin*, 1919, p. 274), and these will be read with additional interest by students who can, while reading, refer to Mrs. Vallentin's figures and the accompanying letterpress.

"British Plants: their Biology and Ecology." By J. F. Bevis and H. J. Jeffery. Ed. 2. 8vo. xii + 346 pp. (Methuen, London, 1921.) 7*s.* 6*d.* net.

We are glad to see a second edition of this excellent introduction to the natural history of British flowering plants, for the authors approach their subject from the point of view of the plant as a living thing, in tune with its environment, and capable of adapting itself (within limits) to changes in that environment. This sane attitude is the one that must appeal most to the inquiring horticulturist who wishes to realize the sequence of life-processes in plants, and to him especially we commend it. The index is full, and an excellent bibliography adds to the value of the book.

NOTES AND ABSTRACTS.

[For Index to Abbreviations, etc., see volume xlv.]

Aphid, Pink and Green, The Life-History and Biology of the. By Loren B. Smith (*U.S.A. Truck Exp. Stn., Va., Bull.* 27, April 1919; 11 figs., 5 tables). —The pink and green aphid (*Macrosiphum solanifolii* Ashmead) is one of the most serious pests the Eastern Virginia market gardeners have to contend with. The outbreaks are becoming more serious each year on potatos, tomatos, and spinach. Besides direct injury, which this insect causes, it has been found to be one of the chief agents in the transmission of spinach blight.—*V. G. J.*

Aphids Injurious to Orchard Fruits, Currant, Gooseberry, and Grape, Control of. By A. L. Quaintance and A. C. Baker (*U.S.A. Dep. Agr., Farmers' Bull.* 1128, June 1920; 34 figs.).—A useful bulletin for reference, over thirty kinds of aphis being described with their life-histories and methods of control.—*A. P.*

Apple Orchards, Plant Lice injurious to, II. Newly Hatched Aphids, Studies on Control of, II. By P. J. Parrott, H. E. Hodgkiss, and F. H. Lathrop (*U.S.A. Dep. Agr., New York Agr. Exp. Stn., Bull.* 431, March 1917; 1 plate, 3 figs., 18 tables).—This is the second report of life-history studies and experiments with the apple aphides (*Aphis sorbi, aveni,* and *pomi*), which have for their object the establishment of efficient spraying practices for the protection of bearing apple orchards.—*V. G. J.*

Apple Root Weevil. By W. W. Froggatt (*Agr. Gaz. N.S.W.* xxxi. pp. 55–60; 1 fig., 1 plate).—Much damage to apple trees is caused by the Apple Root Weevil (*Leptops hopei*). This beetle lays its eggs on the leaf of the tree, gumming the other side over them. When the larvæ hatch out, they descend the trunk of the tree, burrow down in the soil and attack the roots, causing them to decay.

A frill of sheet tin or oiled paper round the stem prevents the beetles ascending the tree, and the larvæ can be destroyed by grease banding. The adult weevils and their larvæ are depicted in the accompanying plate.—*S. E. W.*

Apple Spurs, Seasonable Changes in the Chemical Composition of. By H. D. Hooker, jun. (*U.S.A. Exp. Stn., Missouri, Res. Bull.* 40, September 1920).—Samples of apple spurs, with leaves, flowers, or fruits removed, were collected at intervals during a year, and their chemical composition studied in relation to their physiological condition. A complete picture of the chemical life-history of an apple spur during the two-year cycle it usually passes through is given, and its relation to the habit characteristic of many varieties of bearing in alternate years is discussed.—*A. N. R.*

Apple Spurs, The Relation of Carbohydrates and Nitrogen to the Behaviour of. By E. M. Harvey and A. E. Murnuk (*Oregon Agr. Coll. Exp. Stn., Bull.* 176, April 1921).—The results of these experiments emphasize the fact that the setting of fruit in the apple is determined largely by the amount of foliage present on the spur. Defoliation hindered fruit-bud formation, as shown by the fact that 'Jonathan,' 'Grimes,' and 'Wagener' spurs were able to produce only 38·7 per cent., 54·6 per cent., and 58·6 per cent., respectively, on defoliated spurs as compared with the untreated spurs. Defoliation considerably modified the chemical composition of the spurs, and the possible cause and value of the rather consistent increase effected in the carbohydrate-nitrogen ratio is discussed. The effects of defoliation on spurs suggest a high degree of "individuality," or dependence of the spur on its own leaves for normal activity. In every case defloration increased the leaf area of the spur. Defoliation was found to have a direct effect upon the setting of fruit, the number of fruits per spur varying with the area of the foliage of the spur.—*A. N. R.*

Apple Tree Fruiting every other Year (*Jour. Dep. Agr., Vict.* July 1919, p. 421). —An illustration of this biennial bearing habit is quoted by B. S. Brown in the *Journal of Heredity*. One-half of the tree had been grafted with Gravenstein, while the other half was of the original variety of a Russian type. For some

unaccountable reason each half of the tree chose opposite years for its heavy crop. In the spring it presents an odd appearance by one half being in heavy bloom, while the other half scarcely develops a single blossom. The next year the process is reversed. The tree is about twenty-five years old, and has behaved as described for the past five years. No certain explanation as to the original cause can be given. As there is some slight difference in the blossoming time of the two halves, it is possible that frost may have come at such a time as to destroy the fruit on one side, while the other escaped. These facts are interesting, as they show (1) that the formation of fruit buds is not wholly a question of nutrition; (2) that the food supply of the tree is directed first to the needs of the maturing crop.—*C. H. H.*

Apples, Cost of Producing, in Five Counties in Western New York, 1910–1915. By G. H. Miller (*U.S.A. Dep. Agr., Bull.* 851, July 1920; 16 figs.).—Taking into account all charges—labour, material, and fixed costs, including interest on capital invested—the total net cost of production on 218 farms averaged $118·78 an acre, working out to an average of $1·41 a barrel (p. 43).
A. P.

Apricots in New South Wales. By W. J. Allen (*Agr. Gaz. N.S.W.* xxxi. pp. 201–207; 1 fig.).—The apricot does well in most parts of New South Wales. The best results are obtained in deep friable loam, in well-drained situations protected from strong winds and early morning sun. The best stock is seedling apricot. The land must be ploughed some time before planting. The trees are firmly planted in holes 12 inches deep and 18 inches in diameter. The soil must be kept in good tilth and free from weeds. Irrigation is necessary in dry districts. 'Trevatt' is a valuable variety.—*S. E. W.*

Armillaria (*Agr. Gaz. N.S.W.* xxxi. p. 60).—Apple trees attacked by *Armillaria* are treated with iron sulphate, 8 oz. dissolved in 1 gallon of water. The roots of the tree are laid bare, and the affected parts scraped. The solution is poured on from a watering can.—*S. E. W.*

Asparagus Beetles and their Control, The. By F. H. Chittenden (*U.S.A. Dep. Agr., Farmers' Bull.* 837, August 1917; 9 figs.).—This bulletin describes the two species of asparagus beetle introduced from Europe. These insects feed on the tender young shoots and render them worthless for market. Later broods devour the foliage and frequently kill the plants.

The best remedy for general use is spraying with arsenate of lead. Two pounds of dry lead arsenate or four pounds lead arsenate paste to fifty gallons of water or Bordeaux mixture will make a solution of sufficient strength to destroy both beetles and larvæ.—*V. G. J.*

Bean and Pea Beetles in Kentucky, Observations and Experiments on the. By H. Garman (*U.S.A. Agr. Exp. Stn., Kentucky, Bull.* 213, Dec. 1917; 8 figs.).—Four different weevils attack stored beans and peas in Kentucky and are very injurious.

The experiments made indicate that at a temperature of about 70° F. all stages of the insects will be killed by using from one to two ounces of carbon bisulphide in ten cubic feet of space, the exposure to last twenty-four hours.—*V. G. J.*

Bean Ladybird, The. By A. C. Mallory (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 843, June 1920; 6 plates, 5 figs.).—The Bean Ladybird (*Epilachna corrupta* Muls.) is to the bean industry in the West what the Colorado beetle is to the potato crop in the East, and its origin is obviously the same—Mexico, where it is widely distributed. Leaves, flowers, and growing pods are all attacked—main food being the leaves.

In the case of large areas of beans, close inspection is strongly recommended. Infestation usually begins in small localized areas, and if these spots are located and prompt measures taken to destroy the insect a general infestation can be prevented.

Spraying with arsenite of zinc, 1 lb. to 40 gallons of water, or with arsenate of lead, 1 or 2 lb. to 50 gallons of water, and clean cultivation are the best means of control discovered so far.—*V. G. J.*

Black Currants, Leaf Character in Reverted. By A. H. Lees (*Ann. App. Biol.* ix., April 1922, pp. 49–68; 46 figs.).—This paper indicates a means of ascertaining the reversion of Black Currant leaves, even in very slight cases, or where the leaves have almost regained their normality.

The method consists of (1) counting the number of submain veins running from the midrib to marginal points, and (2) observing the marginal points.

Reversion may be produced by artificial means, but such reversion would be of a temporary character.

'Oak Leaf' is an advanced stage of reversion, and is always associated with mite, therefore the chances are that reverted bushes without 'Oak Leaf' owe their existence in some way or other to the mite factor, either patently or latently.

Forty-six figures are given of the different variations of reversion, and are of great help in ascertaining slight as well as serious attacks.—*G. F. W.*

Blastophaga and the Fig Family, Symbiosis of. By G. P. Rixford (*Journ. Econ. Entom.* xiii. pp. 459–463; Dec. 1920).—Botanists have identified more than six hundred species of Ficus. Some authorities are of opinion that each species of Ficus has its peculiar species of parasitic chalcid fly associated with it to assist in the process of fertilization of the flowers.

At present more than one hundred and sixty species of Blastophaga are known, all parasites on the fig. The symbiosis is one of the oldest known, and of the greatest importance.

With two or three exceptions all the edible figs belong to the species *F. carica*, of which there are more than one hundred and fifty varieties cultivated. Of this large number, the Lob Ingir, the well-known Smyrna variety, is unique in requiring pollination to enable the fruit to mature. In the Adriatic race, which includes most of the varieties cultivated in all fig-growing countries, the fruits reach maturity without pollination, but contain no fertile seeds.

Caprification is the term applied to the process of hanging caprifigs in the Smyrna fig-trees. The chalcid flies (*Blastophaga psenes*), which emerge from the caprifigs covered with pollen, eventually enter the receptacle of the young fruit by the eye carrying the pollen to the stigmas of the female flowers within. It follows that the caprifig must be cultivated contiguously with the Smyrna trees to obtain mature fruit. A detailed description of the life-history of the Blastophaga, family *Agaonidae*, and the pollination of the fig is given.—*G. W. G.*

Bud Selection, with Special Reference to Apples and Strawberries. By V. R. Gardener (*Univ. of Missouri Agr. Exp. Stn., Res. Bull.* 39, August 1920).—Gives interesting results from a series of bud selection experiments conducted at above-mentioned station and at the Oregon Experimental Station.

It was found that apple trees propagated from the high-yielding parent averaged about the same in quantity and grade of fruit produced as those propagated from the low-yielding parent, there being great variation between the individual trees in each lot. Ten successive generations of runner selection from high-yielding and from low-yielding strawberry plants failed to produce strains whose yield was higher or lower than the average of the variety. A considerable number of bud variations selected for propagation proved to be simple fluctuations, incapable of impressing their high-producing or low-producing qualities upon their daughter plants.

A review of some of the most important contributions to literature devoted to this question of bud selection prefaces the report, and serves to emphasize the great diversity of opinions expressed.—*A. N. R.*

Bulb Culture in the United States, Commercial Dutch. By David Griffiths and H. E. Juenemann (*U.S.A. Dep. Agr., Bull.* 797, 50 pp.; 32 figs.)—The various methods of bulb culture are described. Few plants are more widely adaptable and more easily grown than bulbs. Failure is often due to lack of moisture and high temperature occurring before the bulbs complete their growth.

F. G. A.

Bulb Mite, A Study of the. By P. Garman (*Connecticut Agr. Exp. Stn., Bull.* 225, Jan. 1921, pp. 114–132; 3 plates, 3 figs.).—An account of the introduction, life-history, and remedies against a well-known pest of bulbs, *Rhizoglyphus hyacinthi* Banks. This mite is structurally different from *R. echinopus*, which is the name of the European species.

Minute descriptions are given of the egg, larvæ and nymph, and adult stages.

Host plants are narcissus, hyacinth, tulip, crocus, and Easter lilies—onions and potatos artificially—and probably the mite is capable of living on almost any bulb or tuber.

The degree of damage depends on the open structure of the bulb scales, thus narcissi and lilies are the worst and tulips are the least attacked.

Mites are able to penetrate and injure healthy growing bulbs.

Migration takes place in the hypopal or second nymphal stage by the young mites clinging to small flies and caterpillars. Tables are given showing the result of treating bulbs with insecticides, gases, heat, etc.

The most successful methods proved to be the immersion of affected bulbs in nicotine sulphate (1–400) or nicotine oleate at 50° C. for 5 minutes, and hot water at 50° C. for 10 minutes.—*G. F. W.*

Cannas, A Bacterial Disease of. By Mary K. Bryan (*U.S.A. Jour. Agr. Res.* xxi. No. 3, May 1921, pp. 143–152; 8 plates).—A hitherto undescribed bacterial disease of buds of Canna is caused by *Bacterium cannae* n. sp. It is primarily one of young tissues and moist conditions. Infection takes place through stomata and spreads through the parenchymatous intercellular spaces of the leaf blades, petioles, and stems. It is most destructive to young plants, and prevents the plants from blossoming. The method of wintering is unknown, and no special control measures are as yet suggested.

The bacterium causing the disease is described.—*A. B.*

Carbon Dioxide, Residual Effects of Carbon Dioxide Gas Additions to Soil on Roots of Lactuca sativa. By H. A. Noyes and J. H. Weghorst (*Bot. Gaz.* lxix. No. 4, April 1920, pp. 332–336; 5 figs.).—In a previous paper the writers showed that the "carbon dioxide content of garden soils is sometimes detrimental to the root development of some of the plants growing in the garden." The authors' recent investigations show that the roots of the plants grown in the pots that had received the carbon dioxide applications the previous year (a lapse of nine months) had the malformations attributed to carbon dioxide in the previous year. Where the soil had never been subjected to treatment with this gas, the roots were well spread and extended considerably into the soil. Where it had been applied, the roots were shorter, spread out horizontally just beneath (0″ to 2″) the surface of the soil, and had tap roots that were abnormally short, crooked, and branching. The residual effects of the gas were greater for the continuous than the intermittent treatments. The roots of the plants where the 24-hour treatments of carbon dioxide had been given were more affected under the manure than the fertilizer treatments.—*R. J. L.*

Castor-Oil Bean, Bacterial Wilt of. By Erwin F. Smith and G. H. Godfrey (*U.S.A. Jour. Agr. Res.* xxi. No. 4, May 1921, pp. 255–262; 13 plates).—The bacterial wilt of the Castor-Oil Bean (*Ricinus communis* L.) was first noticed in 1918, and was found to occur in many parts of Florida and South Georgia. It causes a wilting of the leaves and growing points, and may come slowly or quickly, and bacterial exudates from the vascular bundles may be noticed. The organism isolated was found to be *Bacterium solanacearum*, and these when inoculated into tomato plants soon caused wilting to take place. Young Ricinus plants were also inoculated successfully.

The organism is found to attack *Tropaeolum majus* L., *Vanilla planiflora* (Andrews), Sunflower (*Helianthus annuus* L.), Common Balsam (*Impatiens balsamina* L.), and Fuchsias.—*A. B.*

Celery, A Bacterial Leafspot of. By Ivan C. Jagger (*U.S.A. Jour. Agr. Res.* xxi. No. 3, May 1921, pp. 185–188; 2 plates).—A hitherto undescribed bacterial disease on leaves of celery has been under observation since 1910. It causes spots of a rusty brown colour, somewhat resembling the Septoria leaf spots, and is apparently confined to the leaf blades. Bacteria have been repeatedly isolated and characteristic spots reproduced by inoculation with pure cultures. It has one to three polar flagella, forms colonies on nutrient agar, greyish white, shiny, and circular, forms acid with glucose and saccharose, alkali from lactose and glycerine, no nitrate reduction, no diastatic action. Is parasitic on leaves of celery (*Apium graveolens* L.). The author names it *Pseudomonas apii* n. sp.

A. B.

Cherry Growing in New South Wales. By W. J. Allen and S. A. Hogg (*Agr. Gaz. N.S.W.* xxxi. pp. 277–279).—The cultivation of cherries can only be carried on successfully in the highlands of New South Wales, as the trees dislike a high temperature and cannot resist drought. The trees are planted 20–24 feet apart in well-drained loam overlying sand or rubble. Black tares, sown in winter and ploughed under in spring, form a useful fertilizer. The favourite variety for canning is 'Florence.'—*S. E. W.*

Citrus-Canker in Soil. By H. A. Lee (*U.S. Jour. Agr. Res.* vol. xix. No. 5, June 1920, pp. 189–206; 2 plates).

Citrus Canker Organisms in Soil, The Decline of the. By H. R. Fulton (*U.S. Jour. Agr. Res.* vol. xix. No. 5, June 1920, pp. 207–224).

It is a commonly accepted idea amongst fruit-growers that the citrus canker organism (*Pseudomonascitri* Hasse) lives and multiplies in the soil. The presence or absence of the organism in the soil is an important one in three aspects: (1) If organism is able to live actively, that is, increase and multiply; (2) whether it exists passively; or (3) whether it is killed in the soil. The first author shows that the organism disappears from unsterilized soil in tubes and boxes within six days after inoculation. In sterilized soil, however, inoculated with *P. citri*,

the organism is seen to increase. In soil under orchard conditions the organism disappears even more rapidly than in soil in boxes or culture tubes. Seeds planted in pots of soil naturally infected with the canker develop normally without any canker. This author holds that the organism may live on buried leaves or woody roots, and suggests these as possible sources of holding the canker organism alive over the winter.

The author of the second paper agrees that the organism undergoes a rapid and continuous decline in numbers under normal soil conditions. The vanishing point is reached in about two weeks by the test methods employed. These included rendering soil alkaline with lime-water, or by lowering its temperature or sterilizing by steam. The addition of dilute sulphuric acid also causes the organism to disappear.

In water the decline is more marked than in soil. Certain bacteria have a marked deleterious effect on *P. citri* in artificial culture media, both by inhibiting growth and by killing it. The fungus apparently enters the seedlings by wounds only.—*A. B.*

Citrus Canker (Pseudomonas citri). By Geo. L. Peltier (*U.S.A. Jour. Agr. Res.* xx. No. 6, Dec. 1920, pp. 447–506).—The susceptibility and resistance of a large number of Rutaceous plants to citrus canker are influenced by the following factors: the anatomical structure of plants, the reaction of the host plants to their environment, the influence of external conditions on the organism and its susceptibility to infection, and the influence of the host upon the virulency of the organism. The author finds that the temperature relations of *Pseudomonas Citri* Hasse in culture is similar to those of the Pseudomonas group of bacteria. The minimum temperature for growth in culture is about 5° C., the optimum between 20° and 30°, the maximum about 35° for 24 hours, and a thermal death-point between 49° and 52°. Humidity is closely associated with temperature and has marked effect upon the viability of the organism. At low temperatures, humidity has little or no influence, while at high temperatures and high humidity it is the limiting factor.

The Citrus plants used vary markedly in their reaction to temperature and humidity, the optimum being between 20° and 30° C. Three conditions necessary for infection: free moisture on the plant, suitable temperature, and an actively growing plant. The conditions for rapid plant growth are also the same for rapid development of the disease. When the host plant becomes dormant the organism becomes inactive and quiescent.

A short bibliography is given.—*A. B.*

Citrus Scab Fungus. By H. S. Fawcett (*U.S.A. Jour. Agr. Res.* xxi. No. 4, May 1921, pp. 243–252).—The author shows by his experiments that the conditions necessary for scab infection by *Cladosporium citri* on *Citrus aurantium* are (1) Viable spores of the fungus, (2) young citrus leaves of a susceptible species, (3) moisture, (4) temperatures between 16° C. and 23° C.—*A. B.*

Citrus Trees, Collar Rot. By C. O. Hamblin (*Agr. Gaz. N.S.W.* xxxi. pp. 439–441; 6 figs.).—Collar rot in citrus trees is due to a fungus (*Fusarium limonis*) which causes gumming of the tree near the ground. The remedy consists in laying bare the base of the tree and applying to the wounds a paste composed of copper sulphate, 1½ lb., quick lime, 4 lb., and 1⅓ gallon of water.
S. E. W.

Citrus Trees, Spraying for the Control of Insects and Mites attacking in Florida. By W. W. Yothus (*U.S.A. Dep. Agr., Farmers' Bull.* 933, March 1918; 24 figs.)—This bulletin gives information regarding the best equipment for Florida conditions, and directions for preparing effective home-made insecticides. There is also a spraying schedule that has proved satisfactory after several years of practical experience.—*V. G. J.*

Codling Moth, A Quandary and a Query. By G. W. Herrick (*Journ. Econ. Entom.* vol. xiv. pp. 156–160; April 1921).—It is well known that a large number of codling moth larvæ enter the young fruits through the side, in addition to those which enter by the calyx. The percentage entering by the side is sometimes as high as 66·96 per cent. of the infestation, but appears to vary with different varieties of apple, and the degree and earliness of closing of the calyx incident on the season and the variety concerned. It is emphasized that, in consequence, a second or even third spraying with arsenate of lead may be a profitable measure. Another control recommended is the removal of fruits entered by the side at the time of thinning. Such apples may be detected by a small quantity of frass extruded by the larva.—*G. W. G.*

Copper-Spray Coatings, The Field Testing of. By J. R. Winston and H. R. Fulton (*U.S.A. Dep. Agr., Bull.* 785, March 1919; 4 figs.).—This field method

of following the persistence of copper-containing sprays should be of great service to agriculturists generally, especially to secure prompt correction of faulty spraying practices, and to serve as a practical guide in timing new applications, especially after rainy periods.—*V. G. J.*

Cost of Spraying Kale, A Study of the. By H. H. Zimmerley and Loren B. Smith (*U.S.A. Exp. Stn., Virginia Exp. Stn., Bull.* 30, Jan. 1920 ; 1 fig.).—Kale is an important crop in East Virginia, and for several years has suffered increasingly heavy losses from the imported cabbage worm, the cabbage looper, and several species of aphides. Arsenate of lead, 1½ lb. powder to 50 gallons of water, is recommended for the caterpillars, and nicotine sulphate, 8¾ oz., fish oil soap, 5 lb. to 50 gallons of water, are used for control of aphides.

The data included in this paper are based upon spraying operations performed with a two-wheel sprayer, equipped with a gasoline engine and triplex pump.
V. G. J.

Crown Gall of Fruit Trees. By W. A. Birmingham (*Agr. Gaz. N.S.W.* xxxi. pp. 717, 718 ; 1 plate).—*Pseudomonas tumefaciens* attacks many plants, causing Crown Gall, *i.e.* enlargements near the crown on the roots of trees. No satisfactory remedy has been discovered. As the infection generally takes place in the nursery, it is well to guard against infection by dipping the grafts in copper-sulphate-lime paste before planting.—*S. E. W.*

Cypress Bark Scale. By F. B. Herbert (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 838, June 1920 ; 6 plates, 5 figs.).—The main cause of the browning and death of so many Cypress trees in California is the Cypress bark scale, *Ehrhornia cupressi.* The characteristic injury shows first on one or two limbs and slowly spreads to the whole tree. The foliage first turns yellow, then red or brown, and after a few years the tree dies. A 12½ per cent. solution of miscible oil is the spray recommended, applied in August and the latter end of September.
V. G. J.

Dandelion, Spraying Lawns with Iron Sulphate to Eradicate. By M. T. Munn (*U.S.A. Exp. Stn., New York, Bull.* 466, Sept. 1919 ; 6 plates).—Experiments made at the station during the past eight years demonstrate that dandelions may be eradicated from lawns at relatively slight expense and without material injury to the grass by spraying with iron sulphate. Four or five applications are necessary : the first in May, one or two should follow at intervals of three or four weeks, and one or two more in late summer. A conspicuous blackening of the lawn follows each application, but this soon disappears if the grass is in a vigorous and healthy condition. The spray solution is prepared by dissolving one pound of iron sulphate in each gallon of water. The quantity required is approximately 4 lb. to a thousand square feet of lawn, or 175 lb. to the acre.

It must be prepared in wooden or earthenware vessels, as it is highly corrosive to metal.—*V. G. J.*

Date : Rot of Date Fruit. By J. G. Brown (*Bot. Gaz.* lxix. No. 6, June 1920, pp. 521–529 ; 5 figs.).—It appears probable that the primary cause of rot and mummification of the date fruit is the attack of Alternaria. This attack paves the way for the entrance of saprophytic Aspergillus and Penicillium species which bring on the disintegration of the pulp. Commonly all three fungi appear in cultures from the same infected spot. Attack of the spot fungus, unaccompanied by the saprophytic Aspergillus and Penicillium, results in mummification without the appearance of rot.—*R. J. L.*

Disease, Air Temperatures and. By J. Johnson (*Phytopathology*, xi. pp. 446–458, Nov. 1921).—Experiments were made with tobacco affected by mosaic, and potatos affected by ' blight,' in chambers in which temperature and humidity could be controlled within very narrow limits. The mosaic disease increased up to 28–30° C., and developed up to 36–37° C., but thereafter the plants sent out normal healthy leaves, and some chlorotic leaves regained their normal colour. This result appears to indicate the connexion of an organism with the disease, since the temperature relations are those of the activities of a parasite rather than of an enzyme. The best temperature for the development of potato disease lies above 25° C. and below 32° C., while the maximum is near 36–37° C. A bibliography is appended.—*F. J. C.*

" Electro-Culture." By F. J. Rae (*Jour. Dep. Agr., Victoria*, xviii. July 1920, pp. 385–394).—Under this title the author includes the following modes of applying electricity to the growth of plants :

1. Illumination by Electric Light said to benefit the growth of tomatos and lettuce.

2. Stimulation by atmospheric electricity brought to the soil by metallic conductors.

3. Potatos grown between two large sheets of zinc and copper in the soil, 200 yards apart and connected by an insulated wire, were said to give a better yield. (*A priori* one would not expect the small current so generated to have much effect.)

4. Stimulation by a current passing through the soil and generated by a cell.

5. Stimulation by high tension discharge from overhead wires. This method has been widely used and increased yields have been obtained, but the expense of installation is great, and the results are not certain.

6. Treatment by passage of a constant current through the soaked seed before sowing. Mr. Rae quotes this process as being a commercial success, but he does not mention the adverse report on the results, made by Dr. E. J. Russell. Sir A. D. Hall also stated at the British Association in 1920 that no such process has proved of real use.—*H. Waller.*

Evaporation and Transpiration, Studies in. By Geo. F. Freeman (*Bot. Gaz.* lxx. No. 3, Sept. 1920, pp. 190–210; 5 figs.).—1. As a result of evaporation experiments carried out by means of a porous cup atmometer enclosed in a glass cylinder of one litre capacity, through which an air current is passed, an evaporation formula is offered which may take any of the following forms:

$$\text{(a) } y = z\,(t - t)\,; \quad \text{(b) } y = \frac{t - t_1}{1 + c\,(w)}n\,;$$

$$\text{(c) } y = \frac{t - t_1}{1 + \dfrac{c\,(w)\,\dfrac{a}{k + a}}{a}}$$

In these formulæ y = rise in the dewpoint of the air caused by the loss of water to it of a given evaporating surface; t = temperature of the air; t_1 = dewpoint of the outside air; z = the constant used when the area and wind movement remain constant; n = exponent of w, used when the area remains constant; c = constant coefficient of w, used either when the area is constant (when a does not appear in the formula) or when a varies and hence appears in the formula; a = area of the evaporating surface which is always expressed as the ratio of the surface exposed to that exposed when c and k were determined; when c and k are determined, the area then used is taken as unity, and all other areas expressed in terms of it; k = constant used in the exponent of w to adjust the area unit to the wind movement unit.

2. These formulæ appear to be general in type, and capable of use in any situation where y is measurable. It is possible that with some modification these formulæ may also be of use when y cannot be measured, but where it is possible to measure directly the actual evaporation per unit area.

3. Under temperature changes only, alfalfa leaves appear to act as physical evaporating surfaces.

4. Changes in the dewpoint of the air result in profound changes in evaporating efficiency of leaf surfaces. This is probably a result of the opening and closing of the stomata.

5. It is possible to make use of these formulæ in comparing the evaporating efficiency of different species of plants and interpreting results which would otherwise appear hopelessly confusing.

6. Distinct pure races of alfalfa exhibit measurable differences in the rate of evaporation per unit area of their leaves. Such differences may be of economic value in semi-arid or irrigated regions where production depends principally upon the efficiency of the use of the available water supply.—*R. J. L.*

Fern-Growing. By H. Drury (*Irish Gard.* 14, pp. 7, 25; Jan., Feb., 1919).—Full directions for the construction of a fern garden.—*F. J. C.*

Fruit-Butters, Homemade. By C. P. Close (*U.S.A. Dep. Agr., Farmers' Bull.* 900; *Bureau of Plant Indust.*, Sept. 1917; plates).—Careful instructions in the preliminary equipment, and the preparation of the so-called "fruit-butters," so popular in the United States. Recipes for various forms of apple-butter, for pear, peach, plum, and 'Garfield' butter are given.—*M. L. H.*

Fuchsia, Notes on the Cytology and Genetics of the Genus. By R. Beer (*Jour. Gen.* 11, pp. 213–227; 1921; 3 plates).—The author reviews the investigations previously made upon the cytology of Fuchsias and recounts his own, together with an account of crosses made between different species and varieties of the

genus. He reports several cases of the occurrence of false hybrids showing only maternal characters, and makes suggestions as to the meaning of the phenomenon.—*F. J. C.*

Galls: The Zoocecidia of North-Eastern United States and Eastern Canada. By B. W. Wells (*Bot. Gaz.* vol. lxv. No. 6, June 1918, pp. 535–542).—Some interesting statistics concerning the plant galls of this phyto-geographic region are given. Of 792 known, 2 are caused by worms (*Nematodes*), 87 by mites, and the remainder by insects, chiefly flies of the family *Itonididae*. Their distribution amongst the plant families is extremely irregular. Although such large families as the *Cruciferae* and *Caryophyllaceae* contain no gall-bearing species, yet in the small family of the *Fagaceae* they are extremely numerous; in *Quercus* alone 176 have been described. "The intimate and constant relation between specific insects and specific plants forms one of the most significant phenomena in the field of cecidology."—*R. J. L.*

Grape-Berry Moth in Northern Ohio, Control of. By H. G. Ingerson and G. A. Runner (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 837, June 1920; 4 plates, 1 fig.).—The grape-berry moth (*Polychrosis viteana* Clem.) is the most destructive insect pest the grape growers of Northern Ohio have to contend with. Arsenate of lead, 1½ lb. of powder to 50 gallons of water, is the active killing agent with resin, fish-oil soap, 1 lb. to 50 gallons for a spreader and adhesive—the first application to be made when the grapes first "set," and the second when the berries touch in the clusters.—*V. G. J.*

Growth in Plants, Effects of Relative Length of Day and Night upon. By W. W. Garner and H. A. Allard (*U.S. Jour. Agr. Res.* xviii. No. 11, March 1920, pp. 553–606; 16 plates).—Three primary factors enter into the action of light upon plants, namely, the intensity of light, the quality, *i.e.* the wave length of the radiation, and the duration of the exposure. In the present investigation we are concerned with growth and reproduction as affected by the daily duration of light exposure. The relative length of the day is a factor of the first importance in growth and development of plants. From the species studied it was found that the plants can attain the flowering and fruiting stages only when the length of day falls within certain limits, and these stages of development are ordinarily reached only during certain seasons of the year. Some species respond to relatively long days, while others respond to short days, and still others are capable of responding to all lengths of the day which prevail where the tests were made [in Washington]. The absence of favourable length of day for bringing into expression the reproductive processes favours the development of vegetative growth (gigantism). On the other hand, a suitable length of day induces precocious flowering and fruiting. Thus certain species may be early or late maturing, according to the length of day to which they are exposed. "Ever-blooming" or "ever-fruiting" may be induced for an indefinite period when exposed to a day favourable to both growth and reproduction.

The relationships between annuals, biennials, and perennials are dependent on responses to the prevailing seasonal range in length of day. Therefore by artificial regulation of length of daily exposure to light, it is found that the normal yearly cycle can be greatly shortened in time or indefinitely lengthened. All species studied showed a rate of growth directly proportional to length of day. The seasonal range in length of day is an important factor in natural distribution of plants, and the inter-relationships between length of day and prevailing temperatures of the winter season largely control successful reproduction. The relation between length of day and time of flowering is of great importance in crop yields in many instances.

A short bibliography is appended.—*A. B.*

Grub-infested Soils, Arsenic for. By J. F. Illingworth (*Journ. Econ. Entom.* vol. xiv. pp. 238–239; April 1921).—A brief account is given of several pot and field experiments with crude white arsenic (arsenious acid) as a remedy for grub-infested soils. The experiments were mostly conducted with grubs of the gauger beetle (*Isodon punctcollis*, Macleay) which were feeding on the roots of cucumber plants. Application of white arsenic is recommended at the rate of 80 lb. to the acre. The poison is said to have no detrimental effect on the plant. It was applied in excessive quantities (200 lb. an acre) to land growing sugar-cane, and careful chemical tests on the juice obtained from this cane showed "not a trace of arsenic in the juice."—*G. W. G.*

Hawthorns, Wild, as Hosts of Apple, Pear, and Quince Pests. By W. H. Wellhouse (*Jour. Econ. Entom.* vol. xiii. pp. 388–391; Oct. 1920).—The author reports that he has a list of 374 species of insects which have been found to feed on the hawthorns (*Crataegus* sp.). Several of these are widely distributed and

well-known apple pests, and a list of 38 of the commoner insects injurious to the apple, and which are also hawthorn feeders, is given in the paper.

It is suggested, in view of the fact that the wild hawthorns are hosts of many apple, pear, and quince pests, and also of many potential insect pests, they should either be removed from the vicinity of orchards, or at least given insecticidal treatment, so that the cumulative benefit of spraying an orchard several years in succession may not be lost by the surrounding country continually providing a new supply of pests.—*G. W. G.*

Heat, Control of Stem Girdle of Spruce Transplants caused by Excessive. By C. F. Korstian and N. J. Fetherolf (*Phytopathology*, xi. pp. 485–490; Dec. 1921).—Observations showed that many seedlings transplanted so that their heads inclined to the north died, while those inclined to the south lived. This is attributed to the killing of the cambium by the great heat incident upon the stems.—*F.J.C.*

Hedges, Ornamental. By B. (*Irish Gard.* 14, p. 4; Jan. 1919).—Praises *Berberis stenophylla* (fig.) as a hedge plant, and suggests *B. Gagnepainii, B. subcaulialata, B. aggregata* (fig.), *B. Prattii* and *B. Chitria, Ligustrum Delavayi, L. Prattii*, and *L. Henryi, Cotoneaster salicifolia, C. Dielsiana, C. Franchetii, C. bullata, Rosa Moyesii*, and *R. Davidii*, and for enclosing a heath garden *Erica mediterranea* is suggested as suitable.—*F. J. C.*

Honey Locust Tree. By W. H. Potts (*Agr. Gaz. N.S.W.* xxxi. pp. 85–90; 7 figs.).—The Honey Locust Tree (*Gleditschia triacanthus*) is easily raised from seed. It is a vigorous grower and makes good hedges and wind breaks, providing shade and protection from wind and storm for stock. It is specially recommended for swine as it yields crops of beans which provide nourishing food.—*S. E. W.*

Insect Activity, the Effect of Storm Phenomena on, Observations on. By D. C. Parman (*Jour. Econ. Entom.* vol. xiii. pp. 339–343; Aug. 1920).—The author discusses the effect of varying barometric pressures on insect life, particularly with reference to Muscids and related diptera. A detailed account of several severe storms is given with observations on the behaviour of the flies amongst the stock, and also in cages in the laboratory. It was noted that during storms the flies died mostly when the barometer was falling rapidly. It is stated that species of *Muscids* first become nervously active and then pass into a state of partial coma; during this state they are more likely to suffer from mechanical agencies, such as heavy rain and wind. Conversely, observations of insects at room windows and lights at night showed them to be most active during high barometric periods—other conditions, such as temperature and humidity, being favourable—and especially so when the barometer is rising. Further, bred adult diptera tend to emerge during high barometric readings and heavy emergencies, apparently always with a high barometer.—*G. W. G.*

Insect Fauna of Permanent Pasture of Cheshire, Observations on the. By H. M. Morris (*Ann. App. Biol.* vii. Nos. 2–3, pp. 141–155; 1 fig.).—A census of the Insect Fauna of a permanent pasture taken in September 1916 and 1917. In the immediate neighbourhood were arable fields of Potatos, Mangolds, Oats, Wheat, Clover, etc., with a small wood of Beech, Oak, Alder, etc.

A map of the locality is given, together with a description of the fields and their crops during 1916 and 1917.

Chemical, mechanical, and botanical analyses of the soil are given.

The census of Insects gave a population of 3,586,088 to the acre, made up of the following orders: Collembola, 566,680; Rhynchota, 15,140; Thysanoptera, 43,258; Lepidoptera, 15,140; Coleoptera, 744,038; Diptera, 2,193,180; and Hymenoptera, 8,652. The noteworthy economic insects were Agriotes, larvæ 114,634; adults 8,652; *Triphaena pronuba*, larvæ and pupæ, 4,326; *Tipula oleracea* and *paludosa*, larvæ 19,466.—*G. F. W.*

Insects, Cold Storage Control of. By E. R. De Ong (*Journ. Econ. Entom.* vol. xiv. pp. 444–447, Oct. 1921).—It may be concluded from the experiments here reported, that dried fruit stored at any temperature from 10° F. to 36° F. will be free from injury by insects during storage; further, that all stages of the insects experimented upon (unless it be the egg) would be dead at the end of the third or fourth month. A temperature of 45° to 50° F. causes dormancy, but only a low mortality. It was found also that the action of bacteria and fungi was suspended during storage. The experiments were conducted with *Plodia interpunctella* (Indian meal moth), *Carpophilus hemipterus* (dried fruit beetle), *Silvanus surinamensis* (saw-toothed grain beetle), *Tenebrioides mauritanicus* (cadelle), and *Carpoglyphus passularum* (dried fruit mite).—*G. W. G.*

Insecticides, Dust, in California. By E. O. Essig (*Journ. Econ. Entom.* vol. 14, pp. 392–394, Oct. 1921).—Promising results have recently been obtained

by Prof. Smith and others with variations of his original 'nicodust,' which is obtained by impregnating finely pulverized kaolin with 'Blackleaf 40.'

Various admixtures of nicodust with sulphur, arsenical compounds, and fungicides are also being prepared. At the present time lime has practically replaced kaolin, as it liberates the volatile nicotine more readily, and the addition of dry sulphur at mixing time appears to increase the efficiency of the dust.

Summarizing the results of available experimental data, the author recommends a dust composed of 5 per cent. or 6 per cent. 'Blackleaf 40' for most common aphides. A 2 per cent. 'Blackleaf 40' dust was adequate for the walnut aphis (*Chromaphis juglandicola* Kalt). It is of doubtful use against aphides with a waxy or mealy protective covering.

For grape-leaf hopper (*Erythroneura comes*) demonstrations indicated that a 6 per cent. dust would kill all nymphs, but a 10 per cent. dust was required to destroy adults. The false chinch bug (*Nysius ericae* Schilling) in one instance at least was controlled by a 6 per cent. dust. Young hairy caterpillars readily succumb to nicodust. It is also said that mixtures of nicodust and arsenate of lead were very efficient in controlling caterpillars and flea beetles.—*G. W. G.*

Insecticides, Petroleum. By R. K. Vickery (*Jour. Econ. Entom.* vol. xiii. pp. 444–447; Dec. 1920).—The author refers to the millions of gallons of oil now being used as insecticides in relation to the Government warning foretelling the rapid depletion of the American petroleum resources. It is pointed out that a shortage would raise the price sufficiently to make petroleum unavailable as an insecticide. Many of the household and industrial oils, such as kerosene, crude oil, lubricants, and the by-product distillates make efficient sprays; and in consequence the study of the toxicology of petroleum to insects has been somewhat neglected. Shafer and others have shown that petroleum is a true chemical poison, but it is not known what compounds in petroleum are actually toxic to insects.

Economic demand might make it profitable to prepare these compounds synthetically. Moore has drawn attention to the fact that the spiracles are the weakest link in the insect's armour against contact insecticides, and has shown that the heavy vapours of petroleum, and other volatile contact insecticides, are the most efficient. These heavy gases condense on the walls of the trachea, and it has been suggested petroleum kills by upsetting the balance between the oxidizing and reducing enzymes in the body fluid. A knowledge of the chemistry of petroleum may make it possible to find compounds fatal to insects and not injurious to plants.

A history of petroleum sprays shows the gradual development of methods to protect the plant from the injury caused by the commercial oils. Emulsion made it possible to dilute the oil with water. Miscible oil made the soap emulsion a commercial proposition; but unfortunately the miscible oil formula is not adapted to the heavy oils. The latest improvements have been with colloidal emulsions, which, being chemically inert, will mix with hard water, lime-sulphur solution, arsenates etc.

Modern synthetic chemistry is making available many compounds, some of which are undoubtedly toxic to insects. The scarcity of petroleum is likely to make it profitable to hunt out these products. The ideal contact insecticide should be an active insect poison, harmless to the most tender foliage. It should keep well and be usable as a wash or as a dust. The article is concluded with a bibliography on the subject.—*G. W. G.*

Insecticide, Some Notes on a New and Promising. By E. N. Cory (*Journ. Econ. Entom.* vol. xiv. pp. 345–347, Aug. 1921).—These notes refer to an alcoholic extract of pyrethrum prepared in the form of a heavy liquid soap, which mixes readily with water, spreads evenly, and sticks fairly well.

Rose aphis and the bean aphis were easily killed at a dilution of 1 to 100; and nearly complete control appears to have been obtained with a dilution up to 1–2000 on chrysanthemums infested with brown aphis. Tests made with a tent caterpillar (*Malacosoma americana* Fabre) at 1 to 600 killed all full-grown larvæ, although death in some cases was slow.

The wash has a decided repellent and possibly some toxic action. At 1–100 mealy bugs (*Pseudococcus citri*) were uninjured, and results on red spider were similarly unsatisfactory. As might be expected, the wash is an exceedingly safe one, and is said not to spot the most delicate flowers at normal dilutions.—*G. W. G.*

Insects on Grasses and their relation to Cultivated Crops, Observations on the. By H. W. Miles (*Ann. App. Biol.* vol. viii. Nos. 3–4, Nov. 1921, pp. 170–181).—An investigation into the occurrence of insect pests among the vegetation of headlands, hedgerows, and waste places surrounding farm land in Shropshire.

The results show the danger of such places carrying over serious pests of crops from year to year, and the obvious suggestion is to keep hedgerows and headlands clean. Pests of grasses may be divided into two groups: (1) those which feed on the grass, and (2) those which shelter among grass during the winter.

The observations made in this paper deal with those insects which, although they use grasses for food or shelter, migrate to cultivated crops, when available, to (1) complete their life-histories, (2) develop a later brood, or (3) for food when the crop is at a critical stage.

During the winter period, such well-known pests as the larvæ of Agriotes, Cockchafer, Frit Fly, and Crane Flies, etc., were found feeding; and the Bean Weevil, *Sitones*, was found hibernating.

During the summer period, besides those found in the winter, were the larvæ of Swift Moth, June Bug, *Lema melanopa*, etc.

Natural enemies include Larks and Jackdaws, Ground Beetles, Carabids, and their larvæ, and Hymenopterous parasites.—*G. F. W.*

Leaf Fall: Chemical Changes accompanying Abscission in Coleus Blumei. By Homer C. Sampson (*Bot. Gaz.* vol. lxvi. No. 1, July 1918, pp. 32–53).—The investigations described in this paper were undertaken to determine some of the internal changes accompanying abscission of leaves. *Coleus Blumei* var. 'Golden Bedder' was chosen for study, partly on account of its ease of propagation, but mainly for its simplicity of analysis owing to the absence of protective tissue at the time of abscission.

It was found that "abscission was the result of the conversion of cellulose into pectose, which was further transformed to pectin and pectic acid, leading to the formation of an excess amount of pectic acid over that of the available calcium sufficient to maintain the solidity of the middle lamella of the cell walls of the abscission layer." These processes were possibly initiated and probably accelerated by the presence of oxidases and ferric ions, both of which accumulate in the abscission layer.—*R. J. L.*

Lecania of Michigan, The, by R. H. Pettit; and **Eugenia,** Mr. Daniel (*U.S.A. Exp. Stn., Mich., Tech. Bull.* 48, March 1920; 7 plates, 16 figs.).—This paper is the result of collections made during a long period of years. It may be of use to the student engaged in the study of coccids, and make easier the identification of species of economic importance, in order that the control experiments may be more exact.—*V. G. J.*

Loganberry, Training and Cultivation of. By A. A. Hammond (*Jour. Dep. Agr., Vict.* July 1920, pp. 417–425).—For commercial growth, one wire is found the most economical. The height recommended for a single wire trellis is from 3 ft. to 3 ft. 6 in. Posts about 5 feet long, sunk 2 feet in the ground, are placed 15 feet apart in the rows, the distance between the rows being from 6 to 8 feet. The end posts are braced. Galvanized barbed wire is then strained taut and stapled to the top of the posts. The advantage of using barbed wire is that the canes are held firmly in place by the barbs, and are not blown about by the wind when carrying a crop of berries, as is the case when plain wire is used. The canes are taken up in a bundle and wound around the wire in one direction, and are cut or broken off, and tied before reaching the next plant in the row. This system of training is called the rope system. The fact that some buds are suppressed by the rope system of training is compensated by the increased vigour and fruitfulness of the remaining buds. To enable cultivation to be carried on during summer the growing canes are trained along the ground close to the trellis. The canes are kept in place by clods of earth, a shovelful of soil, or a few pegs. The pruning consists in removing the old canes immediately after fruiting, also shortening back of canes if required after winding them around the wire, so as not to allow one plant to encroach on the space of the next; any weakly canes are cut out; lateral growths may be cut back to a few buds or completely removed. Canes to be removed should be cut as close to the crown as possible. Ten to twenty tons an acre of stable manure is found to be the best fertilizer. The manure is spread over the land between the rows and ploughed in after the canes have been put up. Where artificial manure has to be used, one part bone dust, one part superphosphate, and one part sulphate of potash is recommended, applied at the rate of 5 cwt. per acre. About five pickers an acre are usually required for gathering the crop. It is best to pick in the cool of the morning, especially with fully ripe berries. Each picker is supplied with a hand carrier holding 8 punnets. The fruit is sent to market in 40-punnet crates, five tiers of 8 one-pound punnets, with four trays or slides having cleats, which prevent the berries being crushed. Wooden buckets are

used for sending fruit to the factories. Loganberries when fully ripe make an excellent fruit juice if carefully sterilized. Loganberry makes excellent jam and jelly, alone or with one-third raspberry or apple added.

It is stated that the cost of production, harvesting, and marketing may be estimated at from one-third to two-fifths of the total value of the crop, and this may be reckoned at from £200 to £300 an acre after the first year. The average profitable life of the loganberry is about fifteen years on suitable land and properly cultivated.—*C. H. H.*

Manure from the Sea. By E. H. Jenkins and J. P. Street (*U.S.A. Agr. Exp. Stn., Conn., Bull.* 194, July 1917; plates).—The high price of chemical manures during the war, and the scarcity of those ingredients which were needed in the manufacture of munitions, suggested the possibility of returning partially to the natural manures used by our forefathers. This bulletin gives tables showing the chemical content of seaweed as compared with horse and cow manure, and gives the result of experience as to the best manner and season for storing the weed.

Seaweed is deficient in humus-forming material as compared with animal manure, and also in phosphoric acid, but it contains more potash and lime.

The question is one of economics and also of soil sanitation. Seaweed, by the time it is gathered and carted, even on farms close to the sea, will probably have cost a good deal in labour, if little or nothing in actual cost. Chemical manures, on the other hand, entail no labour, but cost an appreciable sum to buy, and there is the decided probability of a smaller crop also to take into account.

It is possible on the other hand, that soils which have been continually dressed with chemical fertilizers might respond, temporarily at all events, to the action of more humus-forming manures. The value of marine mud as a dressing is also discussed. The analysis of nine samples taken from various places on the Connecticut shore gave results which suggest that while it would not pay to haul this mud far, for the sea-shore farms it is quite worth consideration.—*M. L. H.*

Maple Seeds, Physiological Study of Maple Seeds. Contributions from the Hull Botanical Laboratory 260. By H. A. Jones (*Bot. Gaz.* vol. lxix. No. 2, Feb. 1920, pp. 127–152, with two figures).—The following summary of these investigations is given:

River Maple.

(1) Seeds lose their viability when the water content is reduced to 30–34 per cent.

(2) Temperature seems to play no part in determining the critical point of water loss. Higher temperatures only hasten the rate at which the point of desiccation is attained.

(3) Respiratory activity in the desiccating seeds at 25° C. first decreases slightly, then rises to a maximum, then gradually falls to zero as desiccation progresses.

(4) After a slight initial increase, catalase activity gradually decreases in the desiccating seeds. Catalase activity increases enormously during the early stages of germination.

(5) Seeds of a river maple may be kept in a vigorous viable condition for a considerable period of time at low temperatures (0° C.) stored over water.

(6) There is a gradual decrease in peroxidase activity accompanying desiccation.

Sugar Maple.

(1) Seeds after-ripen best at temperatures near 5° C., with a good supply of oxygen and moisture.

(2) With after-ripening the seeds show a considerable increase in free-reducing sugars.

(3) Catalase activity increases greatly with after-ripening and germination; there is also a slight increase in peroxidase activity.

(4) Both the dormant and after-ripened seeds have a reaction that is distinctly alkaline. This holds for the hypocotyl as well as for the entire embryo.

(5) Fully after-ripened seeds will remain in this condition for a long time if kept moist at —5° C.—*R. J. L.*

Measuring Wire for laying out Orchards. By E. Wallis, "Pear-growing in Victoria" (*Jour. Dep. Agr., Vict.* Feb. 1920, p. 84).—Is made of No. 10 gauge galvanized wire of sufficient length to measure the longest row. An iron ring 3 inches in diameter is fixed to each end of the wire. One ring is placed on a bar or stake driven into the ground, then the wire is stretched taut to its full

length, and the ring at the other end is fixed in the same way. The measurements along the wire should be accurately made, allowing for an overlap of 4 or 5 feet at each end of wire between the ring and the first mark on the wire. Commencing, then, at a point, say 4 or 5 feet from the ring, a piece of copper wire is wound round the measuring wire and soldered into position. This plan is continued every 20 feet or whatever distance between the trees is decided upon. The use of copper wire for markings is preferable to paint, as the latter is liable to be rubbed off, and copper markings will be as readily visible as paint when pegging is being done. About 20 feet is required for the headland.—*C. H. H.*

Melon Fly, The. By E. A. Back and C. E. Pemberton (*U.S.A. Dep. Agr., Bull.* 643, March 1918; 23 figs.).—The Melon Fly (*Bactrocera cucurbitae* Cog.) was introduced into Hawaii about 1895 by Japanese emigrants in fruits which they brought with them as food from Japan.

Before its introduction, cantaloupes, water-melons, pumpkins, cucumbers, etc. were grown in large quantities, but the ravages of this pest prevent these crops being grown by the average person, and only under great difficulties by the market gardener.

Since there are eight to eleven generations of the Melon Fly a year, and the females live to be over a year old and lay eggs throughout life, the pest can multiply very rapidly.

No satisfactory methods have been yet discovered to control this fly under Hawaiian conditions.—*V. G. J.*

Mesopotamia, Vegetation of. Anon. (*Irish Gard.* 13, p. 183; Dec. 1918).—Notes on the plants grown by Arabs, both vegetables and flowers.—*F. J. C.*

Millipedes, Preliminary Notes on Control of, under Sash. By J. Horsfall and J. R. Eyer (*Journ. Econ. Entom.* vol. xiv. pp. 269–272, June 1921).—The experiments were conducted with seedling lettuce. Sodium cyanide applied at the rate of 150 lb. an acre, in furrows and covered with soil one week before seeding, resulted in comparatively perfect stands of lettuce.

Nicotine sulphate (½ per cent.) sprinkled on a newly seeded bed also compared favourably with the control plots. Poison bait was satisfactory in the spring, but failed as a protection in the autumn. The best formula was:

2 pecks bran, ½–1 pt. molasses, 2 oz. sodium arsenite and water sufficient to make a mash.—*G. W. G.*

Mosquito Control in a Southern Army Camp. By S. M. Dohaman (*Jour. Econ. Entom.* vol. xiii. pp. 350–354; 3 plates; Aug. 1920).—The paper deals only with mosquito control in a large camp, south-west of San Antonio city, Texas.

The best admixture of oils for spraying pools and all apparent dangerous sources of mosquitos was found to be a combination of crude oil (70 per cent.) and kerosene oil (30 per cent.), pending the adoption of more permanent control measures. It is interesting to note that one of the duties of the camp entomologist was to collect bi-weekly specimens of mosquitos found in the camp, which were sent to the Army Medical Museum, Washington, for a study of the relation between disease-carrying mosquitos and local prevailing diseases. The treatment of a sluggish creek close to the camp is fully dealt with and illustrated. A system of drip oiling from a 50-gallon drum, fixed so that ripples caused by a large stone thoroughly dissipated the oil and distributed it to the sides rather than the centre of the stream, was arranged for during operations. Close attention here was necessary so as to secure efficient oiling without killing the top-minnows present in the creek. A central channel was cut along the entire length of the creek and graded so as to ensure a steady flow and not leave undrained pools; and the work was eventually completed by turfing the banks so as to withstand washouts by the heaviest rains.—*G. W. G.*

Mutations: Mass Mutations and Twin Hybrids of Oenothera grandiflora Ait. By Hugo De Vries (*Bot. Gaz.* vol. lxv. No. 5, May 1918, pp. 377–422); 6 figs.).—*Oenothera grandiflora* Aiton from Castleberry, Alabama, splits in every generation into two types, one resembles the parent plant, the other consists of weak, yellow individuals, of which only a few are vigorous enough to flower and ripen their seeds. This latter is called *O. grandiflora* mut. *ochracea*. As the result of experiments in crossing and in combination with the occurrence of about 25 per cent. of barren grains amongst the seeds, De Vries arrived at the conclusion that the yearly production of large numbers of *hracea* is a phenomenon of mass mutation, due to an initial mutation of the ordinary type, followed by secondary mutation in the succeeding generations.

Certain crosses led to the production of twin hybrids, which may be considered a consequence of the mass mutation, the mutated gametes producing one of the twins and the typical sexual cells the other.—*R. J. L.*

Nicotine Dusts, Notes on the Use of. By A. W. Morrill (*Journ. Econ. Entom.* vol. xiv. pp. 394–400, Oct. 1921).—The author comments on the striking variations in the efficiency of nicotine dusts under similar conditions; showing that the factors inducing the variations are not yet understood.—*G. W. G.*

Nicotine and Nicotine Combinations, Some Results with, in Experiments on the Control of Laspeyresia molesta, Busch. By L. A. Stearns (*Jour. Econ. Entom.* vol. xiii. pp. 364–367; Aug. 1920).—The results of the previous season's investigations had emphasized the necessity of increasing the spreading and sticking powers of the insecticides used, on account of the habit of this insect depositing its eggs on the under surface of leaves. For this purpose sea moss solution (prepared by boiling 4 lb. of Irish rock moss for one hour, straining and diluting to 50 gallons of water), and a casein-lime mixture (1 part casein to 3 parts hydrated lime, adding water at the rate of 50 gallons to 1 lb. of the admixture), were found to fulfil the requirements. The conclusions drawn from detailed laboratory experiments and limited field tests suggest the use of nicotine sulphate 40 per cent. diluted, 1 part to 800 parts of water, either alone as an ovicide or in combination with an arsenical near the time of hatching, or, better still, on the day the eggs were laid. Apparently nicotine sulphate and sea moss, with or without the addition of arsenate of lime powder ($\frac{1}{2}$ lb. to 50 gallons) secured a percentage efficiency for the spray of 80 per cent.—*G. W. G.*

Nodule Bacteria in Leguminous Plants. By F. Löhnis and R. Hansen (*U.S.A. Jour. Agr. Res.* xx. No. 7, Jan. 1921, pp. 543–556; 2 plates).—The nodule bacteria are divided into two groups. The first group shows all the features characteristic of *B. radicicola* (Berijerinck). It is peritrichic, grows rapidly upon agar and causes milk to change; it forms nodules on roots of clover, sweet-clover, alfalfa, vetch, pea, navy bean, lupin, black locust, Amorpha, and Strophostyles.

The second group has monotrichic flagellation, very slow growth on agar, no marked change in milk. It is found on cowpea, soya bean, pea nut, Acacia, Genista, and Cassia. From this characteristic it should be named *Pseudomonas japonica*, or *Bacterium japonicum* (Kirchner), but the authors do not advocate this because its life-history is incompletely known.

B. radicicola is closely related to *B. radiobacter*, which last appears to be usually present in nodules of leguminous plants; but if grown on potato, *B. radiobacter* can be easily distinguished by its brown growth from *B. radicicola.*

A short bibliography is appended.—*A. B.*

Oil Sprays, The Results of Using, for the Control of the Fruit-tree Leaf-roller in the Pajaro Valley, California. By Donald D. Penny (*Journ. Econ. Entom.* vol. xiv. pp. 428–433, Oct. 1921).—The variable results obtained by oil-spraying for leaf-roller (*Archips argyrospila* Walker) control, suggested to the author that the different kinds of oils used might be one of the factors responsible.

Experiments were conducted, therefore, with different emulsions of oils referred to as those of an Eastern or paraffin type, and oils of a Western or asphaltum origin.

All the emulsions were prepared with 2·5 per cent. of cresol soap.

The best control in all cases was obtained with the crude-oil emulsions. All the egg masses on apple shoots were destroyed by spraying with 10 per cent. Pennsylvania crude oil and Pennsylvania gas oil; whereas figures closely comparable with the checks were obtained by the use of a 10 per cent. and 15 per cent. emulsion of Western Shell distillate and several miscible oil washes used.

G. W. G.

Onion Smudge. By J. C. Walker (*U.S.A. Jour. Agr. Res.* xx. No. 9, Feb. 1921, pp. 685–722; 6 plates).—Smudge is a common disease of onions, both in the field and in store. It is confined to the bulbs, and is characterized by black spots on the outer scales. It is most common on the white varieties of onions, and was ascribed to *Vermicularia circinans* Berkeley, but the author suggests that it should be termed *Colletotrichum circinans* (Berk.) Voglino, because of its subcuticular stroma and well-defined acervulus. Details are given of its characteristic growth on culture media and the conditions for germination of the conidia in the field. Control measures include protection of the harvested crop from rain, thorough and rapid curing, and well ventilated storage at 33° to 36° F.

A short bibliography is appended.—*A. B.*

Orchard-dusting versus Spraying. By N. J. Giddings (*Journ. Econ. Entom.* vol. xiv. pp. 225–238; April 1921).—This paper is one of a series read at a joint meeting of the American Association of Economic Entomologists and the American Phytopathological Society to consider "dusting as a means of

controlling injurious insects and plant-diseases." The general conclusions reached were that dusting is still largely in the experimental stage, and at present should be used as a supplementary control rather than a substitute for spraying; or as a means of control where spraying, for some reason, is not readily practicable. The difficulties attendant on and the value of dusting vary from year to year; and the greatest benefit has so far been obtained in hot and dry seasons. The need for more efficient dusting machinery is frequently emphasized.

The various admixtures for dusting referred to are: Air-slaked lime; lime-sulphur and nicotine (0·5 to 3 per cent.); sulphur, lead arsenate, nicotine sulphate, and powdered tobacco; sulphur and lead arsenate alone; copper-lime (20 per cent. dehydrated copper sulphate and 2 per cent. copper carbonate); Bordeaux mixture dust and hydrated lime; lime-sulphur and sulphur dust; copper-lime and arsenate of lead; nicotine, kaolin, and ground stone lime.

G. W. G.

Orchard Trees, Beetles attacking. By W. W. Froggatt (*Agr. Gaz. N.S.W.* xxxi. pp. 421–426; 6 figs.).—The Shining Green Cockchafer (*Anaplognathus chloropyrus*) damages the foliage of orchard trees, and the larvæ of *A. analis* devours the roots of strawberry plants. The White Striped Weevil (*Perperus insularis*) not only eats the leaves, but also attacks the bark of small citrus trees. An inverted funnel of stiff oiled paper fixed round the tree stem forms a useful trap for these pests. They can be collected and destroyed every morning.

The Pitted Apple Beetle (*Geloptera porosa*) disfigures apples by biting through their skin. This beetle and the *Perperus* can be caught in sheets spread under the trees, if the branches are tapped or shaken in the early morning, when the torpid beetles fall to the ground.—*S. E. W.*

Peach Growing in New South Wales. By W. J. Allen (*Agr. Gaz. N.S.W.* xxxi. pp. 127–133; 2 figs.).—Cling-stone peaches are preferred in canneries, and such varieties as 'Tuscan Cling,' 'Pelora,' 'Sims,' 'Phillip's Cling,' 'Golden Queen,' 'Goodman's Choice,' 'Pullar's Cling Golddust,' and 'Selima' are recommended for growing in New South Wales. The trees are planted 20 feet apart in situations protected from strong winds and severe frosts. A light loamy well-drained soil is desirable.—*S. E. W.*

Peach Tree Borer, Use of Toxic Gases as a Possible Means of Control of the. By E. B. Blakeslee (*U.S.A. Dep. Agr., Bull.* 796, October 1919; 1 plate).—Of the various volatile compounds tested, paradichlorobenzene has been by far the most promising. While well known chemically, its value as an insecticide is of recent discovery.

It is a crystalline solid at ordinary temperatures, insoluble in water, melting at 53°C., and boiling at 172°C.

For six to fifteen year old trees of average size, doses of 1 ounce to a tree have been found effective in destroying borers without injury to the trees.

The use of paradichorobenzene has been found to reduce the infestation on the average from 6·77 to 0·41–0·36 larvæ a tree, approximately a 94 per cent. control.—*V. G. J.*

Peach Worm, The Striped. By H. G. Ingerson (*U.S.A. Dep. Agr., Bull.* 599, March 1918; 4 plates).—The occurrence of this pest may be so local as to permit of the cutting out of the infested branches or terminals, and it will probably not occur in large enough numbers to cause much damage in orchards that are sprayed regularly with arsenicals. Should, however, the numbers warrant spraying, a single application of arsenate of lead paste, 2 lb. to 50 gallons of water, to which 2 lb. fresh slaked lime is added, applied when the first webbing of the leaves appears will satisfactorily control this insect.—*V. G. J.*

Pear Cross-fertilization. By E. Wallis, "Pear-growing in Victoria" (*Jour. Dep. Agr., Vict.* Mar. 1920, pp. 149–158).—The Kieffer variety is perhaps the most noted self-sterile variety grown in Victoria; planted alone, it absolutely failed to bear crops. In 1910–11, in cross-fertilization trials with four other varieties of Pear, good crops were obtained, each of the varieties proving equally effective as a cross. Branches of blossom of the other varieties were placed in the centres of Kieffer trees in vessels containing water. Over-blossoming may prevent a tree being fruitful, but in some varieties there appears to be a natural abhorrence to self-fertilization. Other factors influencing the fertilization of the blossoms are: fine sunny days during blooming time, and the presence of bees and other insects. Some sixty varieties of Pears are classified as early, intermediate, and late bloomers, and, to get the best effect from inter-pollination, it is advised to plant together those varieties that blossom at the same time, and avoid planting early flowering and late flowering together, placing the best commercial varieties first.

Early Flowering.—Beurré d'Anjou, Beurré Clairgeau, Harrington's Victoria, Howell, Kieffer, Lawrence, Bakehouse's Bergamot, Brockworth Park, Citron des Carmes, Easter Beurré, Forelle, Garber's Hybrid, Le Conte, Maréchal de la Cour, Monchallard, Poire de Berriays, St. Michael Archangel.

Intermediate Flowering.—Beurré de Capiaumont, Black Achan, Clapp's Favourite, Doyenné Boussock, Doyenné du Comice, Durondeau, Gansell's Bergamot, Glou Morceau, Joséphine de Malines, Madame Cole, Packham's Triumph, Souvenir du Congrès, Vicar of Winkfield, Winter Cole, Winter Nelis; Beurré Giffard, Beurré Diel, Beurré Hardy, Brown Beurré, Brown Windsor, Catillac, Cole's Hybrid, Elizabeth Cole, Fertility, Flemish Beauty, Golden Beurré, Idaho, Jargonelle, Urbaniste, Lady Lynn, L'Inconnue, Louise Bonne of Jersey, Mount Vernon, Napoleon, Neverfail, Pitmaston Duchess, Summer Bon Chrétien, Swan's Orange, Uvedale's St. Germain.

Late Flowering.—Beurré Bosc, Broompark, Marie Louise, Williams' Bon Chrétien, Autumn Bergamot, Bailey's Bergamot, Beurré Bosc, Laffer's Bergamot.

The average time the different varieties were in blossom was found to be twelve to eighteen days, and, from first flowers to full bloom, six to twelve days.—*C. H. H.*

Pear Tree Stock. By E. Wallis in "Pear-Growing in Victoria" (*Jour. Dep. Agr., Vict.* Nov. 1919, p. 660).—To avoid stock which suckers, it is recommended to select seed from the Oriental type of pear, such as Kieffer, a hybrid of the Chinese Sand pear, which produces seedlings of thrifty growth and clean stem. Broompark also produces a good stock, but Kieffer seedlings are generally the most suitable.—*C. H. H.*

Pears and Apples, Ripening of, as Modified by Extreme Temperatures. By E. L. Overholser and R. H. Taylor (*Bot. Gaz.* lxix. No. 4, April 1920, pp. 273–296).—The following summary of results is given :—

1. When contrasted with temperatures between 70 and 85° F., temperatures of 87·7 to 110° F. caused an appreciable delay in the ripening of green first-crop Bartlett pears.

2. The retardation of ripening was directly proportional to the increased degree of heat within the limits of 87° and 104° F.

3. The amount of delay in ripening of green first-crop Bartlett pears of the different temperatures when contrasted with 70° F., or room temperature, was as follows: 85° F., no retardation; 87·7° F., 5 days; 94° and 104° F., 13 days.

4. Second-crop Bartlett pears, placed at a temperature of 101° F. and surrounded by a relative humidity of below 50 per cent., remained unripe 4 weeks after similar pears had become fully ripe at room temperature and humidity.

5. The relative humidity does not seem to be a significant factor in checking the ripening processes. Its effect is in lessening or permitting wilting, depending upon whether the relative humidity surrounding the fruit is high or low.

6. The flavour of the pears subjected to those temperatures higher than 85° F. was not normal. There was a slight acidity, and the sweetish taste and juiciness were lacking.

7. Temperatures above 110° F. result in a more rapid ripening and consequent breakdown of the tissue than do any of the lower temperatures, down to average room temperatures.

8. As would be expected, there was a comparatively large loss from rot with the fruit kept at high temperatures and surrounded by high relative humidity.

9. A possible explanation of the effects of high temperatures may lie in the influence upon the enzymes. Temperatures approaching the probable minimum (around 28° F.) on the one hand, and the probable maximum (around 110° F.) on the other, might result in a reduction of enzymatic activities of the fruit, and a consequent retardation of the ripening processes; while with the optimum temperatures (70–85° F.) the enzymatic activity would be most marked, and hence the ripening most rapid.

10. If the Bartlett pears have nearly reached a stage of complete ripeness, the temperatures above 70° F. do not check the ripening process. On the other hand, the ripening and breakdown are more rapid with each appreciable rise in temperature.

11. Unripe Easter pears behave in a manner comparable to the Bartlett when placed under similar conditions of high temperature and relative humidity.

12. The process of ripening with yellow Newtown apples is not delayed by temperatures above 32° F. The ripening takes place with increased rapidity with each appreciable rise in temperature above 32° F. This is true with temperatures up to a point which result in the disorganization of the protoplasmic contents of the cells.

13. The experiments suggest that with an excessively hot season during the time of ripening, Bartlett and Easter and possibly other pears might be allowed to remain on the trees somewhat longer than with a normal season.

14. For yellow Newtown, and no doubt other varieties of apples, which are to be stored any length of time, the necessity of quickly cooling after harvesting is emphasized.—*R. J. L.*

Pears, Bartlett, Ripening and Storage of. By J. R. Magness (*U.S. Jour. Agr. Res.* xix. No. 10, Aug. 1920, pp. 473–500).—Physiological studies in the development, ripening, and storage of the Bartlett Pear show that the factors involved are different from those concerned in the handling of other fruits. These pears are not usually allowed to ripen on the tree, but are picked when they attain a suitable size, and then are allowed to become yellow and soft in storage. Under proper conditions of picking, handling, and storage, Bartlett Pears can be kept in good condition for two or three months.

There is a marked and uniform increase in the total sugar in Bartlett Pears from early summer until after the commencement of the picking season. This increase is due to sucrose in the latter part of the season, and to reducing sugar in the earlier part of the season. A definite relationship exists between the total amount of sugar in ripe fruit and the temperature of the storage shed. Pears ripened at 70° F. have the highest percentage, those ripened at 40° F. the lowest, while those held at 30° F. for six to fourteen weeks, and then ripened at room temperature, are intermediate in amount of total sugar. The percentage of acid in the fruit decreased as the season advanced in Californian fruits, but increased in fruits from Oregon and Washington States. There was an increase in acid between time of picking and time of full ripening of the fruit at 70° F. There was much less acid in fruit ripened at 40° than that ripened at 70° F. The acid content of fruit left to ripen on the tree was nearly constant. There was a progressive reduction in the alcohol-insoluble, acid-hydrolyzable reducing material as the season advanced. The percentage of total solids is lowest at the opening of the commercial season. A short bibliography is appended.—*A. B.*

Physiological Isolation by Low Temperature in Bryophyllum. By C. M. Child and A. W. Bellamy (*Bot. Gaz.* lxx. No. 4, Oct. 1920, pp. 249–267; 6 figs.).—The cooling of a zone of the petiole of the Bryophyllum leaf to a temperature of 2·5 to 4° C. for a few days is a very effective means of inducing the outgrowth of the leaf buds. Usually the opposite leaf, and often leaves of adjoining nodes, also show more or less development. The passage of fluids to the leaf is not appreciably interfered with by the cooled zone; therefore it seems improbable that physiological isolation of the leaf can be due to the blocking of passage of inhibiting substances transported in these fluids.—*R. J. L.*

Pickles, Chutneys, Sauces, The Making of. By Miss A. Knight, Fruit Preserving Expert (*Jour. Dep. Agr., Vict.* Jan. 1920, pp. 34–48).—A useful well-illustrated article on making pickles, sweet spiced fruit, chutney, tomato sauce, mushroom and walnut ketchup, aromatized vinegars, and drying herbs for home use.—*C. H. H.*

Pine, Western, Bark-Beetle, The. By W. J. Chamberlin (*U.S.A. Exp. Stn., Oregon, Bull.* 172, June 1920; 4 plates, 4 figs.).—Timber owners in Oregon are annually losing thousands of dollars through the depredations of timber-killing beetles. The most serious losses at the present time are in Jackson, Klamath, and Lake counties, where the loss due to the work of the Western Pine-bark beetle (*Dendroctonus brevicomis* Lee) during the past season amounted to some $200,000.

This bulletin is a brief summary of present knowledge of the biology and methods for the control of this pest.—*V. G. J.*

Pinus sylvestris, Fastigiate. By Prof. Henry (*Irish Gard.* 13, p. 161; Nov. 1918).—Figures of several fastigiate trees of the common Scots pine are given with notes. Successful grafting on spruce is recorded.—*F. J. C.*

Plant-Growth, The Effect of Cold in Stimulating. By Fred V. Coville (*U.S.A. Jour. Agr. Res.* xx. No. 2, Oct. 1920, pp. 151–160; 16 plates).—In regions having a cold winter, native trees and shrubs become dormant in autumn. It is thought that this condition was brought about by the cold, and that new growth in the spring is due entirely to the warmer weather. The author by a series of experiments finds, however, that cold tends to stimulate rather than to retard growth, and bases his conclusions upon the following evidence:

1. Trees and shrubs of cold climates become dormant at the end of the growing season without the necessity of exposure to cold weather.

2. Trees and shrubs which are kept continuously warm during the winter start into growth much later in spring than those subjected to a period of chilling.

3. The stimulating effect of cold is limited to such portions of the plants subject to the chilling.

4. The stimulating effect on dormant plants by cold is intimately associated with the transformation of stored starch into sugar. The author suggests that, in the process of chilling, the starch grains are separated by the living cell from the enzyme, which would act upon it and convert it into sugar; but when the plant is chilled the vitality of the cell is weakened, so that contact between the starch and the enzyme takes place and converts it into sugar.

5. The twigs of trees and shrubs after their winter chilling and the transformation of their starch into sugar may be regarded as mechanisms for the development of high osmotic pressures which cause the plant to grow. The dormancy before winter and during winter are protective adaptations of vital necessity to the native trees and shrubs. This principle of chilling is essential to an understanding of plant breeding and propagation.—*A. B.*

Plum, Mealy Aphis, Life-history and Habits of the. By W. M. Davidson (*U.S.A. Dep. Agr., Bull.* 774, April 1919; 2 plates).—The mealy plum aphis (*Hyalopterus arundinis* Fab.) is a pest of plums, prunes, and, to some extent, apricots in California. Besides devitalizing the trees it causes small fruit, and is probably concerned in a measure with apical cracking of prunes.—*V. G. J.*

Poison Gas for Pest Extermination (*Agr. Gaz. N.S.W.* xxxi. pp. 13–15).—Rabbits can be exterminated by means of phosgene gas, which is conveyed into the burrows by pipes from cylinders of the gas. It is also suggested that flying foxes may be destroyed by projecting the gas upwards to their sleeping lairs. On account of its destructive action on crops and animals the operation must be conducted with the greatest precautions.—*S. E. W.*

Poplar Longhorn, The Large, Saperda Carcharias Linn., **The Structure, Bionomics and Economic Importance of.** By W. Ritchie (*Ann. App. Biol.* vii. Nos. 2–3, pp. 299–343; 25 figs., 3 plates).—A very complete account of the life-history of this serious pest of forest trees.

In the larval stage this insect does an immense amount of damage by boring in the stems, and occasionally tunnelling into side branches; while the adults feed upon the leaves.

Several species of Poplar are recorded as hosts for this beetle, but the Aspen, *Populus tremula*, is the commonest.

Detailed descriptions are given of the egg, larva, pupa, and adults.

The remedies recommended are (1) to cut and burn all infected trees by the end of June each year, before the beetles begin to emerge; (2) when the adults are present, easily determined by the cutting of the leaves of the host plant, they should be sought out and collected; and (3) in the case of park trees, oviposition may be prevented by ensheathing the lowermost portions of the stems, about 1½ feet above the level of the ground, with close mesh netting, or by painting the trunks with a repellent wash.

The only natural enemy found was an Ichneumonid larva, which attacks the Saperda larva while boring the horizontal portion of its gallery.—*G. F. W.*

Potassium Cyanide for Trapping Fruit Flies. By A. A. Ramsay (*Agr. Gaz. N.S.W.* xxxi. pp. 821, 822).—Aqueous solutions of potassium cyanide decompose more rapidly when exposed to light than in the shade. As a one per cent. solution is decomposed in eight days, it should be renewed twice a week to be efficient.—*S. E. W.*

Potato, "Blackleg" Disease of. By E. F. Artschwager (*U.S.A. Jour. Agr. Res.* xx. No. 4, Nov. 1920, pp. 325–330; 2 plates).—Blackleg is a bacterial disease affecting the underground stem and tubers of the potato, and has been described by Appel, Smith, and Morse. Typically, the attacked stem may show blackening above the ground for some inches, the foliage is discoloured, usually light, with a metallic lustre. In the latter stages of the disease the whole plant turns brown and decays away.

The histological changes consist in a great increase of strongly lignified vascular tissue and transformation of pith and cortex into sclereids. Protein crystals are also formed in leaves, stems, and tubers. These changes have been observed only in diseased plants grown in the arid western sections of Colorado. Possibly in other parts of the U.S. diseased plants will not show these anatomical changes.—*A. B.*

Potato: Effects of Rest and No-Rest Periods upon Growth of Solanum. By W. F. Gericke (*Bot. Gaz.* vol. lxv. No. 4, April 1918, pp. 344–353).—The author investigated the effect of various rest periods of the tuber upon the subsequent growth of the plants. He found:

(1) That after-ripening processes in the potato occurred whether the tubers were in the ground or in ordinary storage.

(2) Potatos planted immediately after the maturation of a crop required a much longer period for the germination of the buds and the appearance of the plants above ground than did potatos that had a rest period.

(3) The no-rest period tubers, when planted, produced one-stalked plants, indicating the germination and growth of one bud.

(4) Plants grown from the no-rest period tubers had a longer growing period than did plants grown from the normal rest period tubers.

(5) Most of the seed tubers of the no-rest series plants were recovered. These potatos had lost very little in weight. When these tubers were planted the second time, germination and growth of several buds ensued. The plants appeared above ground in about the same time as the plants of the normal rest period tubers. The growing period of the no-rest period plants in the second planting was nearly equal to that of their first planting.—*R. J. L.*

Potato, Mosaic Disease of the, and its Transmission. By E. S. Schultz and D. Folsom (*U.S. Jour. Agr. Res.* xix. No. 7, July 1920, pp. 315–337 ; 8 plates).—It has been previously shown that mosaic disease of the potato is a transmissible disease. There may be great variation in the severity of the symptoms shown by the progeny of a given stock, strain or tuber. The authors show that transmission of the mosaic disease can be done by means of tubers, grafting, plant juice and aphides under field conditions. Infection was obtained by intervarietal transfer of juice. It was apparently impossible for the infected plants to recover. Isolation of plants by means of insect cages, as well as elimination of insects, have maintained stocks disease-free, indicating that control of aphides, and possibly of some other kinds of insects, are the most important means of checking the spread of the mosaic disease amongst susceptible varieties.—*A. B.*

Potato Rot Diseases and Temperature Relations. By H. A. Edsom and M. Shapovalov (*U.S. Jour. Agr. Res.* xviii. No. 10, Feb. 1920, pp. 511–524 ; 9 figures).—Plant pathologists are well aware that certain parasitic organisms which seriously injure growing crops in one latitude remain harmless in another. It is reasonable to assume that temperature may greatly influence the occurrence of these parasites. It was found that a certain degree of correlation exists between the temperature relations of some potato fungi in pure cultures and their geographical distribution and seasonal occurrence. This correlation is particularly striking in wilt-producing fungi, *Fusarium oxysporum* and *Verticillium albo-atrum.* A temperature of 40° F. will hold Fusarium rots on tubers in check during storage, while the susceptibility of *V. albo-atrum* to high temperatures suggests the possibility of heat treatment for infected seed-tubers. It is suggested that temperature tests in certain cases may serve as a useful supplementary method for identification of fungi showing contrasting thermal relationships.—*A. B.*

Potato Spraying, Exreriments on the Control of the Pink and Green Aphid. By Loren B. Smith (*U.S.A. Dep. Agr., Va., Truck Exp. Stn., Bull.* 29, Oct. 1919 ; 1 fig.).—The spring crops of Potatos are usually infested with this aphis (*Macrosiphum solanifolii* Ashmead) within two or three weeks after they come through the soil ; the leaves curl and drop off, and a serious loss of crops is experienced. Nicotine sulphate and fish-oil soap are used as spraying material. Spraying must be thorough, and a hard, driving spray is best. A machine that will maintain at least 150 lb. pressure is the most economical to use.—*V. G. J.*

Potato Tuber Moth, The. By J. E. Graf (*U.S.A. Dep. of Agr., Bull.* 427, Feb. 6, 1917, pp. 1–56 ; 45 figs., with 1 map).—A full account of the life-history, habits, and probable source are given of *Phthorimoea operculella* Zell., together with a bibliography.

The earliest records are in 1854 from New Zealand and Tasmania, but no parasites are known in those countries, whereas in America there are, at least, ten parasites of this moth. They are described and figured in this paper. The damage consists of mining leaves, petioles, stems, and tubers.

Preventive measures are (1) good farming, (2) leaving no tubers exposed, and (3) harvesting and marketing tubers as rapidly as possible. If the tubers are infested fumigate with carbon bisulphide, 2 lb. to 1,000 cubit ft. of space for forty-eight hours.—*G. F. W.*

Queen Bees, The Problem of Controlled Fertilisation of. By L. V. France (*Journ. Econ. Entom.* vol. xiv. pp. 105–110 ; Feb. 1921).—The idea of controlling the making of queen bees, which, as is well known, normally takes place in mid-air during the nuptial flight, has long been the dream of beekeepers.

It is frequently found that a few colonies surpass all the others in honey production, gentleness, comb-building, resistance to disease, general hardiness, and length of life; but, owing to the inability to select the drone, these and similar desirable qualities may not be perpetuated.

Numerous experiments in artificial mating have been tried since about 1870, but with small success. Cages of varying size up to 30 ft. high by 30 ft. in diameter in which selected drones and queens are released, have only partially succeeded. The only feasible plan for mating queens with select drones, according to E. R. Root, is to prevent the escape of drones other than select drones, by placing zinc over the entrances of all colonies not having choice drones, leaving only select drones the freedom of the air.—*G. W. G.*

Razoumofskya, Experimental Investigations on the Genus. By James R. Weir (*Bot. Gaz.* vol. lxvi. No. 1, July 1918, pp. 1–31; 19 figs.).—Culture experiments carried out by the writer show that many of the characters employed in the classification of the false mistletos vary with such factors as change of host, geographical location, and environment. "This indicates that only the broader and plainly evident lines of demarcation should be employed in their classification."

Attention is drawn to the danger of introducing the following parasites into Europe:—

(1) *Razoumofskya campylopoda*, infecting *Pinus resinosa*, *P. sylvestris*, and *P. montana*.

(2) *R. laricis* parasitic upon *Larix europea*, *L. leptolepis*, *Abies grandis*, *Pinus ponderosa*, and *P. contorta*. These are new hosts for this species, with the exception of the last. This parasite is only of economic importance at present upon *Larix occidentalis*.

(3) *R. americana* is of importance only on *Pinus contorta* and *P. Banksiana*. It will infect *P. montana*, hence its importance to European forests.—*R. J. L.*

Red Spider (Genera Tetranychus and Oligonychus), Revision of the English Species of. By S. Hirst (*Proc. Zool. Soc.* London, 1920, pp. 49–60; 5 figs.).—A short account of the native species of plant mites, better known as Red Spider. Keys are given to the two genera mentioned, and to the species—8 species of Tetranychus and 3 species of Oligonychus. The most important species from an economic point of view are *T. telarius*, the well-known Red Spider of carnations, peaches, melons, cucumbers, etc., and *O. ulmi*, whose host plants are apples, pears, plums, etc.

This latter has been a serious pest of apples in most counties during the exceptionally hot summer of 1921.—*G. F. W.*

Rhododendron ciliicalyx. By A. O. (*Irish Gard.* 14, p. 18, fig.; Feb. 1919).—Notes on this Chinese sp. as grown in the temperate house at Kew and in its wild habitat. Flowers 4 in. in diameter, white, with yellow blotch inside, and flushed rose without; very fragrant.—*F. J. C.*

Root-Cuttings and Chimaeras, II. By W. Bateson, M.A. (*Jour. Gen.* xi. p. 90; April 1921, plates).—Cases in which two dissimilar plants have been obtained from sister root-cuttings in Pelargonium, and Bouvardia are described. A variegated plant of *Spiraea Ulmaria*, quite sterile, has produced numerous buds upon its roots, but all have formed white shoots.—*F. J. C.*

Root Rot of Fruit Trees due to Armillaria mellea. By W. A. Birmingham (*Agr. Gaz. N.S.W.* xxxi. pp. 669–673; 4 figs.).—*Armillaria mellea* is a most destructive fungus, attacking the roots of trees. In its early stages its presence can only be recognized by examining the roots. It will then be found that the bark below the ground is rotten and can be peeled away, exposing the white fungus with black rhizomorphs running along the surface of the roots. In citrus trees the rhizomorph is firmly attached to the roots, but in apples and stone fruit it runs free. Spore-bearing toadstools may appear in autumn. The fungus spreads from the spores, from old stumps left in the ground, and from infected roots. It is difficult to cure, but in the early stages copper-sulphate-lime paste may be applied to the diseased roots.—*S. E. W.*

Root Variations induced by Carbon Dioxide Gas Additions to Soil. By H. A. Noyes, J. F. Trost, and L. Yoder (*Bot. Gaz.* vol. lxvi. No. 4, October 1918, pp. 364–373; 9 figs.).—Experiments were carried out by introducing carbon dioxide subterraneously into soil in Wagner pots. The effects of the gas varied with the different plants used, but a constant treatment of 650 c.c. of carbon dioxide per hour was apparently preventive of normal root development. "Decaying organic matter is held to be beneficial to growing plants. Cases have been cited by others where turning under immense amounts of green

material has hurt the land temporarily; therefore the results obtained in these experiments lead to the belief that the carbon dioxide content of garden soils is sometimes detrimental to the root development of some plants growing in the garden."

These investigations emphasize the equal importance of soil aëration with moisture and suitable temperature.—*R. J. L.*

Rose Midge, The. By E. R. Sasser (*U.S.A. Dep. Agr., Bull.* 778, May 1919; 2 figs.)—The Rose Midge (*Dasyneura rhodophaga* Cog.) often does considerable injury to roses grown under glass, but it can be controlled, if not completely eliminated, in a short time by the careful application of tobacco dust on the soil, and nightly fumigation with tobacco, in the form of stems, nicotine papers, or one of the volatile nicotine preparations.—*V. G. J.*

Seed Treatment, Pre-soak Method of. By H. Braun (*U.S. Jour. Agr. Res.* xix. July 1920, No. 8, pp. 363–392; 14 plates).—The widespread use of formalin and copper sulphate as germicides in seed treatment has often been attended by decreased and retarded germination. Experiments have shown that this detrimental effect can be avoided for standard varieties of wheat by soaking the seeds in water for six hours before treatment with formalin or copper sulphate. Soaking for ten minutes and covering for six hours (pre-soak method) is better than leaving in water for six hours before treatment. The saturation of the seed coat appears to be the factor counteracting the injurious effect upon germination. This acts by diluting the disinfectant as it diffuses into the tissues, and the author believes it to act as a stimulus to germination. The bacterial "black chaff" of wheat has been controlled by this method.—*A. B.*

Seedlings, Wheat, Effect of Lime upon Sodium Chloride, Tolerance of. By J. A. LeClerc and J. F. Breazeale (*U.S. Jour. Agr. Res.* xviii. No. 7, Jan. 1920, pp. 347–356; 10 plates).—The work here reported is a continuation of work in Bull. 149, "Bureau of Chemistry." In this the effect of lime upon soils which had become acid by continued use of potassium chloride or potassium sulphate was pointed out. The present work details the equally important *rôle* of lime upon salts occurring naturally in "alkali" soils. The higher tolerance to alkali salts shown by plants in soil and sand than by those grown in water cultures is not due entirely to the physical effect of presence of solid particles of differences in fineness, but is also due to certain soluble substances present in minute quantities. Very small amounts of calcium oxide and calcium sulphate can overcome the toxic effects of sodium chloride and sodium sulphate. Magnesium sulphate and barium chloride were slightly antagonistic to sodium chloride; but potassium chloride, sodium nitrate and sodium phosphate, ferric chloride and alum have no effect on the toxicity of sodium chloride.—*A. B.*

Seeds of Cereals, Treatment by Dry Heat of. By D. Atanasoff and A. G. Johnson (*U.S. Jour. Agr. Res.* xviii. No. 7, Jan. 1920, pp. 379–390; 2 plates).—In the investigation of control measures for certain seed-borne diseases of cereals which are not affected by the ordinary chemical and hot-water treatment, the authors found that dry heat was particularly adaptable. Various cereals—rye, wheat, barley, oats—when of good quality and well dried, are able to withstand protracted exposures to dry heat at comparatively high temperature. It is definitely shown that seed infections from bacterial blight of barley (*Bacterium translucens*), and that of oats (*Pseudomonas avenae*), may be eliminated by exposing the infected seeds to dry heat at temperatures which leave the seed viable. The results of the experiments show that a number of seed-borne fungoid diseases, *e.g.* Wheat scab (*Gibberella saubinetii, Fusarium* spp.), Leaf Blotch of Barley (*Helminthosporium sativum*), are particularly checked when the infected seeds are given the dry-heat treatment, and this without any injury to the germinating capacity of the seeds. A list of literature is appended.

A. B.

Slug, The Gray Garden, with Notes on Allied Forms. By A. L. Lovett and A. B. Black (*U.S.A. Exp. Stn., Oregon, Bull.* 170, June 1920; coloured plate, 14 figs.).—The garden slugs are voracious and omnivorous feeders, reproduce often, and in large numbers adapt themselves to all conditions, and maintain themselves against all odds. They have comparatively few natural enemies and are surprisingly resistant to poisons.

Calcium arsenate, 1 part by weight to 16 parts chopped lettuce, is readily eaten and is highly toxic to slugs. This, in conjunction with dry Bordeaux mixture dusted over the plants, has proved a satisfactory method of controlling the pest. The treatment may need to be repeated once or twice at seven to ten days' intervals until injury is reduced to a minimum.—*V. G. J.*

Soil Alkali, A Study of Methods of Determining. By D. W. Pittman (*U.S.A. Exp. Stn., Utah, Bull.* 170, August 1919; 8 figs.).—Reports some comparisons of different methods of testing alkali soils both as to results and relative variability, a study of some of the irregularities in the water-extraction method of testing for sodium carbonate, and a study of crop germination as an index of alkalinity.

A. P.

Soil, Cause of Chlorosis (lime-induced) and Availability of Iron in the. By P. L. Gile and J. O. Carrero (*U.S.A. Jour. Agr. Res.* xx. No. 1, Oct. 1920, pp. 33–62; 2 plates).—Soil surveys of cultivated plants show that a particular type of chlorosis occurs only on calcareous soils, and this appears to be due to the addition of carbonate of lime to soils producing normal calcifugous plants and causes these soils to produce chlorotic plants. From the analyses of the ash of chlorotic plants it would appear that a deficiency of iron in the ash is one cause of the chlorosis, and that excess of lime is another cause. Rice, a plant sensitive to lime, does not appear to be sensitive to the alkalinity of carbonate of lime except as this alkalinity influences the availability of iron in calcareous soils. Pure organic compounds of iron were not efficient sources of iron for rice plants in calcareous soils. Stable manure, and green manure when used in quantity, however, enabled the plant to secure more iron. The availability of iron in calcareous soils appears to be slightly greater near the optimum water content of the soil than at the higher percentages of water.—*A. B.*

Soils, Effect of Calcium Sulphate on the Solubility of. By M. M. McCool and C. C. Millar (*U.S. Jour. Agr. Res.* xix. No. 2, April 1920, pp. 47–54).—Six different soils were treated with a saturated solution of calcium sulphate. In one series of experiments, the mass was transferred to filter paper, permitted to drain, and then transferred to containers. The rate of formation of soluble substances was determined by the freezing-point method. This was found to increase the solubility of the soil considerably.

In another series, the amount of soluble material was reduced to a minimum by washing with distilled water, and the residuary effects of the treatment on solubility determined. The calcium sulphate treatment was found to have resulted in a very large increase in soluble substances.

Two soils of different texture and organic content were treated with a saturated solution of calcium sulphate, a decinormal solution of calcium phosphate, and a combination of the two. The soils were then washed and rate of formation of soluble salts determined. The calcium sulphate increased the solubility in each soil, while the calcium phosphate decreased the rate of formation of soluble substances. When the two substances were used together a neutral effect was produced.—*A. B.*

Soil Fauna of Agricultural Land, A Preliminary Survey of the. By P. Buckle (*Ann. App. Biol.* vol. viii. Nov. 1921, pp. 135–145).—This research was undertaken to ascertain whether (1) arable, (2) freshly broken-up pasture, and (3) permanent pasture lands each had a characteristic insect fauna, and the results indicate that they had.

(1) Arable land showed no characteristic fauna, but the predominant species were those found on pasture.

The difficulty of correct records is on account of the species of insects varying with the particular crop at the time.

(2) In freshly broken-up pasture land there is a corresponding increase in the fauna as vegetative growth increases.

(3) Permanent pasture land shows more stable distribution and number of soil fauna, which is accounted for by the fact that grassland bears a vegetative covering when there is little vegetation on arable land.

As there is no ploughing or working of the soil, which exposes insects to harsh climatic conditions and bird attack, the hibernation of species and the period of quiescence proceeds normally.

The difficulty in sampling is that dominant species are exaggerated, whilst rarer species may be overlooked, unless a very thorough survey is undertaken.

G. F. W.

Soil, Physical State of, Effect on Crop Growth and Season upon. By D. R. Hoagland and J. C. Martin (*U.S.A. Jour. Agr. Res.* xx. No. 5, Dec. 1920, pp. 397–404; 4 figures).—The physical state of certain soil constituents is influenced to a marked degree by the concentration of the soil solution. The colloidal state of the soil suspension undergoes significant alterations during the season. A large increase in colloidal matter is noted when the soil solution is

depleted as a result of adsorption of solutes by the plant. An extension of our knowledge of soil solution in all its dynamic aspects will lead to the greatest advance in knowledge of fertility of soils.—*A. B.*

Soil Solution and Soil Extract. By D. R. Hoagland, J. C. Martin, and G. R. Stewart (*U.S.A. Jour. Agr. Res.* xx. No. 5, Dec. 1920, pp. 381–396).—The composition and concentration of the soil solution undergoes very great alterations as a result of seasonal changes, crop growth, rainfall, bacteria etc. A soil extract is composed largely of solutes present in the soil solution plus substances dissolved from "adsorbed" or easily soluble components of the soil. This last fraction depends on the concentration and composition of the soil solution, since the solutes of the latter exert a depressing effect upon the solubility of certain soil constituents. A new method is suggested for indicating the relations between the chemical elements of the soil solution. Extracts were prepared which did not change appreciably in composition and concentration on contact with the soil. The consideration of the equilibra involved suggests that the ratios between most of the important elements are very similar in concentrated soil extracts and in the soil solution. Analyses of suitable soil extracts and determinations of freezing-points may frequently permit a calculation of the concentration and approximate composition of a soil solution. Various methods have been compared, and in seasonal studies extracts should be made with the smallest proportion of water to soil and the time of contact limited to that necessary for thorough admixture; 1 in 1, or 1 in 5 extracts are convenient and satisfactory. The soil solution fluctuates in composition and concentration with every environmental change and crop growth.

A short bibliography is appended.—*A. B.*

Soils, Temperature of Freezing. By Geo. Buoyoucos (*U.S.A. Jour. Agr. Res.* xx. No. 4, Nov. 1920, pp. 267–270).—The general impression is that when the temperature of soils falls slightly below 0°C. they freeze; that is, the soil moisture is converted into ice. In actual practice, however, it was discovered that it is almost impossible to freeze the soils when they are cooled only slightly below the freezing-point. They have to be cooled down at least 1° C. below their true freezing-point, and then vigorously agitated. The amounts of cooling that mineral soils are able to withstand without freezing is —4·2°C. and peats about —5°C. Possibly this difference is accounted for by the difference in the size of the soil particles. The ability of soils to resist freezing even when their temperature is much below the freezing-point throws new light on questions of temperatures of soils in cold seasons, and therefore upon the physical, chemical, and bacteriological processes going on in the soils in winter.—*A. B.*

Stock, Evolution of the Double. By Miss E. R. Sanders (*Jour. Gen.* xi. pp. 69–74; April 1921; figs.).—Notes the occurrence of twinned flowers in stocks, and accounts thereby for the statements that semi-double flowers occur at times.—*F. J. C.*

Strawberries. By A. J. Olney and C. W. Mathews (*U.S. Agr. Exp. Stn., Kentucky, Bull.* 216, pp. 67–94, illus.). By G. M. Darrow (*U.S. Dep. Agr., Eastern U.S. Farm. Bull.* 1028, 50 pp.; 18 figs.). By G. M. Darrow (*U.S. Dep. Agr., Western U.S. Farm. Bull.* 1027, 29 pp.; 16 figs.). By G. M. Darrow (*U.S. Dep. Agr., S. Atlantic and Gulf Coast Farm. Bull.*, 1026, 40 pp.; 21 figs.).—Describe the methods of growing strawberries in the different regions. The strawberry may be grown successfully upon almost any type of soil, provided it is well supplied with moisture and at the same time well drained.—*F. G. A.*

Tobacco, Fusarium-Wilt of. By J. Johnson (*U.S.A. Jour. Agr. Res.* xx. No. 7, Jan. 1921, pp. 515–536; 5 plates).—A disease of tobacco previously undescribed has been found to occur in Ohio and Maryland. It is characterized by yellowing and wilting of the foliage, the vascular system becoming brown or black. A species of Fusarium can be easily isolated from the discoloured area, and seedlings may be infected with this fungus. The organism appeared to be closely related to *Fusarium oxysporum* (Schlecht) Wr., but has some morphological and physiological differences. Infection has been secured with two strains of *F. oxysporum* from potato to tobacco, but not with tobacco strain on potato. The author suggests the name *F. oxysporum* var. *nicotianae*, n. var., for this organism. The conditions favouring infection are soil infectation, wounds in host, high soil temperature (28–31°C.), and a susceptible variety of tobacco. White Burley variety is most susceptible, while Havana Seed and Cuban varieties are amongst the most resistant. The most hopeful means of control is the development of non-susceptible varieties.

A short bibliography is appended.—*A. B.*

Tobacco Plants, Dipping, at Transplanting Time for the Control of the Tobacco Flea Beetle (*Epitrix parvula* Fabr.). By Z. P. Metcalf (*Jour. Econ. Entom.* vol. xiii. pp. 398–400; Oct. 1920).—It is pointed out that the flea beetle is most destructive just after transplanting. Dipping the plants in solutions of arsenate of lead at transplanting time was tried as a means of assisting the plant over this critical period, and it was found that 1 lb. of arsenate of lead powder to 10 gallons of water gave a total effectiveness of 78 per cent. In this connexion it is interesting to note the author's observation that the tobacco plant, when properly hardened off, will stand almost any quantity of arsenate of lead. Solutions as strong as 20 lb. to 50 gallons were used without appreciable injury to the plant.—*G. W. G.*

Tomato, Bacterial Spot of. By Max W. Gardner and James B. Kendrick (*U.S.A. Jour. Agr. Res.* xxi. No. 2, April 1921, pp. 123–156; 5 plates).—Bacterial spot of the Tomato is a typical spot disease of the fruits, stems, and leaves. Nearly all varieties of tomato are susceptible, and potatos and peppers may also be attacked. The disease was first reported in Tennessee, Illinois, and Michigan, and is caused by a monoflagellate bacterium known as *Bacterium exitiosum* n. sp. It grows readily on a variety of culture media producing yellow translucent colonies. It produces no gas or acid with carbohydrates, is highly sensitive to sunlight, and can resist prolonged desiccation. Foliage infection is by means of the stomata, but fruit infection by punctured wounds, and causes black scabs on skin of fruits. Leaf lesions are at first translucent, then become black and greasy with translucent margins, and are not usually confined to the veins. The organism winters on the surface of the tomato, and diseased fruits readily disseminate the bacteria. No effective control measures are yet known.

A bibliography is appended.—*A. B.*

Tomato, Collar Rot of. By F. J. Pritchard and W. S. Porte (*U.S.A. Jour. Agr. Res.* xxi. No. 3, May 1921, pp. 179–184; 5 plates).—A new disease of tomato seedlings which takes form of rotting and girdling of the stems at the surface of the soil has during the past three years caused heavy loss in the Eastern States. It is chiefly a seed-bed disease, and the symptoms are dark brown lesions on the stem near the ground, forming a kind of collar. The disease is attributed to *Macrosporium solani* by Rosenbaum, and to *Rhizoctonia* by Cook. The authors have, however, isolated a *Verticillium* which can also produce the typical symptoms of the disease.

In inoculation experiments with these fungi made by applying fresh cultures to uninjured stems or mixing them with the potted soil, *Verticillium lycopersici* and *Macrosporium solani* infected tomato seedlings equally, which *Rhizoctonia solani* produced a very few infections of a superficial nature. All three fungi produced typical collar rot lesions on stems of potato and horse nettles.—*A. B.*

Tomato, Insect Enemies and Diseases of. By F. H. Chittenden (*U.S.A. Dep. Agr., Circ.* 40, June 1919; 23 figs.).—The principal insect enemies are the cutworms, blister-beetles, flea-beetles, stalk-borers, plant lice, red spider and white fly. These can all be controlled by spraying in the usual manner with various well-tried remedies.

All diseases are of fungoid or bacterial origin, and can be successfully prevented in most cases by careful rotation of crops, planting resistant varieties, and judicious spraying with Bordeaux.—*V. G. J.*

Tomato Leaf-spot, Effect of Fertilizers and Lime upon. By F. J. Pritchard and W. S. Porte (*Phytopathology*, xi. pp. 433–445, Nov. 1921).—A discussion of results of other workers, and an account of experiments on leaf-spot of tomato, due to *Septoria lycopersici*. It is concluded that favourable conditions for growth increased susceptibility to infection and unfavourable conditions decreased it.—*F. J. C.*

Transplanting, An Investigation in. By J. C. Whitten (*Univ. of Missouri Agr. Exp. Stn., Res. Bull.* 33, January 1919).—At the Missouri Experimental Station fall planting hardy fruit trees and most hardy deciduous shrubs has given better results than spring planting, late fall planting giving better results than early fall. Late spring planting gave as good results as early spring, providing the trees were kept dormant until they were planted. Coniferous evergreens succeed best if transplanted just as their new growth is starting in the late spring. Early fall planted trees have begun root growth no earlier than those planted in late fall, and the earlier planted ones "dried out" more during fall and winter than did those planted later. Young apple trees having their branches pruned back in autumn make better growth the following season than do trees pruned back in spring, and this holds true whether or not the trees are transplanted. The tops of all young fruit trees should be pruned back at time of transplanting,

the degree of pruning differing with character and habit of growth of species. Garden vegetables, such as cabbages, tomatos, etc., will endure lower temperatures, droughts, etc. if grown more slowly in the forcing bed than is customary.—*A. N. R.*

Variegation in Chlorophytum. By E. J. Collins (*Journ. of Gen.* xii. pp. 1–18; April 1922; plates).—Discusses the heredity of variegation in seedlings of *Chlorophytum* where, according to the parts of the plant producing them, the seedlings may be green, white, or variegated, the variegation being often very disorderly, but, by a method which the author described, seedlings with such irregular variegation will often produce quite regular markings on the lateral shoots.—*F. J. C.*

Vegetables, Home Storage of. By James H. Beattie (*U.S.A. Dep. Agr., Bur. Pl. Ind., Farm. Bull.* 879, Aug. 1917; plates).—Directions for storing the surplus vegetables for winter consumption at home.

The best types of storage shed for the different crops and for different climates are described and illustrated, and instructions are given for making a frost- and vermin-proof structure in the basement of an ordinary dwelling-house. This last, of course, is only suitable to such produce as will not create an unpleasant smell through the house. Beans, pears, beets, late cabbages, carrots, celery, onions, parsnips, potatos sweet and Irish, pumpkins and squashes, salsify, late turnips and apples are the fruits and vegetables treated of.

Clamps of various kinds and underground or partly underground structures are also described.—*M. L. H.*

Vines, Planting of Grafted Resistant. By H. E. Laffer (*Agr. Gaz. N.S.W.* vol. xxx. pp. 501–504; 5 figs.).—As the Phylloxera resistant vine is more difficult to grow than the ordinary vine, careful attention must be given to the preparation of the soil some time before planting. It is subsoiled to a depth of 18 inches and superphosphate or bone-meal is mixed with the soil beneath the roots, and well-rotted manure may be added with advantage. Grafted vines are planted 12 inches deep, leaving 4 inches above the surface.

Ungrafted stock is either grafted one year after planting in early spring or "Yema" budded in autumn. The young vines are covered with a mound of earth, which is removed when the buds appear and the vine is cut back. The formation of scion roots must be prevented.—*S. E. W.*

Watering Pot Plants. By A. Petit (*Rev. Hort.* vol. xcii. p. 68).—Immersing flower-pots to half their depth in a vessel of water is advocated in preference to the use of the watering can, on the ground that it is more efficient, does not disturb the soil, and reduces the loss of nitrates.—*S. E. W.*

Weevils of the Genus Sitones injurious to Leguminous Crops in Britain, Bionomics of. By Dorothy J. Jackson (*Ann. App. Biol.* vii. Nos. 2–3, pp. 269–298; 6 figs., 5 plates).—An account of the life-history of *Sitones lineatus* together with descriptions of the egg, larva, pupa, and adult.

The experiments were carried out at Wye, Kent, and Ross-shire.

A key is given to the species of Sitones. Food plants consist of Peas, Beans, Lucerne, Medick, Tares, Wild Vetches, and all species of Clover, but the latter is not a favourite food plant if the others are obtainable.

From January to early April the weevils are hibernating amongst long grass, stubble etc., and in early spring migrate to Peas and Beans, very soon commencing to lay eggs.

Egg-laying continues until the death of the parent weevil, varying from the end of June to the end of August, according to the locality.

The eggs hatch in about three weeks, and the young larvæ become mature in about six or seven weeks, and are found feeding on the root nodules of Peas and Beans, the pupal stage lasting about three weeks. All the weevils emerge before the winter, except occasionally in Scotland, where the pupal stage is found in mid-winter.

There is only one generation in a year.

Natural enemies include poultry, and, according to Miss Ormerod, starlings.

Parasites comprise a mite, belonging to the genus Trombidium; three species of Braconidae, the commonest being *Perilitus nitilus*; and a fungus, *Botrytis bossiana*.—*G. F. W.*

White Fly, The Control of the Greenhouse. By Ll. Lloyd (*Ann. App. Biol.* ix. April 1922, pp. 1–32; 2 plates, 5 figs.).—A very complete survey of this well-known pest to tomato growers.

Asterochiton vaporariorum can survive out of doors in S. England during mild winters.

The nymphs depend on living foliage, so much so that they die if the leaf that

they are attached to dies ; and there is no migration from unsuitable to suitable hosts. Descriptions are given of the egg, nymphal and adult stages, together with the life-history. A list of food plants is given ; the most favoured being tomato, potato, cucumber, French beans, and marrow.

The remedies given are fumigation of market houses with hydrocyanic acid gas, using 1 oz. sodium cyanide (98 per cent.), 1½ oz. sulphuric acid, and 3 oz. water to 4,000 cubic feet.

This strength kills adults and nymphs, but not the eggs, so that a second fumigation must be performed some days later.

For conservatories and small houses, the use of tetrachlorethane is recommended, at the rate of ½ pint to 1,000 cubic feet for 24–36 hours, if possible.

G. F. W.

Wilting, Determination of. By Arthur L. Bakke (*Bot. Gaz.* vol. lxvi. No. 2, August 1918, pp. 81–114 ; 5 figs.).—The exact wilting point occurs when there is a serious rupture in the water columns of the plant.

" During the daily march of foliar transpiring power obtained by making consecutive hourly readings for twenty-four hours, the maximum is attained at a time previous to the greatest evaporation. During the time of approximate maximum evaporation there is a marked fall in the foliar transpiring power index, followed shortly by a rise. The ratio between the maximum and minimum is more or less definite, but not sufficiently so for the formation of any law. When the ratio is reduced to the point where it is in the neighbourhood of unity, the plant is in a state of intense incipient drying. When the maximum value does not exceed the usual minimum, the plant is in a soil environment which is critical from the point of water supply, or almost at its wilting coefficient. It is then merely a question of time before the plant wilts."

Although evaporation gives an increased transpiring power value, yet during the process of wilting, the index of foliar transpiring power comes to be independent of evaporation.

During the process of the march of wilting an equilibrium point is reached, where the indices of foliar transpiring power do not show much variation. It is suggested that the duration of the equilibrium gives a measure of the comparative drought resistance of different plants. Helianthus grown in 1915 during a rainy season was different from Helianthus grown during 1916, when the season was unusually dry. The equilibrium period of 1915 was much shorter than for 1916.

Older leaves wilt long before the younger ones. Stomatal movements are not important factors when the plant is in an intense state of wilting.—*R. J. L.*

Wireworms, On the Life-history of, of the Genus Agriotes, Esch., **with some Notes on that of Athous haemorrhoidalis,** F. By A. W. Rymer Roberts, M.A. (*Ann. Appl. Biol.* vol. vi. Nos. 2 and 3, Dec. 1919, pp. 116–135 ; plate and text figs.).—The paper represents the results obtained at Rothamsted Experimental Station in the biology and life-history of *Agriotes*, and leaves the results of research work to secure an adequate insecticide for control purposes for a future paper. Its general life-history and habits are dealt with in detail, and notes on the relative abundance of species in the British Isles are given. The larvæ feed on almost any crop, and apparently on many weeds apart from grasses, which are probably their original food plants. They can subsist for " very lengthy periods on no other food than humus and decaying vegetable matter." The great value of birds in reducing the number of wireworms is confirmed, and a suggestion is made that poultry might be run on newly ploughed grass land with advantage. Wireworms are apparently parasitized to some extent by insects and fungi. The article concludes with a reference table.—*R. C. S. R.*

Wireworms of the Genus Agriotes, with some notes on that of Athous haemorrhoidalis, On the Life-history of. By A. W. R. Roberts (*Ann. App. Biol.* vol. viii. Nos. 3–4, Nov. 1921, pp. 193–215 ; 4 figs., 1 plate).—A continuation of a paper which dealt with the Biology and Life-history of Agriotes in vol. vi. pp. 116–135.

The present paper gives minute descriptions of the Oval, Larval, and Pupal stages of *Agriotes obscurus* L.—*G. F. W.*

Wistaria venusta Rehder et Wilson. By J. Hutchinson (*Bot. Mag.* t. 8811 ; Sept. 1919).—This plant has been confused with both *W. sinensis* and *W. brachybotrys*, but is quite distinct in the soft covering of short hairs upon its leaves, the rather short and very wide racemes, with large flowers on stout velvety pedicels. The form grown in England (it made its first appearance from Japan at the International Exhibition of 1912) has white flowers, but coloured forms are known.—*F. J. C.*

Wittia panamensis Britton and Rose. By R. A. Rolfe (*Bot. Mag.* t. 8799, June 1919).—A plant intermediate in habit between *Phyllocactus* and *Epiphyllum* but with small purple flowers. It thrives in the succulent house at Kew.—*F. J. C.*

Wood for the Tropics, White-Ant-proof. By T. E. Snyder (*Journ. Econ. Entom.* vol. xiv. pp. 496–501, Dec. 1921).—A method for treating cabinet woods is impregnation with chlorinated naphthalene. This crystalline wax is used in open vats at a temperature of 220°–240°F., and 15 minutes' immersion for ½ inch wood renders it proof against white ants and moisture.

Soft woods over which ant-proof veneers could be glued can be satisfactorily treated with bichloride of mercury or zinc chloride. Construction timbers or timber in contact with the ground should be impregnated with coal-tar creosote, which is a permanent preventive against ants and fungus attacks.—*G. W. G.*

Woolly Aphid of the Apple and Elm, The. By F. V. Theobald (*Jour. Pom.*, II., ii. pp. 73–92; 1 fig., 5 plates).—The life-history of the woolly aphis, *Eriosoma lanigera* Hausmann, is here given. Its introduction into this country from America in 1796 is doubted, as it was known in Europe before this date.

A comparison is made between the life-history of the Aphides and of the sub-family, Eriosomatinæ.

There are four life cycles: (1) permanently on the apple above ground, (2) permanently on the apple below ground, (3) migration from root and stem, and (4) living in its original manner between its primary host, the Elm (*Ulmus campestris* and *U. montana*) and the apple.

It is spread by (1) the flight of the winged females, (2) wind carrying the wingless forms in the wool from tree to tree, and (3) by birds and insects carrying the insects on their bodies.

Remedies recommended are the application of "Tanglefoot" bands to prevent the migration from root to stem, as soil fumigants and insecticides have proved of little use. Nursery stock should be fumigated with hydrocyanic acid gas before it is dispatched.

A list of eighty-five varieties of apples is given, showing those (*a*) badly, (*b*) slightly, and (*c*) not attacked, of which there are only eight. Paradise stock is attacked worst, crab runs it close, Northern Spy and Winter Majetin are immune.

Natural enemies include the Blue and Great Tits, Tree Creeper, Chaffinch, Sparrow, larvæ of *Coccinella septempunctata*, and a Pipirya larva devouring the root form. In the Elm leaf stage, the parasites comprise Braconidæ, also Syrphidæ, Coccinellid larvæ, etc.—*G. F. W.*

Yellow-fever Mosquito in Ant Guards, Flower Vases, and Similar Containers, The Control of Breeding of. By Jas. Zerek (*Jour. Econ. Entom.* vol. xiii. pp. 344–350; Aug. 1920).—Not less than 2 grammes of paradichlorobenzene is recommended per litre of water in the container to prevent the breeding of mosquito larvæ therein; the application to be repeated at least every ten days. It should be added to the water in a powdered form. A similar quantity of powdered camphor gave equal results, but is more expensive. The deleterious action on the larvæ of *Stegomyia fasciata* (= *Aedes calopus*) is due to the heavy vapour gradually given off, which, resting on the surface of the water, is toxic to the larvæ when breathed by them. Apparently the objection to the use of a 2 per cent. solution of common salt, which Dr. J. W. Scott Macfie found to be effective, is its action on plants.—*G. W. G.*

MEMORIAL TO THE LATE MR. S. T. WRIGHT, V.M.H.

At the request of many exhibitors and others the Council of the Royal Horticultural Society has opened a fund to provide a memorial to the late Superintendent of the Gardens at Wisley, Mr. S. T. Wright, and it is proposed, if the amount subscribed is sufficient, that the memorial should take the form of an annuity for Mrs. Wright, and in any case that the fund should be for Mrs. Wright's benefit. Subscriptions for this fund will be thankfully received and gratefully acknowledged by either Mr. F. J. Chittenden, Director, The Roy.H.S. Gardens, Wisley, Ripley, Surrey, or Mr. F. Reader, R.H.S. Hall, Vincent Square, Westminster, S.W. 1.

EXTRACTS FROM THE PROCEEDINGS

OF THE

ROYAL HORTICULTURAL SOCIETY.

GENERAL MEETING.

JANUARY 11, 1921.

The Rt. Hon. Lord LAMBOURNE in the Chair.

One hundred and four Fellows and one Associate were elected, and four Societies affiliated.

GENERAL MEETING.

JANUARY 25, 1921.

The Rt. Hon. Lord LAMBOURNE in the Chair.

One hundred and eight Fellows and two Associates were elected, and three Societies affiliated.

ANNUAL GENERAL MEETING.

FEBRUARY 8, 1921.

The Rt. Hon. Lord LAMBOURNE in the Chair.

Ninety-six Fellows and six Associates were elected, and three Societies affiliated.

The Chairman, having spoken on the subject of the Annual Report, moved its adoption. This was seconded by the Treasurer, who explained the position of the Society's finances. The Accounts were adopted.

The following names of President, Vice-Presidents, members of the Council and officers having been duly proposed and seconded, and the list sent round in accordance with Byelaw 74, and no other names having been proposed, they were elected:

As President.	*Proposed by*	*Seconded by*
The Rt. Hon. The Lord Lambourne, P.C., C.V.O.	Mr. H. B. May, V.M.H.	Mr. Jas. Hudson, V.M.H.
As Treasurer.		
Mr. C. G. A. Nix.	Rev. W. Wilks, V.M.H.	Mr. W. A. Bilney, J.P.
As Secretary.		
Mr. W. R. Dykes, M.A., L.-ès-L.	Rev. W. Wilks, V.M.H.	Mr. W. A. Bilney, J.P.

As Members of Council.	*Proposed by*	*Seconded by*
Mr. E. A. Bowles, V.M.H.	Rev. W. Wilks, V.M.H.	Mr. F. J. Hanbury, F.L.S.
Mr. H. B. May, V.M.H.	Mr. W. A. Bilney, J.P.	Sir A. Rollit, LL.D., Litt.D.
Mr. C. T. Musgrave.	Lt.-Col. F. R. S. Balfour, M.A.	Capt. Arthur Hill, M.A.

As Vice-Presidents.

The Rt. Hon. Lord Balfour of Burleigh, G.C.V.O. The Duke of Bedford, K.G., F.R.S. The Rt. Hon. The Earl of Ducie, F.R.S. Sir John T. Dillwyn-Llewelyn, Bt., D.L., J.P., V.M.H. The Duke of Portland, K.G., P.C., G.C.V.O. The Rt. Hon. James W. Lowther, P.C. The Rt. Hon. Lord Grenfell, F.M. Sir Geo. Holford, C.V.O., C.I.E. Sir James Knott, Bt. Sir Daniel Morris, K.C.M.G., V.M.H. Sir David Prain, C.M.G., F.R.S., V.M.H. Sir Harry J. Veitch, V.M.H.	The Rt. Hon. Lord Lambourne, P.C., C.V.O.	Mr. E. A. Bowles, V.M.H.

As Auditor.

Mr. Alfred C. Harper.	Mr. C. G. A. Nix.	Rev. W. Wilks, V.M.H.

The bestowal of the V.M.H. upon Mr. George Forrest and Mr. R. A. Rolfe was announced, and the Lawrence Medal was handed to Mr. Wallace, who suitably acknowledged it.

The Meeting closed with a vote of thanks to the President for occupying the Chair.

REPORT OF THE COUNCIL FOR THE YEAR 1920.

1. **The Year 1920.**—The year 1920 has been mainly occupied with the task of reorganizing the various activities of the Society. During the war its chief efforts were devoted to food production, but it is now once more able to encourage that care for flowers and the decorative side of gardening which adds so much to the amenities of our homes.

2. **Obituary.**—During the year botany and horticulture have both suffered a grievous loss by the death of John Gilbert Baker, who was for some years in charge of the Kew Herbarium and whose monographs on various genera of garden plants have formed the basis of our knowledge of them.

By the death of George Monro the Society lost a good friend and horticultural charities a generous supporter. He will be long remembered as the founder of the great Covent Garden firm that bears his name.

In spite of the many risks that explorers run, it fortunately rarely happens that a botanist lays down his life while engaged in some distant expedition. News has, however, been received of the death of Reginald Farrer on the frontier between Burma and China on his way home from a two years' expedition in that hitherto unexplored region. He was a man of many talents both as a writer and as an artist, as well as a gardener with an unrivalled knowledge of alpine plants in their native habitats.

Amongst other losses we have to deplore the deaths of Sir John Wolfe-Barry, Adeline Duchess of Bedford, Thomas Bevan, J. Charlesworth, Sir Francis Darwin, Lord Faber, Miss M. W. Lawrence, Sir Edmund J. Loder, Bt., Dr. G. V. Perez, H. Prime, Sir Walter Smythe, Bt., Lady Wantage, the Dowager Viscountess Wolseley, the Countess of Selkirk, Dr. P. Andrea Saccardo, A. A. Peeters, John Snell, A. de Candolle, J. A. Duthie, Louis Leroy, and Percival Spencer U. Pickering.

3. **Resignations.**—It is with great regret that the Council has to announce that owing to persistent ill-health Mr. Arthur Sutton has felt himself obliged to resign his seat on the Council. For a number of years he has given the Society unstinted help and the benefit of his great knowledge and of his influential position at the head of his famous firm.

The Society also loses greatly by the resignation of Lord Balfour of Burleigh, who has always devoted himself ungrudgingly to its welfare. The Council has marked its appreciation of these services by unanimously recommending his nomination as a Vice-President.

These two vacancies on the Council have been filled by the appointment of Mr. Gerald W. E. Loder and Mr. R. W. Wallace, late of Colchester and now of Tunbridge Wells.

A third resignation is that of Sir George Holford, who has declined to allow himself to be nominated for re-election at the end of his period of office. He wishes, however, to remain in touch with the Society and to place his great knowledge of Orchids at its disposal by remaining a Member of the Orchid Committee.

4. **The Future.**—The Council makes an earnest appeal to all Fellows of the Society to obtain as many new Fellows as possible. It is by this means alone that the income of the Society can keep pace with its ever-growing expenditure.

5. **Chelsea and Cardiff Meetings.**—The Chelsea Meeting was favoured with splendid weather and was one of the most successful ever held. If there were complaints of the heat in the tents, they have served to convince the Council that special efforts must be made to remedy this defect in the future, and the Fellows of the Society may also rest assured that every effort will be made to avoid a repetition of the overcrowding in the tents. The area under canvas will be greatly increased and the gangways correspondingly widened.

Everyone who went to Cardiff must have agreed that the exhibits were excellent, and that the Meeting would undoubtedly have been a greater success than it actually was if the weather had been in the least propitious. As a matter of fact the weather was disastrously wet, but there was no doubt that the people

of Cardiff and the neighbourhood greatly appreciated the efforts the Society made by holding its Summer Meeting in that city. Those Members of the Council who attended the Meeting are not likely to forget the kindly welcome and great hospitality extended to them by the Lord Mayor of Cardiff and by the Committee of the local Horticultural Society.

6. **Deputations.**—Deputations from the Council were sent to York and to Lichfield. The Gala at the former was as well organized as usual, and provided a magnificent display of flowers and fruit, while at Lichfield the Deputation was able to be present at the Centenary of the local Society. On both occasions the Deputations were most hospitably entertained by the local officials.

7. **Next Year's Meetings.**—For some time it has been increasingly evident that every effort must be made to obviate the overcrowding which now occurs in the Hall at certain times of the year. It is with this object that the Council has decided to extend the Meetings held during April, May, and June to a second day, in order to give those Fellows who wish to examine the exhibits at their leisure an opportunity of coming at the time when the Hall will not be crowded.

8. **Show Vegetables.**—The experience of this year's Vegetable Meeting and knowledge of the awards made at provincial shows have convinced the Council that the time has come to make an effort to reform the system of judging at Vegetable Shows. Vegetables are primarily grown to be eaten and not to be shown, and it has, therefore, been decided to encourage at all future Shows the exhibition of those tender, shapely specimens of moderate size which chefs and cooks rightly prefer to the monstrosities which often appear on the show table.

9. **Lectures.**—Owing to the fact that many Fellows are prevented by their business engagements from coming to the Hall at 3 P.M., it has been decided to try the experiment of postponing the lectures to 5 P.M., from April to September, an arrangement which it is hoped will give such Fellows an opportunity of attending.

It is also proposed to substitute occasionally for the formal lecture an informal conference on plants in flower or fruit at the time. Fellows are invited to bring to these meetings any interesting plants from their gardens and to explain to those present their peculiarities and the best methods of cultivating them. For instance, at an October Meeting there will be a small conference of this kind on Berberis, at which an effort will be made to have a display of all the best species in fruit at that season, together with any forms as to which there is doubt. The help of the Fellows of the Society is cordially invited in this attempt to make its meetings more interesting and profitable.

10. **Hall Renovation.**—During the year the long-delayed cleaning and repainting of the Hall has been carried out. The building has also been for the most part restored to the condition in which it was handed over to the Australian Imperial Force. No compensation for that occupation has yet been received from the War Office authorities, but it is hoped that before long the Society's claim will be satisfied.

11. **Railway Rates for Horticultural Produce.**—During this year the Society made a determined effort, both by holding a Meeting at Vincent Square, and by sending its representatives to other meetings, to induce the Railways to adopt a more reasonable attitude than that which they at first assumed with regard to the carriage of plants in pots. The Council is glad to say that in the end an arrangement was reached at a final meeting at the Railway Clearing House at which the Railways made concessions and at which rates were agreed upon which, even if they represented a considerable advance on those formerly enforced, were at any rate far less onerous than those which the Railways at first sought to impose.

12. **New Cups.**—Two new Challenge Cups have been presented to the Society, the Sherwood Cup by the Sherwood family in memory of N. N. Sherwood and a silver-gilt model of the "Warwick Vase" by Mrs. L. Jones Bateman of Abergele.

13. **New Plants.**—At each Meeting during the year an attempt has been made to bring together in one place all the new plants, fruits, and vegetables which have received on that occasion an Award of Merit or a First Class Certificate. It was felt that Fellows would appreciate the opportunity of finding all the novelties grouped together instead of having to search for them among the

different groups in various parts of the Hall. To the exhibitor the system should also be welcome, for under it there should be less chance of a novelty escaping notice. It is hoped that exhibitors will do their utmost to carry out this arrangement by providing duplicates wherever possible, so that one specimen at least may be displayed on the special table, while the other takes the place of honour in their group.

14. **Conferences.**—The Council desires to give notice that it has arranged to hold Conferences on November 16, 17, and 18, 1921, on Potatos ; in the Spring of 1922 on Saxifrages ; in the Autumn of 1923 on Conifers.

The Potato Conference is being arranged in conjunction with the Ministry of Agriculture and invitations are being issued to all foreign countries and to the colonies.

15. **Dry Bulb Meeting.**—An appeal has been sent to the best-known growers of bulbs in this country for help in making an exhibition of home-grown bulbs a success. For the last few years this Show has not met with much support among the trade, but there is no doubt that there would be a gratifying demand for home-grown produce if an exhibition of bulbs in the Hall gave evidence that good specimens were being grown in this country. The Meeting would take place in the early autumn.

16. **Trade Fruit Meeting.**—It is also hoped to hold next autumn a special Exhibition of Fruit packed for market, in order that those Fellows who have a knowledge of fruit and who have preferences among the numerous varieties, may learn where their favourite varieties are grown and where they may be obtained.

17. **War Relief Fund.**—Since last year's report the work of supplying seeds, tools, and fruit trees has steadily continued, and the following is an epitome of what has been supplied up to the present time :—The total funds collected amounted to nearly £45,000, of which £5,000 was contributed by Scotland and substantial amounts by our overseas friends. Altogether some 50,000 fruit trees, 65,000 garden tools, and 660,000 packets of vegetable seeds have been distributed. In addition, Belgium, at the request of its Government, received paillassons to the value of £5,500, whilst both Serbia and Roumania were given valuable assistance. The quality of everything distributed has given the greatest satisfaction, and many favourable reports and letters of grateful thanks have been received testifying to the excellence of everything supplied and to the invaluable assistance the Society has rendered to the devastated areas.

The Fund is now almost exhausted, a small balance only being retained for the present to meet any liability which may possibly be outstanding.

18. **Examinations.**—For the National Diploma in Horticulture, which the Society conducts with the approval and support of the Ministry of Agriculture, there were 35 candidates, of whom 20 were successful.

For the School Teachers' Examination there were 603 entries in the Preliminary Section and 10 for Honours. Of these 454 and 6 respectively passed.

At the Society's General Examination in Horticulture 47 Juniors out of 95, and 136 Seniors out of 180 were successful.

19. **Exchange of Courtesies with America.**—The Council has welcomed an opportunity which arose in the course of this year for drawing closer the bonds which unite garden lovers in this country with those in the United States. Representatives, both of the Garden Club of America and of the International Garden Club, have visited this country, and the Council has recently sent to both these Societies resolutions in favour of cordial co-operation and of throwing open both its meetings at Vincent Square and its Gardens at Wisley to those members of these American Clubs who happen to be on a visit to this country. It was felt that nothing could conduce more to a cordial understanding between Great Britain and the United States than that the citizens of the two countries should have these opportunities of meeting on the common ground of their love of plants and of their interest in gardening.

20. **Lindley Library.**—During the year the sum of some £240 has been spent in adding books to the Lindley Library, of which the Society is the Trustee. Among the volumes purchased are :—

" Florica Danica," 8 vols. (£10 10*s.*). *Blake,* " The Complete Gardener's Practice, 1664 " (£4 10*s.*). *Michaux,* " Histoire des Chênes, 1801 " (£5 12*s.* 6*d.*)

De Vries, "Hortorum Viridariorumque Elegantes Formae" (£45). *Robert, Bosse and de Chastillon.* "Recueil des Plantes, 1701" (£36). "The Orchard and the Garden, 1602" (£26 5s.). *Knorr*, "Thesaurus rei Herbariae, 1770-1772" (£25). *Sternberg*, "Revisio Saxifragarum," and "Supplementum I" (£10).

21. **Pritzel.**—The work on the preparation of the revised edition of Pritzel's Index has proceeded steadily but has involved far greater efforts than were realized when it was first taken in hand. Early in the year the list of works, from which illustrations are to be included, was circulated to the leading botanical institutes at home and abroad, with the result that nearly 300 titles of books were added to the list. As a large number of these are not in the Kew Library and some can only be consulted abroad, the magnitude of the task is at once apparent. It is hoped that in the course of next year the Index will be ready for the printer, but there will still be great difficulties to be overcome in view of the present cost of paper and printing, which advances from day to day. It is hoped that means will be found to carry to a successful end the work which the Society has undertaken for the benefit of botany and horticulture. The Council trust that it will not appeal in vain for financial help in carrying out this important undertaking.

22. **The Journal.**—Similar difficulties have been encountered in the publication of the Society's *Journal*, and it is with great regret that the Council has felt obliged to limit the number of Parts published during the year. It is hoped that before long there may be some improvement in the situation and that the difficulties may be overcome.

23. **Victoria Medal of Honour.**—The vacancies among the sixty-three holders of the V.M.H. caused by the deaths of John Gilbert Baker and of George Monro have been filled by the election of Mr. George Forrest, who is well known for his arduous work in exploring the highlands of Western China and in bringing to our gardens their botanical treasures, and of Mr. R. A. Rolfe of Kew, who has devoted himself so unsparingly to the study of orchids.

24. **The Lawrence Medal** has been awarded to Messrs. R. Wallace & Co. for their wonderful display of Irises at Chelsea.

25. **Increase in Membership.**—The following table shows the increase in the number of Fellows of the Society during 1920 :—

Loss by Death in 1920.

		£	s.	d.
Life Fellows ...	15	0	0	0
4 guineas	1	4	4	0
2 ,, ...	93	195	6	0
1 guinea	120	126	0	0
	229	£325	10	0

Loss by Resignation, &c.

		£	s.	d.
4 guineas	3	12	12	0
2 ,, ...	270	567	0	0
1 guinea	362	380	2	0
Associates.....	24	12	12	0
Affiliated Societies	28	29	8	0
	687	£1,001	14	0
Total Loss	916	£1,327	4	0

Fellows Elected in 1920.

		£	s.	d.
4 guineas	20	84	0	0
2 ,, ...	1060	2,226	0	0
1 guinea	966	1,014	6	0
Associates	86	45	3	0
Affiliated Societies ...	103	110	5	0
Commutations = £986 5s. 0d.	41			
	2276	£3,479	14	0
Loss		1,327	4	0
Net Increase in Income		£2,152	10	0

New Fellows, &c.....	2,276
Deaths and Resignations	916
Numerical Increase	1,360
Total on December 31, 1919*	13,920
Total on December 31, 1920	15,280

* The figure given in the Report for 1919 was 14,220, but this included 300 Fellows whose subscriptions remained unpaid though they had not formally resigned. The 687 resignations in the present year include these 300.

WISLEY REPORT.

26. **Visitors.**—The number of visitors to the Gardens at Wisley has been greater than in any previous year, although a service of motor omnibuses has not yet been secured. Many large parties of horticulturists from a distance and numerous visitors from abroad have also visited the Gardens.

27. **The Laboratory.**—The Staff has lost the services of Capt. Page, who accepted the post of Senior Chemist at Rothamsted, and of Mr. A. T. Rudge, who has become Horticultural Instructor in Staffordshire. Dr. F. V. Darbishire, M.A., has been appointed to fill the first of these vacancies, while Mr. J. Dowson, M.A., lately Government Mycologist in Kenya, has been appointed Mycologist. Several vacancies remain in the Laboratory Staff, but the causes referred to in last year's report still operate, and, until it is possible to make appointments permanent, the Council hesitates to fill them. The future progress of horticulture depends upon the scientific investigation both of plant life and of the soil, and of their reactions upon one another. The Council urges upon the Fellows the importance of placing it in a position to make the appointments necessary to utilize to the full the splendid possibilities of the Laboratory and Garden at Wisley. This can only be done by an endowment fund and by founding permanent, or increasing the existing temporary, research scholarships for the investigation of definite problems. The Council feels that these matters concern all Fellows, and it commends them to their earnest consideration.

28. **The Garden.**—For the first time since August 1914, the Garden staff has been completed by the appointment of Mr. Gosden as Rock Garden foreman. Much time and labour have been expended in bringing the garden back to its pre-war standard, but much still remains to be done. Progress has been made however, in many directions, the principal new developments being : the planting of ornamental shrubs, especially those of recent introduction from China ; additions to the Pinetum ; the making of a frame-yard, rendered necessary by long-designed alterations at length undertaken in the front of the Laboratory ; the planting of an herbaceous border of moisture-loving plants ; and the commencement of a field garden. Except for the actual brickwork and the fitting of hot-water pipes this work is being carried out by the garden staff.

29. **Plant Distribution.**—The number of plants distributed in 1920 was exceedingly large, and although, as is inevitable, it was impossible in many cases to send the plants actually asked for, yet, judging by the number of requests for plants received, and the number of appreciative letters of thanks, this branch of the Society's activities meets general approval. A considerable number of seeds collected by Mr. Forrest in China and of plants raised from them were included in the distribution, and it is hoped to send out many more in 1921. Many of these have still to be " proved " and their cultivation is, therefore, all the more interesting to the plant-lover. Mr. Forrest's collections of 1919 (the last year of his Chinese expedition) have reached the Gardens and are being grown. Several novelties from the Society's Gardens have been shown at Vincent Square during the past two or three years, and it is hoped to distribute them as widely as possible as soon as stock can be raised.

30. **New Land.**—Circumstances were not favourable during the year for taking over any of the land recently acquired at Wisley for experimental purposes and it remains let as before.

31. **Garden Trials.**—Floral Trials have been resumed and those of Antirrhinums and Michaelmas Daisies proved particularly attractive and instructive to the many amateur and professional horticulturists who came to see them. The trials of early peas were very useful, especially when compared with the trial of five years ago, while the second-early potato trial brought to light some promising new varieties. The greatly increased extent of these trials and the fuller study our staff is now able to devote to them will, it is hoped, result in the development of a classification and of a better understanding of the varieties of each of the principal vegetables and flowers and of the names applied to them. Full reports will appear in the *Journal*, where also the overdue report on Bearded Irises will be published as soon as opportunity allows.

32. **Experimental Work.**—Captain Page's experiments upon green-manuring have yielded interesting results which need confirmation and further investiga-

tion. Dr. Darbishire is now in charge of these important experiments, which are being aided by a small grant from the Development Fund. Dr. Darbishire is also continuing his work on the comparative chemical composition of varieties of garden crops and on collateral questions. Mr. Dowson has commenced an investigation of a serious disease of Michaelmas Daisies. Mr. Rawes, in addition to work on orchard pollination and experiments upon summer pruning, has raised a large number of seedling apples and plums which are being grown on, as are the late Dr. Wilson's seedling Rubi, and the seedling vines raised by Dr. Keeble and Mr. J. Wilson. Mr. G. F. Wilson has continued his experiments on onion fly, and commenced a series of experiments on cabbage root fly and apple blossom weevil. An interesting investigation into the comparative value of nitrogen as a manure in sulphate of ammonia and various organic substances is in progress. A comparison of the incidence of mildew upon roses budded upon various stocks leads to the conclusion that the stock has no influence upon the susceptibility to mildew. Further experiments upon the factors involved in securing high yields of potatos are in progress. Mr. B. Buxton, a voluntary worker in the Laboratory, has completed an investigation into the course of development of flower buds of the red currant and, with Captain Page, has carried out some work upon the spectrum of certain plant pigments.

33. **Horticultural Instruction.**—The full number of thirty horticultural students is now attending the course of instruction at the Gardens, and the lack of a Hostel is acutely felt. Such a hostel should be self-supporting, and a site for it can be provided, but the necessary funds for its erection are not available. The difficulty of housing has been met for the twenty men disabled in the war now training at the Garden in vegetable-growing, etc., by the erection of old army huts by the Surrey Agricultural Committee, but the Council feels that similar provision would be only a costly, temporary, and unsatisfactory means of meeting the deficiency of a hostel. One of the students, Mr. A. E. Sims, was awarded the Knott Scholarship for 1920-22. Three others, Mr. F. C. Brown, Mr. W. R. Pearson and Mr. G. Wood, won the Wisley Diploma, and four old Wisley students, Messrs. A. Simmonds, H. W. Abbiss, W. G. Kent, and B. P. Perry, gained the National Diploma in Horticulture.

34. **War Memorial.**—During the War twenty old Wisley students met their deaths in various parts of the world, and the Council commissioned Sir Robert Lorimer to design a fitting memorial. This is now being prepared, and will shortly be placed on the wall of the beautiful hall of the Laboratory.

35. **Chemical Analyses.**—Until now the privileges of chemical analysis which Fellows have enjoyed have been given through Dr. Voelcker, but the Council has arranged that in future these analyses shall be done in the Wisley Laboratory. The fees payable will be at the same rates as heretofore.

36. **Gifts.**—The Council has again to acknowledge most gratefully many gifts of plants, seeds (including a set of those collected by the late Mr. Reginald Farrer, from Lt.-Col. F. R. S. Balfour) and books for the Library at Wisley, a donation towards the cost of apparatus from Mr. B. Buxton, and special contributions from Messrs. Denny and Thomas towards Garden expenses. Among the gifts is a set of Pæonies presented by Mrs. Harding and representing the best of those grown in American gardens. These have recently arrived in excellent condition and will, when established, add greatly to the value of the large collection already in our Gardens, and give an idea of the standard set by American Pæony lovers.

37. **Committees, etc.**—Finally, the Council wishes to express its gratitude to those Fellows of the Society who have served on one or other of its Committees and without whose help the work could not be carried on. The Council also owes its thanks to the Press for the way in which it has supported the work of the Society and kept it before the public.

By Order of the Council,
W. R. DYKES,
Secretary.

December 1920.

SCHEDULE OF INVESTMENTS.

31st December 1920.

			£	s.	d.
3 %	Local Loans £5,800	*cost*	6,006	16	6
3½ %	Dominion of Canada Registered Stock (1930–1950) £2,000	,,	2,000	0	0
5 %	Havana Terminal Railroad Company Mortgage Debenture Bonds £8,300	,,	8,946	0	0
4½ %	Central Argentine Railway, Limited, Consolidated Preference Stock £2,800	,,	2,907	3	6
4 %	Central Argentine Railway, Limited, Debenture Stock £600	,,	537	15	10
2½ %	India Stock £186 9 0	,,	109	2	2
4 %	Mortgage on Freehold £1,000	,,	1,000	0	0
5 %	War Loan (1929–1947), £9,550	,,	9,274	18	2
3½ %	War Loan (1925–1928), £4,998 16 0	,,	4,363	16	9
5 %	London County Stock (1940–1960) £2,114 0 9	,,	1,781	3	2
2½ %	Metropolitan Consolidated Stock (1919–1940) £3,462 8 10	,,	1,783	6	7
2¾ %	Plymouth Corporation Red. Stock (1918–1958) £786 1 10	,,	386	19	7
6 %	Plymouth Corporation Red. Stock (1940–1950) £427 13 6	,,	405	5	3
2½ %	Bristol Corporation Red. Stock (1957) £2,096 13 6	,,	974	7	9
			£40,476	15	3

[*See also pp. xiii, xvii–xxi.*]

Dr. **ANNUAL REVENUE & EXPENDITURE ACCOUNT**

	£ s. d.	£ s. d.
To Establishment Charges—		
Ground Rent	690 0 0	
Rates and Taxes	865 2 8	
Water Rate	52 19 3	
Electric Light	244 6 2	
Gas	91 8 10	
		1,943 16 11
Salaries and Wages	4,152 9 2	
Printing and Stationery	1,895 15 10	
Publications	1,086 11 10	
Postages	755 9 7	
Fuel	171 17 8	
Professional Fees	205 5 6	
Gratuities	40 10 0	
Repairs and Renewals (including £2,496 for Hall Painting)	3,188 1 8	
Miscellaneous Expenses	293 0 0	
		11,789 1 3
,, Insurances		122 3 7
,, Journal, Printing and Postage		4,283 18 1
,, Staff Pension	403 11 8	
Less contributed by the Staff, as per scheme	265 5 0	
		138 6 8
,, Meetings—		
Spring Meeting	2,131 7 2	
Summer Meeting	2,014 5 0	
Autumn Fruit and Vegetable Meeting	271 15 4	
Labour, Floral Meetings and Conferences	264 2 9	
Expenses, do. do.	318 9 3	
Council, Committee and Deputation Expenses	346 3 7	
Painting Orchid Certificates	54 12 0	
		5,400 15 1
,, Inspection of Gardens		265 6 4
,, Prizes and Medals—		
Awarded at Society's Meetings		773 13 4
,, Contribution to Lindley Library—		
Purchase of Books	251 13 5	
Expenses	178 5 2	
		429 18 7
,, Special Expenditure—		
Contribution to Forrest Account	83 9 0	
Curtains	75 1 8	
Lift Ropes	22 0 0	
Gestetner Duplicator	38 0 0	
		218 10 8
,, Examinations in Horticulture	405 16 10	
Less Received in Fees	314 17 5	
		90 19 5
,, Depreciation—		
Hall Glass Roof, Furniture, and Appliances for Meetings		390 15 0
,, Balance, carried to Balance Sheet		9,729 18 7
		£35,577 3 6

FOR YEAR ENDING 31st DECEMBER 1920. Cr.

	£ s. d.	£ s. d.
By Annual Subscriptions		21,284 8 6
„ Entrance Fees		318 3 0
„ Dividends and Interest	2,409 9 0	
„ do. do. Davis Trust . .	51 2 6	
		2,460 11 6
„ Meetings—		
Spring Meeting	2,933 18 8	
Summer Meeting.	2,014 5 0	
Takings at Hall Meetings	287 5 4	
		5,235 9 0
„ Hall Lettings	3,473 16 0	
Less Labour Expenses	394 10 5	
		3,079 5 7
„ Journals and Other Publications—		
Advertisements	786 12 11	
Sale of Publications	1,498 16 7	
		2,285 9 6
„ Prizes and Medals		213 4 0
„ Life Compositions—		
Being amount paid by Fellows now deceased.		162 15 0
„ Rent of Freehold Property . . .		262 7 8
„ Inspection of Gardens		275 9 9
		£35,577 3 6

Dr. **VINCENT SQUARE—BALANCE**

LIABILITIES.

	£ s. d	£ s. d	£ s. d
To Capital Funds Account—			
As at 31st December 1919	47,227 4 2		
Less Fees paid by Fellows now deceased	162 15 0		
		47,064	9 2
,, Life Compositions, 1920		986	5 0
,, Sundry Creditors		2,351	17 3
,, Subscriptions, &c., paid in advance . . .		696	3 0
,, Reserve Account—			
Hall Painting, Depreciation and Renewals, Balance, 31st December, 1919 . . .	4,919 2 7		
Added 1920	390 15 0		
		5,309	17 7
,, Laboratory Prize Fund—			
Balance 31st December 1919 . . .	20 17 4		
Dividends (Nicholson Memorial Fund) . .	2 4		
		20	19 8
,, Williams Memorial Fund	55 3 4		
,, Masters Memorial Fund	107 19 5		
,, Schröder Pension	6 6 8		
,, Lindley Library Trust	10 0 0		
,, Sir James Knott Trust	26 0 0		
		205	9 5
,, General Revenue Account . . .	51,013 4 5		
Add Capital Expenditure, Wisley	944 7 11		
	51,957 12 4		
,, *Less* Loss on Sale of Investments . .	7,187 18 9		
	44,769 13 7		
,, Revenue for the Year 1920, as per annexed Account . .	£9,729 18 7		
Less Wisley, Excess of Expenditure over Income .	7,714 10 2		
	2,015 8 5		
		46,785	2 0
		£103,420	3 1

SHEET, 31st DECEMBER 1920. Cr.

ASSETS.

	£ s. d.	£ s. d.
By Capital Expenditure—		
„ New Hall and Offices—		
As at 31st December 1919 . . .	41,277 13 4	
„ Furnishing Hall and Offices—		
As at 31st December 1919 . . .	2,464 9 8	
„ Freehold Property, Wisley . .	8,268 16 6	
		52,010 19 6
„ Appliances for Meetings		366 14 3
„ Sundry Debtors and Payments made in Advance		1,457 5 9
„ Woking Water Co.—		
Deposit in respect of laying water-mains from Ripley to Wisley Gardens . . .		1,260 0 0
„ Education Charts, Johnson, Riddle & Co. .		1,126 8 8
„ Pritzel Revision fund—Loan account .		52 14 5
„ Investment of Hall Painting, Depreciation and Renewals Reserve Account—		
5 % War Loan 1927–47, £500 0 0 . *cost*	467 11 0	
3½% War Loan 1925–28, £305 5 1 . „	266 16 6	
5 % War Loan 1929–47, Registered Stock £1,689 5 11 . . . . . „	1,693 1 2	
5 % London County Stock 1940–60, £610 14 0 . . . . . „	514 12 10	
2½ % Metropolitan Consols Stock 1919–40, £1,000 2 0 . . . . . „	515 5 2	
2¾ % Plymouth Corporation Registered Stock 1918–58, £225 9 4 . . . „	111 6 5	
6 % Plymouth Corporation Registered Stock 1940–50, £123 15 6 . . . „	117 5 3	
2½ % Bristol Corporation Registered Stock 1957, £607 12 0 . . . . . „	282 13 6	
		3,968 11 10
„ Investments, as per Schedule . . *at cost*		40,476 15 3
(In common with most pre-war Securities the above have, for sale purposes, considerably depreciated, but for revenue purposes they bring in the same income as before.)		
„ Cash—		
On Deposit	1,500 0 0	
At Bank 1,219 19 4		
Less Wisley Depreciation Account 130 1 0		
	1,089 18 4	
In Hand	110 15 1	
		2,700 13 5
		£103,420 3 1

I have audited the books from which the foregoing Accounts are compiled, and certify that they exhibit a true and correct statement of the position of the Society on the 31st Dec. 1920. In the above total of Assets, £103,420 3 1, are included investments amounting to a total sum of £3,968 11 10 representing depreciation reserves, on account of such matters as roof renewal, hall painting, glasshouses, &c., and that these funds are not available for the General Purposes of the Society.

ALFRED C. HARPER, F.C.A., *Auditor*,
(Harper Brothers & Feather, *Chartered Accountants*),
35 Great Tower Street, London, E.C.

11th January 1921.

Dr. WISLEY GARDENS—ANNUAL REVENUE & EXPENDITURE

	£ s. d.	£ s. d.	£ s. d.
To Salaries—			
Wisley Gardens and Research Station . .			3,252 12 5
,, Rates and Taxes		264 7 9	
,, Water Rate		49 0 7	
,, Insurances		87 12 4	
,, Labour		2,630 3 0	
,, Garden Implements		164 19 1	
,, Loam and Manure		22 18 9	
,, Repairs		1,184 12 10	
,, Fuel		660 10 8	
,, Miscellaneous Expenses—			
Garden	270 13 11		
Laboratory	56 14 2		
		327 8 1	
,, Trees and Shrubs		11 8 10	
			5,403 1 11
,, Cost of Growing, Packing and Distributing Plants to Fellows			489 2 7
,, Staff Pension		392 17 11	
Less contributed by the Staff, as per scheme .		211 6 0	
			181 11 11
,, Depreciation—			
Glass Houses, Plant and Materials . .		257 2 3	
Motor		190 0 0	
			447 2 3
			£9,773 11 1

ACCOUNT FOR YEAR ENDING 31st DECEMBER 1919. Cr.

	£ s. d.	£ s. d.
By Dividends and Interest		1,252 3 6
„ Produce Sold		452 11 11
„ Students' Fees		94 10 0
„ Donations		59 15 6
„ Contribution by Ministry of Agriculture		200 0 0
„ Balance, being excess of Expenditure over Revenue		7,714 10 2
		£9,773 11 1

Dr. **WISLEY GARDENS—BALANCE**

LIABILITIES.

	£ s. d.	£ s. d.
To Capital Funds Account—		
As at 31st December, 1919 . . .	33,472 18 0	
Less Amount transferred to R.H. Society, 31st December, 1920	944 7 11	
		32,528 10 1
„ Endowment Trust Fund		28,972 7 11
„ Depreciation and Renewals Reserve Fund—		
As at 31st December, 1919	4,581 15 3	
Added, 1920	130 1 0	
		4,711 16 3
		£66,212 14 3

ASSETS.

	£ s. d.	£ s. d.
By Dwelling Houses—		
As at 31st December 1919	5,651 17 4	
,, Glass Houses, Ranges, Potting Sheds, &c.—		
As at 31st December 1919	5,202 6 0	
,, Laboratory—		
As at 31st December 1919 . . .	20,623 18 2	
		31,478 1 6
N.B.—The Wisley Estates are, under the Trust Deed, vested in the Society only so long as it is in the position to use them as an Experimental Garden. The value of the expenditure thereon depends therefore on the continual use of the Garden by the Society.		
,, Stock Fuel		85 0 0
,, Motor Lorry	947 13 0	
Less Depreciation	190 0 0	
		757 13 0
,, Inventory of Plant and Loose Effects—		
As taken by Mr. Chittenden		1,515 13 9
,, Library		270 9 0
,, Investment of Depreciation and Renewals Reserve Account—		
5 % War Loan 1929–47 . £650 0 0 *cost*	607 17 0	
3½ % War Loan 1925–28 . £395 18 11 ,,	346 9 0	
5 % War Loan 1929–47 . £491 10 6 ,,	439 13 5	
5% L'ndon Cnty. Stk. 1940–50 £785 5 3 ,,	661 13 6	
2½ % Met. Cons. Stk. 1919–40. £1,287 9 2 ,,	662 19 3	
2¾ % Plymouth Cor. Red. Stock 1918–58 . . . £288 8 10 ,,	142 1 0	
6 % Plymouth Cor. Red. Stock 1940–50 . . . £159 18 4 ,,	151 12 4	
2½ % Bristol Cor. Red. Stk. 1957 . . . . £795 14 6 ,,	369 15 3	
	3,382 0 9	
Add Cash for Investment, 1920 . . .	130 1 0	
		3,512 1 9
,, Endowment Trust Fund Investments—		
Gt. Eastn. Rly. 4½ % Deb. Stk. £3,500 *cost*	3,535 0 0	
Leopoldina Rly 5 % Term. Debs. £2,000 ,,	2,000 0 0	
City of Moscow Loan 1912. 4½ % Bonds . . . . . £6,000 ,,	5,730 0 0	
Buenos Ayres Gt. S. Ry. 5 % Non. Cum. Pf. Stk. . . . . £2,500 ,,	2,825 0 0	
5 % War Stock, 1925–45 . . £5,000 ,,	5,000 0 0	
5 % War Stock, 1929–47 . . £4,350 ,,	3,972 7 11	
Can. Pac. Ry. 4 % Per. Cons. Deb. Stk. £4,632 ,,	3,890 17 6	
London County Cons. 3½ % Stk. £135/8/4 ,,	130 0 0	
5% London County Stk., 1940–60 £600 ,,	505 12 0	
2½ % Met. Cons. Stk., 1919–40 . £970 ,,	499 12 0	
2¾ % Ply. Cor. Red. Stk., 1918–58 £400 ,,	197 1 0	
6% Ply. Cor. Red. Stk., 1940–50 £30/9/4 ,,	29 6 4	
2½ % Bristol Cor. Red. Stk., 1957 £600 ,,	278 18 6	
		28,593 15 3
(In common with most pre-war Securities, the above have, for sale purposes, considerably depreciated, but for revenue purposes they bring in the same income as before, less Interest on the City of Moscow Loan, upon which no dividend has been received during the year.)		£66,212 14 3

I have audited the books from which the foregoing Accounts are compiled, and certify that they exhibit a true and correct statement of the position on the 31st Dec. 1920.

ALFRED C. HARPER, F.C.A., *Auditor*,
(Harper Brothers & Feather, *Chartered Accountants*),
35 Great Tower Street, London, E.C.

11th January, 1921.

Dr.

ALFRED DAVIS

Bequeathed to the Society in 1870 for Annual Prizes,

	£ s. d.	£ s. d.
To Amount of Fund, 31st December 1919 . .	1,797 8 9	
	1,797 8 9	
,, Dividends received 1920		51 2 6

WILLIAMS

Raised by Donations in 1891 in Memory of

	£ s. d.	£ s. d.
To Amount of Fund, 31st December 1919 . .	204 2 5	
	204 2 5	
,, Balance 31st December 1919		48 8 4
,, Dividends received 1920		6 15 0
		55 3 4

MASTERS

Raised by Donations in 1908 in Memory of Dr. Masters

	£ s. d.	£ s. d.
To Amount of Fund, 31st December 1919 . .	542 17 0	
	542 17 0	
,, Balance 31st December 1919		88 4 4
,, Dividends received 1920		19 15 1
		107 19 5

NICHOLSON

Raised by Donations in 1908 in Memory of

	£ s. d.	£ s. d.
To Amount of Fund, 31st December 1919 . .	160 12 11	
,, Dividends received 1920		6 9 10

SCHRÖDER

Provided by Royal Horticultural Society in Memory of the late Baron

	£ s. d.	£ s. d.
To Amount of Fund, 31st December 1919 . .	557 14 6	
,, Balance 31st December 1919		6 6 8
,, Dividends received 1920		20 0 0
		26 6 8

TRUST FUND.

Cr.

or in any other way the Council may determine.

	£ s. d.	£ s. d.
By London County 5 % Stock, 1940–60, £375 . .	316 0 0	
,, Met. Consd. 2½ % do. 1919–40, £610 . .	314 4 0	
,, Plymouth Corpn. 2¾ % Red. Stk., 1918–58, £200	98 10 6	
,, do. 6 % do. 1940–50, £32 7 4	31 2 3	
,, Bristol Corpn. 2½ % do. 1957, £400 .	186 3 6	
	946 0 3	
,, *Loss* on Sale of Consols	851 8 6	
	1,797 8 9	
,, Revenue and Expenditure Account . . .		51 2 6

MEMORIAL FUND.

B. S. Williams towards Prizes and Medals.

	£ s. d.	£ s. d.
By East India Railway Co. Annuity, Class B £7 .	168 0 0	
,, New South Wales Government 4 per cent. Inscribed Stock (1942–62) £36 3*s.* 1*d.* . . .	36 2 5	
	204 2 5	
,, Balance in hands of R.H. Society . . .		55 3 4
		55 3 4

MEMORIAL FUND.

towards the Provision of one or more Annual Lectures.

	£ s. d.	£ s. d.
By Midland Railway Consolidated 2½ per cent. Perpetual Preference Stock £400 . . .	290 13 6	
,, Midland Railway Consolidated 2½ per cent. Perpetual Guaranteed Preferential Stock £400	252 3 6	
	542 17 0	
,, Balance in hands of R.H. Society . . .		107 19 5
		107 19 5

MEMORIAL FUND.

George Nicholson for Prizes to Wisley Students.

	£ s. d.	£ s. d.
By Tasmanian Government 4 per cent. Inscribed Stock (1940–50), £162 4*s.* 5*d.* . . .	160 12 11	
,, Cost of Prizes		6 7 6
,, Transfer to Wisley Prize Fund . . .		2 4
		6 9 10

PENSION.

Schröder to pay to Gardeners' Royal Benevolent Institution for one Pension.

	£ s. d.	£ s. d.
By Great Western Railway 4 per cent. Debenture Stock £500.	557 14 6	
,, Gardeners' Royal Benevolent Institution . .		20 0 0
,, Balance in hands of R.H. Society . . .		6 6 8
		26 6 8

Dr. **LINDLEY LIBRARY**

	£ s. d.	£ s. d.
To Amount of Fund, 31st December 1919 . . .	6,310 3 3	
,, Contribution from R.H. Society, 31st December 1920	251 13 5	
	6,561 16 8	
To Balance 31st December 1919		10 0 0
,, Dividends and Donations received 1920 . .		46 14 10
,, Contribution from R.H. Society, 31st December 1920		178 5 2
		235 0 0

PRITZEL REVISION

Fund to be raised for the Revision of Pritzel's Iconum-

	£ s. d.	£ s. d.
To Amount of Fund, 31st December 1919. . .	859 2 2	
,, Balance, 31st December 1919		341 16 8
,, Dividends received, 1920		38 18 11
,, Donations ,, 1920		209 5 6
,, Loan from R.H. Society, repayable . . .		52 14 5
		642 15 6

SIR JAMES KNOTT

Bequeathed to the Society in 1920 for the purpose

	£ s. d.	£ s. d.
To Amount of Fund, 31st December, 1920 . .	600 0 0	
,, Dividends received, 1920		33 10 0
		33 10 0

TRUST. Cr.

	£ s. d.	£ s. d.
By Lancashire and Yorkshire Railway 3 per cent. Consolidated Preference Stock £1,516 held by the Charity Commissioners	1,458 15 7	
„ Value of Library, 31st December 1919	4,851 7 8	
„ Purchase of Books, 1920 (*See* Report)	251 13 5	
	6,561 16 8	
By Librarian's Salary		225 0 0
„ Balance in hands of R.H. Society		10 0 0
		235 0 0

FUND.

Botanicarum Index. Estimated cost, £3,000.

	£ s. d.	£ s. d.
By India 2½ per cent. Stock £1,367 13 6	859 2 2	
„ Amount expended, 1920		642 15 6
		642 15 6

TRUST.

of providing a Scholarship for the Wisley Students.

	£ s. d.	£ s. d.
By War Stock 5 % 1929–47	600 0 0	
„ Cash expended		7 10 0
„ Balance in hands of R.H. Society		26 0 0
		33 10 0

GENERAL MEETING.

FEBRUARY 22, 1921.

The Rt. Hon. Lord LAMBOURNE in the Chair.

One hundred and three Fellows and two Associates were elected, and six Societies affiliated.

A lecture was given by Mr. Vivian P. Davis on " Beautiful Gardens."

GENERAL MEETING.

MARCH 8, 1921.

Dr. A. B. RENDLE in the Chair.

Ninety-five Fellows and two Associates were elected, and eight Societies affiliated.

A lecture was given by Dr. A. B. Rendle on " Plants of Interest in the Day's Exhibition."

GENERAL MEETING.

APRIL 5, 1921.

H. J. ELWES, Esq., F.R.S., in the Chair.

One hundred and four Fellows and two Associates were elected, and one Society affiliated.

An informal discussion on Plants in Flower at the Time.

The Daffodil Meeting took place on this day.

The Barr Cup was awarded to J. L. Richardson, Esq., of Waterford.

GENERAL MEETING.

APRIL 28, 1921.

W. R. DYKES, Esq., in the Chair.

One hundred and forty-eight Fellows and three Associates were elected, and five Societies affiliated.

A lecture was given by Mr. W. B. Turrill on " The Balkan Flora."

GENERAL MEETING.

MAY 10, 1921.

W. R. DYKES, Esq., in the Chair.

One hundred and thirteen Fellows and two Associates were elected, and three Societies affiliated.

A lecture was given by Professor J. B. Farmer on " Alpines."

MEETING AT CHELSEA, MAY 24, 25, 26, 1921.

Awards made by the Council after Consultation with the Judges.

Sherwood Cup for the Best Exhibit in the Show.

To Messrs. Sutton & Sons, for florists' flowers.

"Daily Graphic" Challenge Cup for Rock Garden.

To R. Tucker.

Orchid Challenge Cup for Amateurs.

To J. J. Joicey, Esq. (gr. J. MacKay).

Silver-gilt Flora Medal.

To Dr. Miguel Lacroze (gr. M. Taylor).

Silver-gilt Banksian Medal.

To E. R. Ashton, Esq. (gr. H. Varnum).

Orchids.

Gold Medal.

To Messrs. Armstrong & Brown, for Orchids.
To Messrs. Charlesworth & Co., for Orchids.
To Messrs. J. & A. McBean, for Orchids.
To Sir Jeremiah Colman, Bt. (gr. J. Collier), for Orchids.
To Baron Bruno Schröder (gr. J. C. Shill), for Orchids.

Silver-gilt Flora Medal.

To Messrs. Stuart Low & Co., for Orchids.
To Messrs. Sanders, for Orchids.
To Pantia Ralli, Esq. (gr. S. Farnes), for Orchids.

Silver-gilt Banksian Medal.

To Messrs. J. Cypher & Sons, for Orchids.
To Messrs. Flory & Black, for Orchids.
To Messrs. Mansell & Hatcher, for Orchids.

Silver Flora Medal.

To Messrs. H. Dixon, for Orchids.

Silver-gilt Lindley Medal.

To Mr. J. E. Shill, gardener to Baron Schröder, for cultivation.

Exhibits in the Open Air.

Gold Medal.

To Messrs. Herbert Jones, for formal garden.
To Messrs. B. H. B. Symonds-Jeune, for rock garden.
To Messrs. R. Tucker, for rock garden.
To Messrs. R. Wallace & Co., for rock and water garden.

Silver-gilt Flora Medal.

To Messrs. Clarence Elliott, for rock garden.
To Messrs. Pulham & Sons, for rock garden.
To Messrs. Waterer, Sons & Crisp, for rock garden.
To Messrs. G. G. Whitelegg & Co., for rock garden.
To Messrs. J. Cheal & Sons, for formal garden.
To Messrs. J. MacDonald, for Grasses.

Silver-gilt Grenfell Medal.

To Messrs. J. Carter & Co., for formal garden.

Silver-gilt Banksian Medal.

To Messrs. Kent & Brydon, for rock garden.
To Messrs. J. Waterer, Sons & Crisp, for trees, shrubs, and topiary.

Silver Floral Medal.

To Messrs. R. Neal & Son, for formal garden.
To Messrs. W. Cutbush & Son, for topiary and shrubs.
To Messrs. J. Piper & Son, for topiary and Japanese trees.

Silver Grenfell Medal.

To Messrs. J. Cheal & Sons, for clipped trees.
To Messrs. L. R. Russell, for flowering shrubs.

Silver Banksian Medal.

To Messrs. W. H. Gaze & Sons, Ltd., for rock garden.
To Messrs. E. Dixon, for formal garden.
To Messrs. Fromow & Sons, for Japanese Maples.
To The Maytham Gardens, for herbaceous border.

EXHIBITS IN THE TENT.

Gold Medal.

To Messrs. Allwood Bros., for Carnations.
To Messrs. J. Carter & Co., for flowering plants.
To Messrs. R. & G. Cuthbert, for flowering and ornamental shrubs.
To Messrs A. Dickson & Sons, for Sweet Peas.
To Messrs. Dobbie & Co., for Sweet Peas.
To Hon. Vicary Gibbs (gr. E. Beckett), for vegetables.
To Messrs. G. Paul & Son, for Roses.
To Mr. Amos Perry, for Irises and ferns.
To Messrs. M. Prichard, for herbaceous plants.
To Messrs. Rivers & Son, for fruit trees in pots.
To Mr. L. R. Russell, for stove plants.
To Messrs. Sutton & Sons, for vegetables.
To Messrs. R. Wallace & Co., for herbaceous plants
To Messrs. J. Waterer, Sons & Crisp, for Rhododendrons and Azaleas.
To Messrs. Sutton & Sons, for florists' flowers.

Silver Lindley Medal.

To the Hon. Vicary Gibbs, for vegetables.

Silver Knightian Medal.

To Messrs. Laxton Bros., for Strawberries.

Silver-gilt Flora Medal.

To Mr. J. C. Allgrove, for hardy flowers.
To Messrs. Artindale & Son, for herbaceous plants and Eremurus.
To Messrs. Barr & Sons, for herbaceous plants.
To Messrs. Bees, Ltd., for herbaceous plants, etc.
To Messrs. Blackmore & Langdon, for Begonias and Delphiniums.
To Messrs. G. Bunyard & Co., for Irises.
To Messrs. Ben Cant & Sons, for Roses.
To Messrs. Cheal & Sons, for flowering trees and shrubs.
To Mr. Clarence Elliott, for alpine plants.
To Mr. C. Engelmann, for Carnations.
To Mr. Elisha J. Hicks, for Roses.
To Messrs. G. Jackman & Sons, for Clematis.
To Dr. John MacWatt, for Primulas.
To Mr. R. C. Notcutt, for flowering shrubs.
To Messrs. W. Paul & Son, for Roses.
To Messrs. J. Peed & Son, for Caladiums, Gloxinias, etc.
To Mr. M. Prichard, for alpine plants.
To Miss E. Rohde and Mrs. Grieve, for herb garden.
To Mr. C. Turner, for Roses.

Silver-gilt Grenfell Medal.

To Messrs. Ryder & Son, for flowering shrubs.

Silver-gilt Banksian Medal.

To Messrs. Barr & Sons, for Irises.
To Messrs. G. & A. Clark, for herbaceous plants.
To Messrs. W. Cutbush & Son, for Roses.
To King's Acre Nurseries, for fruit trees.
To Messrs. B. Ladhams, Ltd , for hardy flowers.
To Mr. G. W. Miller, for herbaceous plants.
To Mr. G. Reuthe, for alpine plants.

Silver Flora Medal.

To Mr. R. Bolton, for Sweet Peas.
To Messrs. G. Bunyard & Co., for herbaceous plants.
To Sir William Cain (gr. C. Moore), for Carnations.
To Messrs. Carter Page & Co., for flowering plants.
To Mr. A. Dawkins, for Schizanthus.
To Messrs. Dobbie & Co., for Antirrhinums.
To the Donard Nursery Co., for new and rare shrubs.
To Mr. J. Douglas, for Carnations.
To Messrs. Godfrey & Son, for flowering plants.
To Messrs. Maxwell & Beale, for herbaceous plants.
To Messrs. J. Piper & Son, for Clematis.
To Mr. R. Prichard, for alpine plants.
To Mr. G. Reuthe, for flowering shrubs.
To Messrs. W. H. Rogers & Son, for alpine plants.
To Mr. L. R. Russell, for stove plants.
To Messrs. Sanders, for stove plants.
To Mr. J. Stevenson, for Sweet Peas.
To Messrs. Stuart Low & Co., for Carnations.
To Messrs. Waterer, Sons & Crisp, for herbaceous plants.
To Messrs. E. Webb & Sons, for flowering plants.
To Mr. W. Wells, jun., for herbaceous plants.

Silver Grenfell Medal.

To Messrs. Bakers, Ltd., for herbaceous plants.
To Messrs. Bowell & Skarratt, for herbaceous plants.
To Mr. Reginald J Cass, for Pelargoniums, etc.
To Messrs. Cheal & Sons, for alpine plants.
To Mr. H. Clarke, for Violas.
To Messrs. Cutbush & Son, for Carnations.
To Messrs. Dobbie & Co., for Tulips.
To Mr. H. N. Ellison, for Cacti, ferns, etc.
To Messrs. Fletcher Bros., for Rhododendrons and Conifers.
To Mr. C. H. Herbert, for Pinks.
To Mr. Hugh Mann, for Hydrangeas.
To Messrs. Maxwell & Beale, for alpine plants.
To Messrs. J. Piper & Son, for alpine plants.
To Mr. George Prince, for Roses.
To Messrs. Stuart Low & Co., for Australian plants.
To Messrs. R. Tucker & Son, for alpine plants.
To Yokohama Nursery Co., for Japanese trees and gardens.

Silver Banksian Medal.

To Messrs. R. H. Bath, Ltd., for flowering plants.
To Mr. E. H. Causer, for flowering plants and ferns.
To Mr. J. Forbes (Hawick), for Pansies, Violas, Stocks, and Statice.
To Messrs. Harkness & Sons, for herbaceous plants.
To Messrs. K. Luxford & Co., for Carnations.
To Messrs. Rich & Co., for hardy flowers.
To Mr. L. R. Russell, for Amaryllis.
To Messrs. Ryder & Son, Ltd., for Iris.
To Messrs. Storrie & Storrie, for Cinerarias.
To Messrs. G. G. Whitelegg & Co., for Irises.
To Aubrey F. Wootton, Esq., K.C. (gr. W. Lamson), for Pelargoniums.

Scientific Exhibits.

Silver-gilt Lindley Medal.

To Messrs. Charlesworth & Ramsbottom for microphotographs of Orchid Germination and the Bacterial agencies assisting it.

To the Horticultural Education Association (C. F. Lawrance, County Education Offices, Northampton), for an Educational Exhibit, including maps and diagrams illustrating extension of horticultural teaching.

Vote of Thanks.

To the Imperial College of Science, S. Kensington (Prof. V. H. Blackman), for Illustrations of the Life History of the Parasite causing Wart Diseases.

GENERAL MEETING.

JUNE 7, 1921.

R. W. WALLACE, Esq., in the Chair.

Three hundred and eighteen Fellows and eleven Associates were elected, and eight Societies affiliated.

An informal discussion on Irises took place.

GENERAL MEETING.

JUNE 21, 1921.

C. T. MUSGRAVE, Esq., in the Chair.

Ninety-seven Fellows and five Associates were elected, and two Societies affiliated.

A lecture was given by E. J. Holland, Esq., on " Scented Roses."

SCIENTIFIC COMMITTEE.

JANUARY 11, 1921.

Mr. E. A. BOWLES, M.A., in the Chair, and six members present.

Triple-spathed Richardia.—Mr. C. J. Lucas sent an inflorescence of *Richardia aethiopica* with three white spathes, the innermost being very small.

Mints.—Mr. Fraser showed specimens and made remarks upon various forms of *Mentha aquatica*, including an *albino*.

Cockroach among Bananas.—A beautiful green cockroach, *Panchlora viridia*, found among imported bananas, was sent for identification.

SCIENTIFIC COMMITTEE, JANUARY 25, 1921.

Mr. E. A. BOWLES, M.A., in the Chair, nine members and two visitors present.

Snowdrops.—Mr. Elwes showed a number of snowdrops from different sources, including one which was twin-flowered last year, and is again twin-flowered, although one flower was separated from the other by a length of stem of six inches. Mr. Elwes also showed a form known as *Galanthus maximus*, which was referred to Mr. Bowles.

Various plants.—Mr. Elwes also showed *Moraea Johnstoni* and remarked that it was apparently identical with *Dietes Macleayi major*.

Galanthus lutescens.—Mr. Bowles remarked that this yellow-flowered snowdrop comes well and true from seed.

Pink-flowered Rhododendron moupinense.—Mr. A. Grove showed a plant from his garden of the *Rhododendron moupinense* with pink instead of the usual white flowers. It was lifted from the open ground.

Orchid from Palestine.—Mr. Bowles showed an Orchid from Palestine which he took to be *Serapias pseudocordigera*. It was referred to Dr. Rendle for further examination.

Eustephia coccinea.—Mr. Elwes showed a plant which he had grown for ten years, and which was only now flowering. Mr. Worsley recognised it as *Eustephia coccinea*. It bore two long-tailed flowers on the top of a foot-long scape.

SCIENTIFIC COMMITTEE, FEBRUARY 8, 1921.

Mr. E. A. BOWLES, M.A., in the Chair, with ten members, and Miss PELLEW and Mr. S. POPE, visitors.

Orchid from Palestine.—Dr. Rendle corroborated the identification with *Serapias pseudocordigera* of the species shown at the last meeting.

Galanthus maximus Velenowsky.—Mr. Bowles said he had made a careful examination of the snowdrop Mr. Elwes had shown under the name *Galanthus maximus* at the last meeting. He could find nothing in it to cut it off specifically from *G. Elwesii*, of which it was a far western representative from Bulgaria.

Rumex alpinus.—Mr. Fraser showed dried examples of this fine plant as seen in Alpine meadows (usually starting its growth too early to be really effective in England), and remarked that it was apparently a survival of old cultivation around monasteries.

'Witches' Broom' on Prunus subhirtella autumnalis.—Mr. P. D. Williams sent a witches' broom from this plant, which had developed after pruning in the spring of last year.

'Linkages' in Primula sinensis.—Mr. Bateson showed specimens of *Primula sinensis* to illustrate the process by which the new variety 'Etna,' that day exhibited by Messrs. Sutton & Sons, had been bred. In it were combined, for the first time, a red stigma (a feature which has a peculiar influence on the colour of the petals) with dark red foliage. Hitherto all combinations with dark red foliage have been weak in flower colour. The variety was interesting

as a by-product of the research into the somewhat abstruse theory of Linkage, undertaken first in Cambridge and afterwards at the John Innes Horticultural Institution in conjunction with the late R. P. Gregory, who had done most of the work. About thirty pairs of factors have been distinguished in the species, of which four form one linkage group, namely magenta, thrum, light red leaf, green stigma, with their recessives red, pin, dark leaf, red stigma. The linkage between leaf and stigma colour is extremely close, more than 30 : 1, and the cross over combination is consequently very rare. From theoretical considerations it was nevertheless highly probable that such a combination might eventually be produced. Had the original combination been in the form red stigma with dark leaf, the abundance of anthocyanin in both organs might, in accordance with older views, have seemed a natural correlation, and been attributed to a single factor, but this would have been a mistaken inference.

From the new combination further novelties can now be readily made. Mr. Bateson acknowledged the great assistance he had received during more than twenty years from Messrs. Sutton, who had allowed him to keep constantly in touch with their operations on Primula and other plants, and it was a pleasure to be able to send them in return a plant of horticultural interest, from which they had worked up the fine group of ' Etna ' exhibited in the Hall.

Mr. Sutton said the whole field of hybridization for raising new varieties of vegetables and flowers has been altered by Prof. Bateson's Mendelian research work, so that we are now at once able to make crosses with a more or less certain knowledge of what will result from the crosses—instead of working in the dark " and taking the chance of what might turn up."

SCIENTIFIC COMMITTEE, FEBRUARY 22, 1921.

Mr. E. A. BOWLES, M.A., in the Chair, and six members present, with Mr. E. H. JENKINS and Mr. S. POPE, visitors.

Hybrid Saxifrage.—Mr. E. H. Jenkins showed an interesting hybrid Saxifrage called ' The Link.'

SCIENTIFIC COMMITTEE, MARCH 8, 1921.

Mr. E. A. BOWLES, M.A., in the Chair, and eight members present.

British Primulas.—Mr. Fraser showed a specimen of the well-known hybrid *Primula veris* × *acaulis* and of *P. elatior*, and drew attention to the fact that not only is the throat of the corolla open in *P. elatior*, but the capsule is longer than the calyx.

Variegated Abutilon.—Mr. Hosking showed specimens to illustrate the transmissibility of variegation in Abutilons. The case of *A. Thompsoni* on *A. striatum* is well known, but Mr. Hosking showed it could also be used to cause variegation in *A. insignis* and other species.

SCIENTIFIC COMMITTEE, APRIL 5, 1921.

Mr. E. A. BOWLES, M.A., in the Chair, and ten members, with Mrs. BERKELEY (visitor), present.

Primrose, effect of selection.—Mrs. Berkeley of Spetchley showed a number of primroses of various colours raised at Spetchley, the result of twenty years careful selection for size of flowers, many of the flowers being about double the size of the common primrose. A Certificate of Appreciation was, on the proposal of Colonel Balfour, seconded by Mr. Cuthbertson, unanimously awarded to Mrs. Berkeley for her work with these primroses.

Anemone Pulsatilla forms.—Mr. Fraser showed a series of specimens to illustrate the range of variation in *Anemone Pulsatilla*. In the course of discussion it was pointed out that the dark-flowered form (var. *tenuifolia*) flowers about a fortnight later than the paler one and comes true from seed.

Delphinium Ajacis.—Mr. Fraser also showed a specimen of this species which has become naturalized on Kew Green.

Schizanthus hybrids.—Mr. Cuthbertson showed flowers of a new strain of Schizanthus raised by Dr. Badger by selection from a large-flowered plant which

appeared in some seedlings of his in 1909. The flowers were of various colours, many of them very rich, and of large size up to two inches in diameter. A Certificate of Appreciation, proposed by Mr. Worsley, seconded by Mr. Hosking, was unanimously recommended to Dr. Badger.

Big bud in black currants.—Mr. Worsley drew attention to a variety of black currant which was affected by big bud, but in which the shoot grew through the bud, so that growth was not greatly interfered with by the attack.

SCIENTIFIC COMMITTEE, APRIL 26, 1921.

Mr. E. A. BOWLES, M.A., V.M.H., in the Chair, and five members present.

Pyrus hybrid.—Mr. J. Fraser showed a hybrid Pyrus which he had collected on Leatherhead Downs, and which he regarded as *Pyrus intermedia* × *P. Aucuparia.*

Juniperus virginiana galled.—Mr. C. J. Lucas of Warnham Court sent shoots of *Juniperus virginiana* bearing numerous fruiting bodies of the fungus *Gymnosporangium confusum*, which is perennial in the tissues of Junipers and has a summer stage on Crataegus &c.

Variegated Pelargoniums.—Mr. Hosking showed examples of variegated scented Pelargoniums with various types of yellowing of the foliage, all derived from one green type which was produced at times upon the variegated plants.

Albino Orchis mascula.—Mr. Gurney Wilson showed a number of very fine spikes of *Orchis mascula* and an albino form which he had collected wild.

Fruiting of Prunus Pseudocerasus.—Mr. Bunyard sent fruiting shoots of this Prunus, introduced long since by the R.H.S., but now, in the single form, exceedingly rare. The plant had fruited at Maidstone under glass.

Fruit of Prunus triloba.—A branch bearing immature fruit of *Prunus triloba* came from Mr. Geo. Lamb of Hextable.

Aberrant Narcissus.—Mr. H. J. Chapman showed an inflorescence of Narcissus in which the flower had sprung from a stalk at an elbow several inches distant from the base of the plant.

SCIENTIFIC COMMITTEE, MAY 10, 1921.

Mr. E. A. BOWLES, M.A., in the Chair, and four members present.

Crown-Gall.—Mr. Fraser showed a Loganberry with a well-developed crown-gall on the rhizome due to the attack of *Pseudomonas tumefaciens*. This organism attacks a great number of different plants, but rarely seems to do any great amount of damage.

Drimys Winteri.—Mr. Hosking showed a piece of *Drimys Winteri* in flower from the John Innes Institution at Merton, where it is growing sheltered between green-houses.

Dionaea muscipula.—Mr. Hales showed a plant of Dionaea with small plants developing upon the inflorescence.

Certificate of Appreciation.—A Certificate of Appreciation was, at the instance of the Orchid Committee, awarded to Monsieur Graire for work done in raising the interesting hybrid between *Oncidium macranthum* and *Odontoglossum Thompsonianum* (*Odontocidium* × *Graireanum*).

SCIENTIFIC COMMITTEE, JUNE 7, 1921.

Iceland Poppies malformed.—Mr. Wood of Ashtead showed a number of flowers of the Iceland poppy malformed in various ways, some having all their stamens transformed into linear petaloid structures somewhat spathulate at the tips, others showing various types of duplication of parts, of which the most striking was a form with the sepals four and persistent.

Variations in the foliage of Populus nigra.—Mr. Fraser showed specimens of the foliage of a tree, which he believed to be *Populus nigra*, at different ages from the seed, viz. one, two, and seven years, showing the gradual development of the mature form of foliage as the tree acquired age. He also showed leaves from stool shoots of the same tree measuring up to eight inches across.

SCIENTIFIC COMMITTEE, JULY 21, 1921.

Mr. E. A. BOWLES, M.A., in the Chair, and six members present.

Veronica formosa.—Mr. Bowles showed on behalf of Mr. Loder *Veronica formosa*, called *V. Girdwoodiana* in gardens. This is the only shrubby species of *Veronica* from Australia.

Proliferation in Geum.—Mr. Fraser showed on behalf of Mr. F. G. Wood abnormal flowers proliferating of *Geum rivale*, Leonard's variety.

Crataegus.—Mr. Forrest also showed specimens of the two native Crataegus with a hybrid between them, a sheet of dried specimens of seedlings, and the variety *laciniata* of *C. monogyna*.

Ailanthus roots.—Mr. Bowles showed a root growing under his lawn, which may have come from *Ailanthus glandulosa*, growing some distance away (on examination it proved to belong to *Juglans nigra*, a very long distance from the place where the root was found).

FRUIT AND VEGETABLE COMMITTEE.

JANUARY 11, 1921.

Mr. J. CHEAL, V.M.H., in the Chair, and twenty members present.

Awards Recommended :—

Silver-gilt Grenfell Medal.

To Messrs. Sutton, Reading, for vegetables.

First-class Certificate.

To Apple ' Claygate Pearmain ' (votes unanimous), from Messrs. G. Bunyard, Maidstone. This variety received an Award of Merit on January 29, 1901, and is described in the proceedings of the Committee for that date.

Other Exhibits.

Mrs. Miller, Marlow : preserves.
Sir B. Oppenheimer, Slough : Tomato ' Sefton Park Prolific.'

FRUIT AND VEGETABLE COMMITTEE, JANUARY 25, 1921.

Mr. C. G. A. NIX in the Chair, and ten members present.

Award Recommended :—

Silver Knightian Medal.

To Messrs. Sutton, Reading, for Kales.

Other Exhibits.

Mrs. Miller, Marlow : preserves.
Miss Sewell, S. Kensington : preserves.

FRUIT AND VEGETABLE COMMITTEE, FEBRUARY 8, 1921.

Mr. C. G. A. NIX in the Chair, and nineteen members present.

Awards Recommended :—

Silver-gilt Hogg Medal.

To Messrs. Rivers, Sawbridgeworth, for Citrus trees in pots.

Silver-gilt Knightian Medal.

To Messrs. Dobbie, Edinburgh, for Potatos.

First-class Certificate.

To Apple ' Superb ' (votes unanimous), from Messrs. Laxton, Bedford. This apple received an Award of Merit on August 26, 1919, and is described in the proceedings for that day.

Other Exhibits.

G. W. W. Blathwayt, Esq., Porlock Weir : Lemons grown in open.
Messrs. Ramsbotham, Bletchley : seedling Apple.
G. Woodward, Esq., Teston : Pear ' Joséphine de Malines.'

FRUIT AND VEGETABLE COMMITTEE, FEBRUARY 22, 1921.

Mr. J. CHEAL, V.M.H., in the Chair, and eighteen members present.

No awards were recommended on this occasion.

Exhibits.

Mr. J. A. Devenish, Staverton: Apple 'Peter Lock.'
Mrs. Miller, Marlow: preserves.
Mr. J. Smith, Cumnor: Apple 'Chawley Seedling.'

FRUIT AND VEGETABLE COMMITTEE, MARCH 8, 1921.

Mr. C. G. A. NIX in the Chair, and eighteen members present.

Awards Recommended:—

Gold Medal.

To Messrs. V. & G. Banks, London, for preserved fruits and vegetables in bottles.

Silver-gilt Knightian Medal.

To C. A. Cain, Esq. (gr. Mr. Pateman), Welwyn, for Apples and Pears.

Other Exhibits.

Mrs. Miller, Marlow: preserves.
Miss Sewell, London: preserves.
Messrs. Westmacott, London: Cape fruit.

FRUIT AND VEGETABLE COMMITTEE, MARCH 22, 1921.

Mr. C. G. A. Nix in the Chair, and eighteen members present.

Awards Recommended:—

Silver Knightian Medal.

To Messrs. Sutton, Reading, for vegetables.

Silver Banksian Medal.

To Messrs. Westmacott, London, for Cape fruits.

Other Exhibits.

Messrs. V. & G. Banks, London: preserved fruits.
Mr. Hickson, Lewes: Apple for naming.
Mrs. Miller, Marlow: preserves.
Miss Sewell, London: preserves.
Mr. B. Webster, Tewkesbury: Apple 'Reliable.'

FRUIT AND VEGETABLE COMMITTEE, APRIL 5, 1921.

Mr. C. G. A. Nix in the Chair, and twenty-one members present.

No awards were recommended on this occasion.

Exhibits.

Messrs. V. & G. Banks, London: bottled fruits &c.
Mrs. Miller, Marlow: preserves.

FRUIT AND VEGETABLE COMMITTEE, APRIL 26, 1921.

Mr. C. G. A. NIX in the Chair, and fourteen members present.

Award Recommended:—

Silver Knightian Medal.

To Messrs. Sutton, Reading, for vegetables.

Other Exhibits.

Messrs. Bunyard, Maidstone: Apple 'Wagener' and fruits of *Cerasus Pseudocerasus*.
Mr. T. P. Edwards, Southgate: Apple 'Northern Heights.'
Messrs. Elcombe, Romsey: seedling Apple.

FRUIT AND VEGETABLE COMMITTEE, MAY 10, 1921.

Mr. P. C. M. VEITCH in the Chair, and ten members present.

No awards were recommended on this occasion.

Exhibits.

Messrs. Barr, Covent Garden : Tomato ' Orange Sunrise.'
Messrs. Dobbie, Edinburgh : Potato ' Arran Comrade.'
Rev. W. Wilks, Shirley : Apple ' Allen's Everlasting.'

FRUIT AND VEGETABLE COMMITTEE, JUNE 7, 1921.

Mr. A. H. PEARSON in the Chair, and sixteen members present.

No awards were recommended on this occasion.

Exhibit.

Messrs. Bunyard, Maidstone : Strawberry ' Black Prince.'

FRUIT AND VEGETABLE COMMITTEE, JUNE 21, 1921.

Mr. E. A. BUNYARD in the Chair, and eleven members present.

No awards were recommended on this occasion.

Exhibits.

Mr. E. Bishop, Calverton : Strawberry ' Bishop's Favourite.'
Mrs. Miller, Marlow : preserves.

FLORAL COMMITTEE.

JANUARY 11, 1921.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-six members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. Sutton, Reading, for Primulas.

Silver Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Mr. C. Engelmann, Saffron Walden, for Carnations.
To Messrs. Ryder, St. Albans, for clipped trees.

Silver Banksian Medal.

To Messrs. S. Low, Bush Hill Park, for Carnations &c.
To Messrs. Whitelegg, Chislehurst, for shrubs &c.

Bronze Flora Medal.

To Mr. S. Aish, Dunstable, for Chrysanthemums.
To Messrs. Cutbush, Highgate, for Rhododendrons.
To Mr. G. Reuthe, Keston, for hardy plants.
To Messrs. Russell, Richmond, for Azaleas.

Award of Merit.

To Carnation 'Cupid' (votes 10 for, 1 against), from Mr. C. Engelmann, Saffron Walden. A new seedling perpetual-flowering Carnation of medium size and good form. Its calyces are non-bursting, and its colour is a good bright pink.

To Chrysanthemum 'Autocrat' (votes unanimous), from Messrs. Lowe & Shawyer, Uxbridge. A large pure white Decorative variety of fine form and with broad florets. It is excellent in every respect.

To Chrysanthemum 'Autocrat Incurved' (votes 10 for), from Messrs. Lowe & Shawyer, Uxbridge. This variety is an excellent pure white incurved sport from 'Autocrat.'

Other Exhibits :—

Messrs. Chapman, Rye : Freesias &c.
Misses Hopkins, Shepperton : hardy plants.

FLORAL COMMITTEE, JANUARY 25, 1921.

Mr. H. B. MAY, V.M.H., in the Chair, and sixteen members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

Silver Grenfell Medal.

To Mr. C. Engelmann, Saffron Walden, for Carnations.
To Mr. G. W. Miller, Wisbech, for hardy plants.
To Messrs. Russell, Richmond, for Azaleas.

Silver Banksian Medal.

To Messrs. Carter, Raynes Park, for Primulas.
To Messrs. Cutbush, Barnet, for Carnations &c.
To Messrs. Low, Bush Hill Park, for Carnations.
To Messrs. Waterer, Sons & Crisp, Twyford, for hardy plants.
To Messrs. Whitelegg, Chislehurst, for conifers &c.

Bronze Flora Medal.

To Messrs. Bowell & Skarratt, Cheltenham, for hardy plants.
To Mr. J. J. Kettle, Corfe Mullen, for Violets.
To Messrs. Tucker, Oxford, for alpines.

Bronze Banksian Medal.

To Messrs. Cheal, Crawley, for conifers and shrubs.
To Messrs. Ryder, St. Albans, for Cyclamen.

Award of Merit.

To *Primula stellata* 'Fairy Queen Improved' (votes unanimous), from Messrs. Carter, Raynes Park. The plants of this useful decorative Primula grow about one foot high, and bear large flowers, measuring 1¼ inches across, with great freedom. The flowers are white with a zone of deep rose round the eye.

Other Exhibits:—

Messrs. Chapman, Rye: Freesias, Irises, &c.
Misses Hopkins, Shepperton: hardy plants.

FLORAL COMMITTEE, FEBRUARY 8, 1921.

Mr. H. B. MAY, V.M.H., in the Chair, and thirty members present.

Awards Recommended:—

Gold Medal.

To Messrs. Sutton, Reading, for Cyclamen and Primulas.

Silver-gilt Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. Carter, Raynes Park, for Primulas.
To Mr. C. Engelmann, Saffron Walden, for Carnations.

Silver Grenfell Medal.

To Messrs. Cheal, Crawley, for shrubs and alpines.
To Lord Lambourne, Romford, for Carnations.
To Mr. G. W. Miller, Wisbech, for Polyanthus.
To Messrs. Waterer, Sons & Crisp, Twyford, for hardy plants.

Silver Banksian Medal.

To Messrs. Cutbush, Barnet, for Carnations &c.
To Messrs. S. Low, Enfield, for Carnations &c.
To Mr. M. Prichard, Christchurch, for hardy plants.
To Messrs. Russell, Richmond, for Azaleas.
To Messrs. Tucker, Oxford, for alpine plants.

Bronze Flora Medal.

To Misses Allen-Brown, Henfield, for Violets.
To Messrs. Barr, Taplow, for hardy plants.
To Messrs. Bowell & Skarratt, Cheltenham, for hardy plants.
To Chalk Hill Nurseries, Reading, for Primulas.
To Messrs. C. Elliott, Stevenage, for alpine plants.
To Mr. J. J. Kettle, Corfe Mullen, for Violets.
To Messrs. Maxwell & Beale, Broadstone, for alpine plants.
To Mr. G. Reuthe, Keston, for shrubs &c.
To Messrs. Whitelegg, Chislehurst, for conifers.

Award of Merit.

To Carnation 'Thor' (votes 13 for, 2 against), from Mr. C. Engelmann, Saffron Walden. A bright scarlet perpetual-flowering seedling of great excellence. The flowers are borne on good stiff stems, and are of medium size, sweetly scented, and with good, non-splitting calyces.

To *Primula sinensis* 'Etna' (votes unanimous), from Messrs. Sutton, Reading. A rich deep-crimson variety of compact habit. The flowers are large and have a narrow darker zone around the eye. The foliage is darkly tinted and adds much to the beauty and decorative value of the plant.

Cultural Commendation.

To Mrs. C. C. Fletcher Toomer, Hampstead, for *Cephalotes follicularis*.

Other Exhibits :—

Messrs. H. Chapman, Rye : Freesia ' Radiance.'
Misses Hopkins, Shepperton : hardy plants.

FLORAL COMMITTEE, FEBRUARY 22, 1921.

Mr. H. B. MAY, V.M.H., in the Chair, and thirty-three members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. Sutton, Reading, for Hyacinths.

Silver Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. Gill, Falmouth, for Rhododendrons.
To Messrs. Russell, Richmond, for forced shrubs.

Silver Grenfell Medal.

To Messrs. Cutbush, Barnet, for forced shrubs and alpine plants.
To Mr. G. W. Miller, Wisbech, for hardy plants.
To Messrs. S. Low, Bush Hill Park, for Carnations and other greenhouse plants.

Silver Banksian Medal.

To Messrs. Barr, Taplow, for hardy plants.
To Mr. C. Engelmann, Saffron Walden, for Carnations.
To Mr. M. Prichard, Christchurch, for hardy plants.
To Mr. G. Reuthe, Keston, for hardy plants.
To Messrs. Tucker, Oxford, for alpine plants.

Bronze Flora Medal.

To Messrs. Baker, Wolverhampton, for hardy plants.
To Messrs. Bowell & Skarratt, Cheltenham, for alpine plants.
To Messrs. Cheal, Crawley, for shrubs and alpine plants.
To Messrs. Piper, Langley, for shrubs and alpine plants.
To Messrs. Waterer, Sons & Crisp, Twyford, for hardy plants.

Bronze Banksian Medal.

To Messrs. Elliott, Stevenage, for alpine plants.
To Mr. J. J. Kettle, Corfe Mullen, for Violets.
To Messrs. Maxwell & Beale, Broadstone, for alpines.
To Messrs. Reamsbottom, Geashill, for Anemones.
To Messrs. Ryder, St. Albans, for Primulas.

Award of Merit.

To *Primula malacoides* ' Pink Beauty ' (votes 18 for, 7 against), from Mr. W. Yandell, Maidenhead. An excellent variety of *P. malacoides* with large deep-purplish-rose flowers nearly an inch across and having a yellow eye. The plants are about one foot high and very free-flowering.

To *Primula sinensis* ' Intensity ' (votes 21 for), from Messrs. Sutton, Reading. The crimson flowers of this splendid Primula measure nearly two inches across, and have a brown eye surrounded by a narrow zone of colour less intense than that prevailing in the rest of the flower. The edges of the flowers are crinkled and beautifully waved. The plants are of compact habit, and the handsome trusses of bloom are held well above the foliage.

To *Viburnum fragrans* (votes 19 for), from E. A. Bowles, Esq., M.A., Waltham Cross. A very desirable hardy shrub bearing terminal cymose heads of very fragrant, small, white flowers, faintly tinted with pink. It commenced to flower in the exhibitor's garden in October and had endured two consecutive frosts of 10° F. with no ill effects to the flowers.

Other Exhibits :—

Misses Hopkins, Shepperton : hardy plants.
Rev. B. F. S. Pinney, Blandford : Violets.
Mr. W. Wells, jun., Merstham : *Oenothera Childsii*.
Mrs. J. Bourne Wheeler, Derby : miniature rock gardens.

FLORAL COMMITTEE, MARCH 8, 1921.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-five members present.

Awards Recommended :—

Gold Medal.

To Messrs. Sutton, Reading, for Hyacinths and Freesias.

Silver-gilt Banksian Medal.

To Messrs. Dobbie, Edinburgh, for Hyacinths.

Silver Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. Cuthbert, Southgate, for Hyacinths.
To Messrs. Low, Bush Hill Park, for Carnations.

Silver Grenfell Medal.

To Messrs. Barr, Taplow, for hardy plants.
To Messrs. Cuthbert, Southgate, for Azaleas.
To Mr. C. Engelmann, Saffron Walden, for Carnations.
To Messrs. Gill, Falmouth, for Rhododendrons.
To Mr. G. Reuthe, Keston, for hardy plants.

Silver Banksian Medal.

To Messrs. Cheal, Crawley, for hardy plants.
To Messrs. Cutbush, Barnet, for Lilacs.
To Mr. Dalrymple, Southampton, for Freesias.
To Mr. E. J. Hicks, Twyford, for Roses.
To Mr. H. Hicks, Hatfield Peverel, for Violets.
To Mr. G. W. Miller, Wisbech, for hardy plants.
To Messrs. Piper, Langley, for rock garden.
To Mr. M. Prichard, Christchurch, for hardy plants.
To Messrs. Russell, Richmond, for forced shrubs.
To Messrs. Tucker, Oxford, for alpine plants.
To Messrs. Waterer, Sons & Crisp, Twyford, for hardy plants.

Bronze Flora Medal.

To Misses Allen-Brown, Henfield, for Violets.
To Messrs. Bowell & Skarratt, Cheltenham, for alpine plants.
To Messrs. Carter, Raynes Park, for Primulas.
To Mr. J. J. Kettle, Corfe Mullen, for Violets.
To Messrs. Luxford, Harlow, for Carnations.
To Messrs. Maxwell & Beale, Broadstone, for alpine plants.
To Messrs. Reamsbottom, Geashill, for Anemones.
To Messrs. Whitelegg, Chislehurst, for alpine plants.

Bronze Banksian Medal.

To Messrs. C. Elliott, Stevenage, for alpine plants.
To Misses Hopkins, Shepperton, for hardy plants.

First-class Certificate.

To *Clematis Armandi* × *Pavoliniana*, Jeune's variety (votes unanimous), from Capt. Symons-Jeune, Henley-on-Thames. This handsome climber was raised from seed saved at La Mortola, and appears to be a hybrid, intermediate in form between the two parents *C. Armandi* and *C. Pavoliniana*. It flowers earlier than the latter, but has its characteristic flowers and free-blooming habit, while it takes the darker narrow-pointed leaf and more robust habit of *C. Armandi*. It is absolutely hardy, and its very numerous bunches of long-stalked, starry-white flowers are sweetly scented. The individual flowers often measure 2½ inches across.

Award of Merit.

To *Freesia* (*Tubergeni*) 'Apothéose' (votes unanimous), from Mr. C. G. van Tubergen, jun., Haarlem. This variety has very large open flowers, the ground colour of which is white, streaked, heavily tinged, and deeply margined with lilac, which almost becomes rosy-mauve with age.

To *Freesia* (*Tubergeni*) 'Treasure' (votes 15 for, 3 against), from Mr. C. G. van Tubergen, jun., Haarlem. A large open golden-yellow variety faintly tinged with lilac on the outside.

To Rhododendron 'H. T. Gill' (votes 18 for, 2 against), from Messrs. Gill, Falmouth. This variety is the result of a cross between *R. Fortunei* and *R. arboreum*, and is said to be the brightest-coloured hybrid which has yet resulted from this cross. The flowers are widely open and measure about 2¾ inches across. They are borne in compact trusses of about fifteen blooms, and are of a bright rosy-cerise colour with a few inconspicuous brown dots at the base.

Cultural Commendation.

To Messrs. Cheal, Crawley, for *Soldanella montana*.

Other Exhibits :—

Rev. J. Jacob, Whitchurch : Freesias.
Lionel de Rothschild, Esq., M.P., Gunnersbury : *Primula limnoica*.
Messrs. Ryder, St. Albans : Hyacinths and Cinerarias.
W. J. H. Whittall, Esq., Haslemere : *Magnolia Campbellii*.

FLORAL COMMITTEE, MARCH 22, 1921.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-six members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Mrs. Berkeley, of Spetchley, Worcester, for Primroses.
To Messrs. Cutbush, Barnet, for forced shrubs.
To Mr. G. H. Dalrymple, Bartley, for Freesias.
To Mr. C. Engelmann, Saffron Walden, for Carnations.
To Messrs. Gill, Falmouth, for Rhododendrons.
To Mr. E. J. Hicks, Twyford, for Roses.

Silver Grenfell Medal.

To Messrs. Low, Bush Hill Park, for Carnations and other greenhouse plants.

Silver Banksian Medal.

To Messrs. Cheal, Crawley, for shrubs.
To R. Fox, Esq., Falmouth, for Rhododendrons.
To Mr. G. W. Miller, Wisbech, for Primroses.
To Messrs. M. Prichard, Christchurch, for alpine plants.
To Mr. G. Reuthe, Keston, for hardy plants.
To Messrs. Russell, Richmond, for forced shrubs &c.
To Messrs. Ryder, St. Albans, for Stocks and Mignonette.
To Messrs. Tucker, Oxford, for alpine plants.

Bronze Flora Medal.

To Messrs. Barr, Taplow, for hardy plants.
To Messrs. Bowell & Skarratt, Cheltenham, for alpine plants.
To Misses Hopkins, Shepperton, for hardy plants.
To Mr. J. J. Kettle, Corfe Mullen, for Violets.
To Messrs. Maxwell & Beale, Broadstone, for alpine plants.
To Messrs. Piper, Langley, for Clematis &c.
To Mr. G. Prince, Oxford, for Roses.
To Messrs. Reamsbottom, Geashill, for Anemones.
To Messrs. Veitch, Exeter, for flowering shrubs.
To Messrs. Waterer, Sons & Crisp, Twyford, for alpine plants.
To Messrs. Whitelegg, Chislehurst, for alpine plants.

Bronze Banksian Medal.

To Messrs. Elliott, Stevenage, for alpine plants.
To Mr. R. Prichard, West Moors, for alpine plants.

First-class Certificate.

To *Magnolia Veitchii* (votes 16 for), from Messrs. R. Veitch, Exeter. A very beautiful hybrid Magnolia resulting from a cross made by the exhibitors between *M. conspicua* and *M. Campbelli*. The flowers are 5 inches long and pointed. Their colour is ivory-white, tinged on the outside with pink. The plant is said to be vigorous and quite tree-like in habit. It is not only beautiful and distinct, but interesting as the first artificially raised hybrid Magnolia.

Award of Merit.

To Primrose 'Spetchley Strain' (votes 15 for, 2 against), from Mrs. Berkeley, of Spetchley, Worcester. An excellent strain of very large-flowered Primroses, comprising beautiful shades of white, primrose, yellow, blue, crimson, and purple.

To Rhododendron 'Robert Fox Barclay' (votes 10 for), from R. Barclay Fox, Esq., Falmouth. A very fine dark-crimson variety resulting from a cross between *R.* 'Glory of Penjerrick' and *R. Thomsoni*. The flowers are large, open, and measure 3 inches or more across. They are borne in loose trusses of about nine blooms. The foliage is broad and handsome.

To *Rhododendron* × *Werei* (votes 13 for), from R. Barclay Fox, Esq., Falmouth. Another very fine Rhododendron raised from a cross between *R. arboreum* and *R. Thomsoni*. The wide-open flowers are bright rose-pink, and are borne in compact trusses of from twelve to fourteen blooms. The foliage is long and narrow.

To Rose 'Margaret Horton' (votes 10 for, 2 against), from Mr. E. J. Hicks, Hurst. A Hybrid Tea variety of great beauty. The flowers are long and pointed in bud and of a rich apricot colour, becoming paler with age. They are very fragrant and are borne on strong stems.

To *Saxifraga hybrida* 'H. Marshall' (votes 17 for), from Messrs. M. Prichard & Sons, Christchurch. This dainty alpine grows about 3 inches high and carries comparatively large flowers, which are very pale pink when first open, but fade to white with age. The centre of the flower is deep rose. The flower stems rise from rosettes of compact glaucous foliage.

To *Saxifraga* × *Jenkinsiae* (votes 9 for, 2 against), from E. H. Jenkins, Esq., Surbiton. This plant resulted from a cross between *S. Burseriana major* and *S. lilacina*. Its flowers are white, faintly tinged with pink. They are large, and have the edges of the overlapping petals beautifully crinkled. The flower stems rise from a cushion of encrusted foliage.

To *Saxifraga* × Mira (votes 13 for), from Messrs. C. Elliott, Stevenage. This is reputed to be a hybrid between *S. Lapeyrousii* and *S. lilacina* raised by the late Mr. Reginald Farrer. It is very dwarf and free-flowering, and has comparatively large bright-pink flowers, which are borne on tiny pink stems.

To *Saxifraga* 'Pompadour' (votes 15 for), from Messrs. M. Prichard & Sons, Christchurch. A dwarf mossy variety with deep crimson flowers of large size borne on very dark stems. The centres of the flowers are green.

Cultural Commendation.

To Earl Bathurst (gr. Mr. T. E. Arnold), Cirencester, for Clivias.
To Mr. G. H. Dalrymple, Bartley, for *Iris Susiana*.
To F. Lloyd, Esq., Croydon, for *Saxifraga Rocheliana*.

Other Exhibits :—

Mrs. Muirhead Campbell, Northampton : Violets.
Rev. B. Pinney, Blandford : Violets.
Lady Stratheden, Jedburgh : Carnation 'Mrs. Arthur Williams.'

FLORAL COMMITTEE, APRIL 5, 1921.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-seven members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. Dobbie, Edinburgh, for Schizanthus.

Silver-gilt Banksian Medal.

To Mr. C. Engelmann, Saffron Walden, for Carnations.

Silver Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. Cheal, Crawley, for shrubs.
To Messrs. Cutbush, Barnet, for shrubs.
To Messrs. W. Paul, Waltham Cross, for Roses.
To Messrs. Piper, Langley, for shrubs and rock garden.

Silver Grenfell Medal.

To Messrs. B. R. Cant, Colchester, for Roses.
To Messrs. Cuthbert, Southgate, for Azaleas &c.
To Mr. M. Prichard, Christchurch, for hardy plants.

Silver Banksian Medal.

To Mrs. Berkeley, of Spetchley, Worcester, for Primroses.
To Mr. E. J. Hicks, Twyford, for Roses.
To Messrs. Low, Bush Hill Park, for Carnations and Australian plants.
To Messrs. Waterer, Sons & Crisp, Twyford, for hardy plants.

Bronze Flora Medal.

To Messrs. Barr, Taplow, for hardy plants.
To Colonel Stephenson Clarke, Cuckfield, for hardy shrubs.
To the Donard Nursery, Newcastle, for shrubs.
To Mr. J. J. Kettle, Corfe Mullen, for Violets.
To Misses Hopkins, Shepperton, for hardy plants.
To Messrs. Maxwell & Beale, Broadstone, for alpines.
To Mr. G. W. Miller, Wisbech, for hardy plants.
To Messrs. Carter Page, London, for Violas.
To Messrs. Reamsbottom, Geashill, for Anemones.
To Mr. G. Reuthe, Keston, for hardy plants.
To Messrs. Russell, Richmond, for shrubs.
To Messrs. Tucker, Oxford, for alpine plants.
To Messrs. Whitelegg, Chislehurst, for shrubs.

Bronze Banksian Medal.

To Messrs. C. Elliott, Stevenage, for alpine plants.

Award of Merit.

To *Azalea mollis* 'Robespierre' (votes 16 for, 1 against), from Messrs. Cuthbert, Southgate. A very fine bright salmon-orange variety bearing its flowers in handsome trusses of twelve or more blooms.

To *Prunus Cerasus pilosiuscula media* (votes unanimous), from Hon. Vicary Gibbs, Elstree. This plant, which is a native of Szechwan and West Hupeh, China, was first discovered by Dr. Henry. It was introduced by Mr. E. H. Wilson in 1900 and 1907. The young foliage is tinted with purple, and all along the branches are clusters of pale-pink flowers with very prominent stamens.

To *Prunus Sargentii* (votes 12 for, 4 against), from Hon. Vicary Gibbs, Elstree. A very free-flowering tree bearing on sturdy petioles clusters of broad-petalled, rounded, pink flowers about 1¼ inch across.

Other Exhibits:—

T. H. Lowinsky, Esq., Sunninghill: *Rhododendron habrotrichum.*
Mr. H. Marcham, Borough Green: *Viola gracilis* 'Leonard Marshall.'
Messrs. Ryder, St. Albans: *Scilla nutans alba.*
Mr. W. Wells, jun., Merstham: *Viola gracilis* 'Merstham var.'

FLORAL COMMITTEE, APRIL 26, 1921.

Mr. H. B. MAY, V.M.H., in the Chair, and thirty-four members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. Cuthbert, Southgate, for flowering shrubs.

Silver Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Mr. C. Engelmann, Saffron Walden, for Carnations.
To Mr. E. J. Hicks, Twyford, for Roses.
To Messrs. L. R. Russell, Richmond, for green-house plants and flowering shrubs.

Silver Grenfell Medal.

To Messrs. B. R. Cant, Colchester, for Roses.
To Messrs. Cutbush, Barnet, for Roses and flowering shrubs.
To Messrs. Ladhams, Southampton, for hardy plants.
To Messrs. Low, Bush Hill Park, for Carnations and Australian plants.

Silver Banksian Medal.

To Mr. J. C. Allgrove, Langley, for flowering shrubs.
To Messrs. Cheal, Crawley, for flowering shrubs.
To Messrs. Piper, Langley, for hardy plants.
To Mr. M. Prichard, Christchurch, for alpines.
To Mr. R. Prichard, West Moors, for alpines.
To Mr. G. Prince, Longworth, for Roses.
To Mr. G. Reuthe, Keston, for hardy plants.
To Messrs. Sutton, Reading, for Schizanthus.
To Messrs. Tucker, Oxford, for alpines.
To Messrs. Waterer, Sons & Crisp, Twyford, for Rhododendrons.
To Mr. W. Wells, jun., Merstham, for hardy plants.

Bronze Flora Medal.

To Mr. H. Clarke, Taunton, for Violas.
To Messrs. Crook, Camberley, for Polyanthus.
To Messrs. C. Elliott, Stevenage, for alpines.
To Messrs. Hopkins, Shepperton, for hardy plants.
To T. H. Lowinsky, Esq., Sunninghill, for Rhododendrons.
To Messrs. Maxwell & Beale, Broadstone, for hardy plants.
To Messrs. Carter Page, London, for Violas.
To Messrs. Reamsbottom, Geashill, for Anemones.
To Messrs. Waterer, Sons & Crisp, Twyford, for hardy plants.
To Messrs. Whitelegg, Chislehurst, for flowering shrubs.

Bronze Banksian Medal.

To Mr. E. Hills, Hanley Castle, for Primulas and Anemones.
To Mr. G. W. Miller, Wisbech, for hardy plants.

Award of Merit.

To Aubrietia ' Attraction ' (votes 19 for), from Mr. M. Prichard, Christchurch. A very free-flowering Aubrietia with pale-lilac flowers, the centres of which are surrounded by a zone of white.

To *Azalea viscosa glauca* (votes 16 for, 4 against), from F. J. Strover, Esq., South Norwood. The exhibitor of this plant raised it from a cutting obtained from a large hedge growing in France. The flowers are small, white, with pale buff anthers, very sweetly scented and borne in great profusion.

To Camellia ' Fred Sander ' (votes unanimous), from Messrs. Sander, St. Albans. A bright-red semi-double variety having the margins of the petals beautifully fringed.

To Cerasus ' Hizakura ' (votes unanimous), from Mr. R. C. Notcutt, Woodbridge. A very handsome flowering cherry, bearing pretty deep-rose-pink double flowers in bunches all along its branches.

To *Primula chionantha* (votes 11 for), from Messrs. C. Elliott, Stevenage. A new Chinese species with long fleshy dark-green leaves covered lightly with yellow meal on the under side. The plant, which appears to be a vigorous grower, throws up numerous scapes about a foot high, bearing many whorls of large white fragrant flowers. The calyces and stems of the flowers are covered with yellow meal.

To Rhododendron ' Bernard Crisp ' (votes unanimous), from Messrs. Waterer, Sons & Crisp, Bagshot. A large-flowered variety bearing about fifteen blooms in a compact truss. The individual flowers are rosy-mauve with a white centre. The upper petal is dotted with crimson.

To Rhododendron ' Britannia ' (votes 15 for, 1 against), from Messrs. van Nes, Boskoop. A very deep rosy cerise variety bearing about fifteen widely open flowers in a truss. The individual blooms measure 2½ inches across. This variety is the result of a cross between Rhododendron ' Queen Wilhelmina ' and *R.* ' Stanley Davis.'

To Rhododendron ' Dona Tizia ' (votes 6 for, 3 against), from T. H. Lowinsky, Esq., Sunninghill. A very beautiful hybrid, raised as the result of a cross between Rhododendron ' Doncaster ' and *R. Aucklandii rosea superba.* Its wide open flowers are pale pink, fading to white in the centre, and tinged with deeper pink outside. The flowers are borne in loose trusses of about eleven, and have bright-red pedicels. The width of the blooms is about 4 inches.

To Rose ' Lady Verey ' (votes 21 for), from Mr. E. J. Hicks, Twyford. A new seedling climbing variety with medium-sized double white fragrant flowers tinged with cream in the centre.

Other Exhibits :—

Miss Du Cane, Witham : Saxifraga ' Susan.'

Messrs. English, Gloucester : Rose ' Dorcas.'

Hon. Vicary Gibbs, Elstree : *Clematis macropetala, Pyrus Malus aldenhamensis.*

FLORAL COMMITTEE, MAY 10, 1921.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-nine members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. Russell, Richmond, for flowering shrubs.

Silver Flora Medal.

To Mr. C. Engelmann, Saffron Walden, for Carnations.
To Messrs. Jackman, Woking, for Clematis.
To Messrs. Low, Bush Hill Park, for Carnations and Australian plants.
To Messrs. Wallace, Tunbridge Wells, for flowering shrubs.

Silver Grenfell Medal.

To Messrs. B. R. Cant, Colchester, for Roses.
To Mr. R. C. Notcutt, Woodbridge, for flowering shrubs.

Silver Banksian Medal.

To Messrs. Cheal, Crawley, for Dahlias and flowering shrubs.
To Messrs. Cutbush, Barnet, for Roses.
To Mr. E. J. Hicks, Twyford, for Roses.
To Mr. A. Perry, Enfield, for hardy plants.
To Messrs. Piper, Langley, for hardy plants.
To Mr. M. Prichard, Christchurch, for hardy plants.
To Messrs. Waterer, Sons & Crisp, Bagshot, for Rhododendrons.
To Mr. W. Wells, jun., Merstham, for alpine plants.

Bronze Flora Medal.

To Messrs. C. Elliott, Stevenage, for alpine plants.
To Messrs. Ladhams, Southampton, for hardy plants.
To Mr. G. W. Miller, Wisbech, for hardy plants.
To Messrs. Reamsbottom, Geashill, for Anemones.
To Mr. C. Turner, Slough, for Lilacs and Violas.
To Messrs. Waterer, Sons & Crisp, Twyford, for alpine plants.
To Messrs. Whitelegg, Chislehurst, for shrubs and alpine plants.

Bronze Grenfell Medal.

To Mr. G. Reuthe, Keston, for hardy plants.

Bronze Banksian Medal.

To Messrs. Carter Page, London, for Violas.
To Chalk Farm Nurseries, Reading, for Primulas and Pansies.
To Messrs. Tucker, Oxford, for alpine plants.

Award of Merit.

To Azalea ' Hino Manyo ' (votes unanimous), from Mr. R. C. Notcutt, Woodbridge. A very free-flowering dwarf Azalea of the Kurume type with small bright-pink flowers.

To Carnation ' Wivelsfield Apricot ' (votes 14 for), from Messrs. Allwood, Haywards Heath. A good apricot-coloured perpetual-flowering variety of excellent form, borne on stiff wiry stems.

To *Geranium Pylzowianum ?* (votes 19 for, 1 against), from Messrs. C Elliott, Stevenage. A charming alpine form introduced by the late Mr. Farrer. It grows about 3 to 4 inches high, and has numerous widely open pale-lilac-pink flowers with black stamens. The habit of the plant is very neat and compact.

To Iris ' Hebe ' (votes 12 for, 4 against), from Messrs. van Tubergen, jun., Haarlem. This striking variety belongs to the Regelio-cyclus group. The standards are erect and heavily veined with violet, and the rounded falls are of a deeper shade veined with purple.

To *Wahlenbergia serpyllifolia* ' Malby's White ' (votes 18 for), from Messrs. C. Elliott, Stevenage. This charming alpine plant has compact tufts of foliage from which spring the relatively large, white, erect, open Campanula-like flowers. There is a faint trace of purplish shading in some of the flowers.

Other Exhibits :—

Mrs. Brocklebank, Cambridge : Carnation ' Bartlow Beauty.'
Mr. A. Cowan, Penicuik : seedling Erythroniums.
Mr. G. R. Downer, Chichester : Lupines.
Mr. W. R. Dykes, M.A., London : *Iris Hoogiana.*
Dame Alice Godman, Horsham : *Primula chionantha.*
Misses Hopkins, Shepperton : alpines.
Messrs. Ireland & Hitchcock, Marks Tey : Auriculas.
Messrs. Maxwell & Beale, Broadstone : alpines.
S. Morris, Esq., Norwich : *Lithospermum prostratum album.*
Messrs. Ryder, St. Albans : Auricula ' Mauve Beauty,' Anemone ' His Excellency.'
Messrs. Stark, Great Ryburgh : Geum ' Ryburgh Tangerine.'

FLORAL COMMITTEE, MAY 24, 1921.

AT CHELSEA.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-eight members present.

Awards Recommended :—

[For cups &c., see General Meeting, p. xxii.]

First-class Certificate.

To *Primula helodoxa* (votes unanimous), from Lionel de Rothschild, Esq., Exbury. This magnificent hardy Primula received an Award of Merit on May 23, 1916. It was collected in China by Mr. Forrest in 1912, and bears many whorls of bright-yellow flowers.

Award of Merit.

To *Aster alpinus* ' Wargrave variety ' (votes 14 for), from Messrs. Waterer, Sons & Crisp, Twyford. This variety has large flowers of a lilac-mauve colour with golden-yellow centre. The plants are from 6 to 9 inches high.

To Azalea ' Shin Seikai ' (votes 18 for), from Messrs. Piper, Langley. A dwarf variety with dainty white flowers. This and the two following Azaleas belong to the Kurume section.

To Azalea ' Suiyohi ' (votes 12 for, 4 against), from Messrs. Piper, Langley. The flowers of this variety are larger than those of the foregoing, being white, deeply tinged towards the edges with pink.

To Azalea ' Tsuta Momii ' (votes 11 for), from Messrs. Piper, Langley. A very effective variety with salmon-pink flowers.

To Carnation ' Bookham Salmon ' (votes unanimous), from Mr. J. Douglas, Great Bookham. A bright salmon-pink Border Carnation of excellent form and substance.

To Carnation ' Bookham Scarlet ' (votes 12 for), from Mr. J. Douglas, Great Bookham. A bright-scarlet Border variety of perfect form.

To Carnation ' Kelso ' (votes 9 for, 3 against), from Mr. J. Douglas, Great Bookham. A large-flowered Border variety of splendid form. The ground colour is buff, prettily splashed with heliotrope.

To Carnation ' Tarzan ' (votes unanimous), from Mr. C. Engelmann, Saffron Walden. An excellent rich scarlet perpetual-flowering variety, borne on good stiff stems.

To *Dracaena deremensis Bausei* (votes unanimous), from Mr. C. F. Bause, South Norwood. A very handsome green-house plant of compact habit, with dark green and white leaves. It is a sport from *Dracaena deremensis Warneckei* and is of similar growth but more drooping habit.

To Iris ' Banzai ' (votes 17 for), from Messrs. H. Chapman, Rye. This handsome Iris resembles a much improved Spanish Iris, and has whitish standards and yellow falls broadly blotched with gold.

To *Lithospermum prostratum album* (votes unanimous), from S. Morris, Esq., Norwich. A white variety of this charming rock-garden plant.

To *Lupinus polyphyllus* ' Pink Pearls ' (votes unanimous), from Mr. G. R. Downer, Chichester. A very striking carmine-pink variety bearing large spikes of bloom.

To *Lupinus polyphyllus* ' Sunshine ' (votes unanimous), from Messrs. Waterer, Sons & Crisp, Twyford. A very handsome primrose-yellow variety.

To *Lupinus polyphyllus* ' Tunic ' (votes 14 for, 1 against), from Mr. G. R. Downer, Chichester. This variety produces large spikes of pale-pink flowers blotched with white on the standard.

To Rhododendron ' Hugo de Vries ' (votes 10 for, 2 against), from Messrs. Wallace, Tunbridge Wells. The large deep-rose-pink flowers of this variety are borne in compact, erect trusses. The upper petals are spotted with brown. The variety is the result of a cross between ' Pink Pearl ' and ' Doncaster.'

To *Rhus Cotinus foliis purpureus* (votes 12 for, 1 against), from Mr. R. C. Notcutt, Woodbridge. A variety of this useful and handsome shrub with deep-purple foliage.

To Rose ' Florence ' (votes 6 for), from Messrs. W. Paul, Waltham Cross. A bright-rose-pink hybrid Tea variety with large flowers. It appears to be a vigorous grower.

To Rose ' Juliana ' (votes unanimous), from Messrs. Cutbush, Barnet. A very pretty Polyantha Rose having pink flowers with a white centre.

Other Exhibits:—

Messrs. Allwood, Haywards Heath : *Dianthus Allwoodii.*
J. Birchenall, Esq., Alderley Edge : Nasturtium ' Golden Prince.'
Messrs. Blackmore & Langdon, Bath : Gloxinia ' Pink Princess.'
Mr. R. Bolton, Halstead : Sweet Peas.
J. A. Christie, Esq., Norwich : *Primula pulverulenta* ' Mabula.'
Messrs. Clark, Dover : hardy plants.
Dame Alice Godman, Horsham : *Rhododendron crassum.*
Messrs. Grove, Sutton Coldfield : *Viola gracilis* ' Wyndley Gem.'
Mr. E. J. Hicks, Twyford : Rose ' Lafayette.'
Messrs. Ireland & Hitchcock, Marks Tey : Sweet Peas.
Messrs. Koster, Boskoop : Azaleas.
Messrs. Ladhams, Southampton : *Veronica prostrata* ' Shirley Blue.'
Messrs. Laxton, Bedford : Roses and Lupines.
Messrs. Maxwell & Beale, Broadstone : Dianthus ' Broadstone.'
Rev. F. Page-Roberts, Strathfieldsaye : Poppy ' Strathfieldsaye Beauty.'
Mr. M. Prichard, Christchurch : hardy plants.
Messrs. Rogers, Southampton : Cupressus.
Lady Sackville, Brighton : ' Hen and Chickens ' Marigold.
Messrs. Storrie & Storrie, Glencarse : Cinerarias and Auriculas.
Messrs. Tucker, Oxford : *Polemonium roseum.*
Messrs. S. van Til, Hillegom : Gladiolus ' Prince of Wales.'
Miss E. Willmott, Great Warley : *Clematis Sieboldii alba.*
Rev. D. F. Wright, Nottingham : Pelargonium ' Sir Percy Blakeney.'
The Yokohama Nursery Co., London : *Azalea obtusa* ' Kirin.'

FLORAL COMMITTEE, JUNE 7, 1921.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty members present.

Awards Recommended:—

Gold Medal.

To Messrs. Dobbie, Edinburgh, for Aquilegias.
To Messrs. Ireland & Hitchcock, Marks Tey, for Sweet Peas.

Silver-gilt Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Mr. A. Perry, Enfield, for hardy plants.

Silver Flora Medal.

To Messrs. Kelway, Langport, for Pæonies and Delphiniums.
To Messrs. Wallace, Tunbridge Wells, for hardy plants.
To Messrs. Whitelegg, Chislehurst, for hardy plants.

Silver Grenfell Medal.

To Messrs. Barr, Taplow, for Irises.
To Messrs. Bastin, Bexley Heath, for Begonias.
To Messrs. Bath, Wisbech, for Pæonies and Delphiniums.
To Messrs. Cuthbert, Southgate, for Irises.
To Mr. C. Engelmann, Saffron Walden, for Carnations.
To Mr. E. J. Hicks, Twyford, for Roses.
To Messrs. Ladhams, Southampton, for hardy plants.
To Messrs. Peed, West Norwood, for Gloxinias.
To Mr. G. Reuthe, Keston, for hardy plants.
To Messrs. Waterer, Sons & Crisp, Twyford, for hardy plants.

Silver Banksian Medal.

To Mr. G. W. Miller, Wisbech, for hardy plants.
To Mr. M. Prichard, Christchurch, for hardy plants.
To Messrs. Rogers, Southampton, for alpines.
To Messrs. Ryder, St. Albans, for Gladioli and Irises.
To Messrs. Simpson, Birmingham, for Antirrhinums.

Bronze Flora Medal.

To Messrs. Bide, Farnham, for Sweet Peas.
To Messrs. Cheal, Crawley, for hardy plants.
To Mr. G. R. Downer, Chichester, for hardy plants.
To Miss Hannen, Baldock, for Delphiniums.
To Messrs. Harkness, Bedale, for hardy plants.
To Messrs. Maxwell & Beale, Broadstone, for alpines.
To Mr. R. C. Notcutt, Woodbridge, for shrubs.
To Rev. J. H. Pemberton, Romford, for Roses.
To Messrs. Piper, Langley, for shrubs and hardy plants.
To Messrs. Rich, Bath, for hardy plants.
To Messrs. Russell, Richmond, for shrubs.
To Mr. C. Turner, Slough, for shrubs.
To Mr. W. Wells, jun., Merstham, for hardy plants.
To Mr. F. Wood, Ashtead, for hardy plants.

Bronze Banksian Medal.

To Misses Hopkins, Shepperton, for hardy plants.
To Reedens School of Gardening, Newick, for hardy Orchids and bog plants.

Award of Merit.

To *Dianthus hybridus* 'Ruy Blas' (votes 14 for), from Mr. M. Prichard, Christchurch. A very pretty single Pink, with rich carmine flowers measuring 2 inches across and having a central zone of crimson. The edges of the rounded petals are slightly fringed.

To Hydrangea 'Etincelant' (votes 12 for), from Mr. T. Stevenson, Cowley. A very handsome Hydrangea of compact habit, and bearing large trusses of bright-rose-pink flowers, which when first open are whitish in the centre, but later become entirely pink. It was raised by M. Lemoine.

To Iris ' Ambassadeur ' (votes 11 for), from Messrs. Whitelegg, Chislehurst. A large-flowered tall bearded variety with copper-coloured standards heavily tinted with bronzy-purple and dark-purple falls.

To *Potentilla* × *Warrensii* (votes 12 for), from Mr. H. Hemsley, Crawley. A very free-flowering hybrid between *P. argyrophylla* and *P. sulphurea.* The flowers, which measure about 1½ inches in diameter, are bright yellow, and are borne on stems between 9 and 12 inches high.

Other Exhibits:—

Countess Bathurst, Cirencester: Pansy ' The Pinbury.'
Messrs. D'Alcorn, Spalding: Pæonies.
Lionel de Rothschild, Esq., Exbury: *Buddleia alternifolia.*
Mr. A. V. Ellis, Isleworth: Dianthus.
Mr. T. A. Lamb, Newcastle: Pyrethrum ' Mrs. O. R. Lamb.'
Messrs. G. Paul, Cheshunt: *Ribes sanguinea aurea.*
Mr. G. Prince, Longworth: Roses.
Mr. F. Stocks, Chester-le-Street: seedling Carnation.
Mr. H. White, Windlesham: Rhododendrons.

FLORAL COMMITTEE, JUNE 21, 1921.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-one-members present.

Awards Recommended:—

Gold Medal.

To Messrs. Dobbie, Edinburgh, for Sweet Peas.

Silver-gilt Banksian Medal.

To Messrs. Blackmore & Langdon, Bath, for Delphiniums.
To Messrs. Whitelegg, Chislehurst, for Delphiniums.

Silver Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. B. R. Cant, Colchester, for Roses.
To Messrs. Kelway, Langport, for Delphiniums.
To Messrs. Peed, West Norwood, for Gloxinias.

Silver Grenfell Medal.

To Messrs. Cutbush, Barnet, for Hydrangeas.
To Mr. C. Engelmann, Saffron Walden, for Carnations.
To Messrs. Ladhams, Southampton, for hardy plants.
To Mr. A. Perry, Enfield, for hardy plants.
To Messrs. Russell, Richmond, for foliage plants.
To Messrs. Waterer, Sons & Crisp, Twyford, for hardy plants.
To Mr. W. Wells, jun., Merstham, for Delphiniums.

Silver Banksian Medal.

To Messrs. Baker, Wolverhampton, for Poppies.
To Messrs. Barr, Taplow, for Irises.
To Messrs. Bastin, Bexley Heath, for Begonias.
To Messrs. Bath, Wisbech, for Delphiniums.
To Messrs. Elliott, Stevenage, for hardy plants.
To Miss Hannen, Baldock, for Delphiniums.
To Messrs. Carter Page, London, for Irises.
To Rev. J. H. Pemberton, Romford, for Roses.
To Messrs. Ryder, St. Albans, for Irises and Gladioli.

Bronze Flora Medal.

To Messrs. Cuthbert, Southgate, for Azaleas.
To Mr. F. Wood, Ashtead, for hardy plants.

Bronze Banksian Medal.

To Mr. G. R. Downer, Chichester, for hardy plants.

Award of Merit.

To Campanula ' Fleur de Neige ' (votes unanimous), from Mr. G. W. Miller, Wisbech. A remarkably good double white variety of *Campanula persicifolia*. It should be very valuable for market work.

To Delphinium ' Sunshine ' (votes 7 for, 2 against), from Mr. W. E. Samuel, Wrexham. The large pale-blue mauve-shaded flowers of this variety are borne in a fine bold spike. The eye is dark and more broken than in some varieties.

To Delphinium ' Welshman ' (votes 8 for, 3 against), from Mr. W. E. Samuel, Wrexham. The spikes of this variety are very tall and handsome. The flowers are slightly smaller than those of the variety mentioned above, and are pale blue splashed with mauve. The eye is dark and very conspicuous.

To Dianthus ' Ella ' (votes 11 for), from S. Morris, Esq., Norwich. A single white Pink of excellent form with a dark-crimson centre.

To Lilium × ' Mrs. R. O. Backhouse ' (votes unanimous), from Messrs. Wallace, Tunbridge Wells. This tall handsome Lily is the result of a cross made by the late Mrs. Backhouse between *Lilium Martagon* and *L. Hansoni*. It is of robust habit and grows five or six feet high. The flowers are reflexed and of a buff colour spotted with crimson. The stamens are brown and the backs of the segments are tinted with pink.

To *Philadelphus burfordensis* (votes unanimous), from Sir William Lawrence, Bt., Burford. This beautiful free-flowering variety is a sport from Philadelphus ' Virginale.' Its flowers are white and very large.

To *Philadelphus* ' Girandole ' (votes 10 for), from Sir William Lawrence, Bt., Burford. An excellent double white variety raised by M. Lemoine. It is very floriferous.

To *Phytolacca clavigera* (votes unanimous), from Mr. A. Perry, Enfield. A handsome hardy herbaceous plant bearing dense racemes of small pink flowers with green centres. The plant throws out numerous side shoots, and has very attractive foliage.

To *Rhododendron discolor* (votes unanimous), from Messrs. Wallace, Tunbridge Wells. A new Chinese species which has proved to be perfectly hardy, and is of great value for hybridizing on account of its late-flowering habit. It is beautifully scented, and the widely open white flowers are borne in trusses of eight or nine. The outside of the flowers is tinted with pink.

To Rose ' Mrs. Hornby Lewis ' (votes 7 for), from Mr. E. J. Hicks, Twyford. A large and very fragrant hybrid Tea variety. The colour is cream tinged with apricot.

To Rose ' The Premier ' (votes 6 for, 1 against), from Messrs. G. Paul, Cheshunt. This beautiful floriferous rose is a hybrid of *Rosa lucens*. It bears large clusters of semi-double white flowers tinted with pink when first opening. The stamens are golden and add to the attractiveness of the blooms. The foliage is shiny, and the long arching branches which the plant throws up render it ideal for the wilder parts of the garden.

To *Streptocarpus* ' Mauve Queen ' (votes 9 for, 2 against), from Messrs. Cuthbert, Southgate. The flowers of this variety are very large, measuring nearly 4 inches across. The colour is a charming shade of violet-mauve, and the throat is white.

Cultural Commendation.

To Mr. W. E. Samuel, Wrexham, for Delphiniums.

Other Exhibits:—

Messrs. Ballington, Matlock: Delphiniums.
Messrs. Boekee, Leiden: Delphinium ' Mauve Queen.'
Messrs. Clark, Dover: *Ozothamnus rosmarinifolius*.
G. Hall, Esq., Alton: Carnation ' Mrs. Goodwyn Hall.'
Mary, Countess of Ilchester, Dorchester: *Pittosporum daphniphylloides*.
Misses Hopkins, Shepperton: hardy plants.
D. Mappin, Esq., Hartfield: Delphiniums.
F. M. Remnant, Esq., Hutton: Border Carnation ' Mrs. Rhoda Remnant.'
Mr. M. F. Saunders, Downend: Dianthus ' Salmon King.'

ORCHID COMMITTEE.

JANUARY 11, 1921.

Sir JEREMIAH COLMAN, Bt., in the Chair, and fifteen members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. Stuart Low, Jarvisbrook, Sussex, for hybrid Cattleyas, Laeliocattleyas, and Brassavola hybrids, and rare species.

Silver Flora Medal.

To Messrs. Armstrong & Brown, Tunbridge Wells, for hybrid Odontoglossums and Odontiodas.

To Messrs. McBean, Cooksbridge, for hybrids including Cymbidiums.

Silver Banksian Medal.

To Messrs. Cypher, Cheltenham, for Cypripediums.

First-class Certificate.

To *Laeliocattleya* × *Schroederae* var. 'Conqueror' (*C.* × 'Maggie Raphael' *alba* × *L.-c.* × *Bella alba*) (votes 10 for, 2 against) from Baron Bruno Schröder. Flowers large, white with claret-crimson lip.

To *Odontioda* × 'Hypatia,' McBean's var. (*Odm.* × *ardentissimum* × *Oda.* × 'Diana') (votes 13 for), from Messrs. McBean. Claret-red with blush white margins. Front of lip light lilac.

Award of Merit.

To *Odontoglossum* × 'Rufus' (parentage unrecorded) (votes 14 for), from W. R. Fasey, Esq., Snaresbrook. Flower large, reddish-violet with white margin and front to the lip.

To *Odontoglossum* × 'Faustina' (*eximium* × 'Dora') (votes 13 for), from W. R. Fasey, Esq. Flower light purple; lip white with purple blotch in front of the yellow crest.

To *Odontioda* × 'Madeline,' McBean's var. (*Oda.* × *Charlesworthii* × *Odm. crispum*) (votes 13 for), from Messrs. McBean. Roman red with some lines of the yellow ground appearing on the surface.

To *Odontioda* × 'Cilleham' var. 'Ada Evans' (*Oda.* × 'Joan' × *Odm.* × *illustrissimum*) (votes 14 for), from Messrs. McBean. Flower Odontoglossum-like. Claret-red with thin white margin.

To *Odontonia* × 'Ceres' (*Miltonia* × *Bleuana* × *Odm.* × *Lawrenceanum*) (votes 12 for), from Messrs. Charlesworth. A pretty Miltonia-like flower; straw yellow with reddish-rose band on the lip.

To *Charlesworthara* × *nobilis* (*Oncidium macranthum* × *Miltonioda* × 'Ajax' (votes unanimous), from Messrs. Charlesworth. Habit of *O. macranthum*, but smaller. Flowers chocolate-red with narrow yellow margins.

Cultural Commendation.

To Messrs. Armstrong & Brown for *Odontioda* × 'Alcibiades' with a spike of thirty flowers.

To Messrs. McBean for *Cattleya* × 'Maggie Raphael' *alba* with ten flowers.

To Messrs. McBean for *Odontonia* × *brugensis* with four spikes.

Other Exhibits.

Sir Jeremiah Colman, Bt.: *Laeliocattleya* × *amethystella.*

R. Windsor Richards, Esq.: *Brassocattleya Digbyano-Mendelii*, white variety.

Messrs. Flory & Black: hybrids.

Messrs. Sanders; *Saccolabium* sp.

ORCHID COMMITTEE, JANUARY 25, 1921.

Sir JEREMIAH COLMAN, Bt., in the Chair, and fifteen members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for hybrid Odontoglossums, Odontiodas, Laeliocattleyas, and some species.

Silver Banksian Medal.

To Messrs. Sanders, St. Albans, for Cymbidiums, Cattleyas, and other hybrids.

First-class Certificate.

To *Sophrolaeliocattleya* × 'Joseph Charlesworth' (*S.-l.-c.* × 'Marathon' × *L.-c.* × 'Eurydice') (votes 10 to 2), from Messrs. Charlesworth. Cattleya-like, reddish-rose, tinged yellow. Lip crimson, with yellow lines from base.

Award of Merit.

To *Cymbidium* × 'Martin' (*Lowii-grandiflorum* × *Parishii Sanderae*) (votes 9 for, 2 against), from Lt.-Col. Sir Geo. L. Holford, K.C.V.O., Westonbirt. Inflorescence bearing eight flowers with lanceolate sepals and petals of yellow colour. Lip cream-white with dotted band of purple spots.

To *Odontioda* × 'Niobe,' Fasey's var. (*Odm.* × 'Jasper' × *Oda.* × *Bradshawiae*) (votes unanimous), from W. R. Fasey, Esq., Snaresbrook. Colour deep claret with slight white margin and front to the lip.

To *Odontoglossum* × 'Radiant,' McBean's var. ('Dora' × 'Alexandrina') (votes 13 for), from Messrs. McBean. A large and finely-formed flower, the inner parts of the segments being rosy-mauve with spotting of claret-red.

To *Cattleya* × 'Monarch' *brugensis* ('Empress Frederick' × *Trianae ignea* (votes 12 for, 2 against), from Messrs. Sanders. A fine large Cattleya with light rose sepals and petals and Tyrian purple lip.

To *Odontoglossum* × 'Trident' (*eximium* × 'King Albert') (votes 10 for), from Messrs. Flory & Black. Flower claret-purple with white front to lip.

Other Exhibits.

Sir Jeremiah Colman, Bt.: Lycastes.
Sir Herbert S. Leon: hybrid Cattleyas.
Lt.-Col. Sir Geo. L. Holford (gr. Mr. H. G. Alexander): *Cypripedium* × 'Judah' ('Alabaster' × 'Bronzino').
Pantia Ralli, Esq.: *Cattleya labiata*, White's var.
W. R. Fasey, Esq.: Odontoglossums.
Messrs. McBean: Odontiodas etc.
Messrs. Flory & Black: hybrids (vote of thanks).
R. G. Thwaites, Esq.: hybrids.

ORCHID COMMITTEE, FEBRUARY 8, 1921.

Sir JEREMIAH COLMAN, Bt., in the Chair, and fifteen members present.

Awards Recommended:—

Gold Medal.

To Messrs. McBean, for a finely cultivated group of hybrid Cymbidiums.

Silver-gilt Flora Medal.

To Messrs. Stuart Low, for hybrids and species of Dendrobium.

Silver Flora Medal.

To Messrs. Armstrong & Brown, for many fine Odontoglossums and Odontiodas.

Silver Banksian Medal.

To Messrs. Cypher, Cheltenham, for hybrid Cypripediums.
To Messrs. Sanders, St. Albans, for hybrids.

First-class Certificate.

To *Sophrolaeliocattleya* × 'Falcon' (*Sophronitis grandiflora* × *L.-c.* × 'Aureole') (votes unanimous), from Lt.-Col. Sir Geo. L. Holford, K.C.V.O. Flowers, scarlet with golden hue, the front of the lip ruby, the base orange.

To *Cymbidium* × 'Dragonfly' (parentage unrecorded) (votes 13 for), from Sir Geo. L. Holford. Flower pearl-white with claret-purple stripes on the side lobes of the lip, and a similarly coloured front lobe.

Award of Merit.

To *Laeliocattleya* × 'H. T. Pitt,' Fasey's var. (*C.* × 'Enid' × *L.-c.* × 'Bella') (votes unanimous), from W. R. Fasey, Esq. A large flower with light-mauve sepals and petals and reddish-purple lip with crimped edge.

To *Odontioda* × 'Colinge' var. 'Athene' (*Oda.* × 'Coronation' × *Odm. crispum*) (votes 13 for), from G. W. Bird, Esq., West Wickham. Flowers white, edged mauve, with clusters of purple spots in the centre of each petal.

To *Dendrobium nobile* var. 'Sir F. W. Moore' (votes 12 for), from Messrs. Armstrong & Brown. A massive seedling of rich colour and fine shape.

To *Brassocattleya* × 'Gallon Snowflake' (*C. chocoensis alba* × *B.-c.* × *Thorntonii*) (votes 12 for, 1 against), from Sir Jeremiah Colman, Bt. Flower large and broadly proportioned; pure white.

To *Angulocaste* × *Cooperi* (*Anguloa Cliftonii* × *Lycaste cruenta*) (votes unanimous), from Messrs. Sanders, St. Albans. Flower Lycaste-like in form, the Anguloa only appearing in the vinous-purple markings on the petals, the slightly changed lip, and broader leaves. Colour, citron-yellow.

Other Exhibits.

Sir Jeremiah Colman, Bt.: *Lycaste Skinneri* 'Rainbow.'
J. J. Joicey, Esq.: *Laeliocattleya* × 'Beatrice.'
W. R. Fasey, Esq., Odontoglossums.
Messrs. Charlesworth: *Odontonia* × 'Iris' (*M. Roezlii* × *Odm.* × Epicasta).
Pantia Ralli, Esq.: *Odontoglossum* × *Fabia excelsa.*
Baron Schröder: Cut spikes of *Cymbidium Pauwelsii*, The Dell var., and *Calanthe* × 'Baron Schröder.'

ORCHID COMMITTEE, FEBRUARY 22, 1921.

Sir JEREMIAH COLMAN, Bt., in the Chair, and fifteen members present.

Awards Recommended:—

Silver Flora Medal.

To H. T. Pitt, Esq., Rosslyn, Stamford Hill (gr. Mr. Thurgood), for *Cypripediums*, and other hybrids and species.

To Messrs. Charlesworth, for Odontoglossums, Odontiodas, and Cattleyas.

To Messrs. Stuart Low, for Cattleyas, Laeliocattleyas and other hybrids.

To Messrs. McBean, for Odontoglossums, Odontiodas, etc.

Silver Banksian Medal.

To Messrs. Armstrong & Brown, for hybrid Dendrobiums and Cypripediums.

First-class Certificate.

To *Cymbidium* × 'Landrail' ('Dryad' × *Lowianum*) (votes 13 for), from Lt.-Col. Sir Geo. L. Holford, K.C.V.O. One of the finest white Cymbidiums, the lip being decorated with ruby-crimson blotches.

To *Dendrobium* × 'Model' ('Cybele' × *nobile*) (votes 13 for, 1 against), from Baron Bruno Schröder, The Dell Park, Englefield Green. Flower large and circular in outline, white with the outer halves of the segments mauve, and a dark maroon base to the lip.

Award of Merit.

To *Dendrobium* × 'Butterfly' Low's var. (*Ainsworthii* × *chessingtonense*) (votes 11 for), from Messrs. Stuart Low. Sepals and petals, lemon-yellow; disc of the lip, dark maroon.

To *Cattleya* × 'Enid' *alba* var. 'Kathleen' (*Mossiae Reineckiana* × *Warscewiczii* 'Fr. M. Beyrodt') (votes 7 for, 3 against), from Messrs. McBean. Flower white with rose veining on the front of the lip.

To *Laeliocattleya* × 'Eunice' *alba* var. 'Constance' (*L. anceps Schroederiana* × *C. chocoensis alba*) (votes 8 for), from Messrs. McBean. Habit of *L. anceps*, but with larger white flowers.

Cultural Commendation.

To Mr. J. Collier (gr. to Sir Jeremiah Colman, Bt.), for *Dendrobium nitidum* (*speciosum nitidum*) with twenty-five spikes.

To Mr. H. J. Gillett (gr. to Col. Stephenson R. Clarke, C.B.), for *Platyclinis glumacea* with over forty sprays.

Other Exhibits.

Sir Jeremiah Colman, Bt. : selection of rare species.
The Duke of Marlborough : various hybrids.
H. T. Pitt, Esq. : *Odontioda* × 'Lady Veitch.'
Baron Bruno Schröder : *Laeliocattleya* × *Schroederae* var. 'Victrix.'
B. H. Smith, Esq. : *Odontioda* × 'Juliet,' Frant Court var.
Lt.-Col. Sir Geo. L. Holford : *Cymbidium* × 'President Wilson' (*Lowianum* × *Alexanderi*).
W. R. Fasey : *Odontoglossum* × 'Continental.'
Mr. J. B. Lakin : *Cattleya Harrisoniana alba.*

ORCHID COMMITTEE, MARCH 8, 1921.

Sir JEREMIAH COLMAN, Bt., in the Chair, and seventeen members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Sir Jeremiah Colman, Bt., Gatton Park, for varied group, a feature in which was twenty-eight varieties of *Lycaste Skinneri.*

To Messrs. McBean, for Cymbidiums, Odontoglossums, and other hybrids.

Silver Flora Medal.

To Messrs. Charlesworth, for *Neomoorea irrorata* with three spikes, and a fine selection of Laeliocattleyas.

To Messrs. Armstrong & Brown, for showy hybrids with many Dendrobiums.

To Messrs. Sanders, for hybrids with specially good Odontoglossums.

Silver Banksian Medal.

To H. T. Pitt, Esq., for Cypripediums, Odontoglossums, and Dendrobiums.

To Messrs. Flory & Black, for hybrids.

First-class Certificate.

To *Odontoglossum crispum* 'R. Felton' (votes 12 for), from Messrs. McBean. A large seedling of typical white *crispum* with few purple spots on petals.

Award of Merit.

To *Cymbidium* × *Alexanderi giganteum* (*eburneo-Lowianum* × *insigne*) (votes 8 for, 3 against), from Mrs. Bischoffsheim. Wax-like in texture, five inches across, white, with some very fine purple lines on petals, and spotting on lip.

To *Odontoglossum* × 'Rubens' var. 'Mrs. Harold Smith' (*eximium* × *ardentissimum*) (votes 11 for, 1 against), from Messrs. Sanders. A pretty flower with the inner parts of the segments dark violet, the outer white.

To *Odontoglossum* × 'Bullecourt' (*Wilckeanum* × 'Mars') (votes 13 for), from H. T. Pitt, Esq. Flower bronzy red with white margin.

To *Cymbidium* × 'Excelsior' (*Schlegetii* × *Pauwelsii*) (votes 8 for, 4 against), from Messrs. McBean. A large cream-white flower with rose spotting on lip.

Preliminary Commendation.

To *Odontioda* × 'Cistelet' var. 'Scarlet Emperor' (*Cochlioda Noezliana* × *Odm.* × 'Her Majesty,' from W. R. Fasey, Esq. Flower dark scarlet with ribbed yellow crest to the lip.

Other Exhibits.

Lt.-Col. Sir Geo. L. Holford, K.C.V.O.: *Cymbidium* × 'Dryad,' *C.* × 'President Wilson' and *L.-c.* × 'Orange Blossom.'

Col. Stephenson R. Clarke, C.B.: *Brassolaelio-cattleya* × 'Grace,' and *L.-c.* × 'Tyre.'

W. R. Fasey, Esq.: *Odontoglossum* × 'Vulture' (*Vuylstekeae* × *eximium*)

Messrs. Stuart Low: *Cattleya* × 'Albion,' with nine flowers.

ORCHID COMMITTEE, MARCH 22, 1921.

Sir HARRY J. VEITCH in the Chair, and seventeen members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. Charlesworth, for hybrids, including new Odontoglossums and Brassocattleyas.

To Messrs. Armstrong & Brown, for hybrids, with *Oncidium Papilio* and *Odontoglossum naevium.*

To Messrs. Sanders, St. Albans, for a group with the centre of *Cymbidium insigne Sanderi.*

Silver Banksian Medal.

To H. T. Pitt, Esq., for Odontoglossums, Miltonias, and various hybrids.

To Messrs. S. Low, for very fine Laeliocattleyas, and rare Bulbophyllums.

To Messrs. McBean, for hybrids.

First-class Certificate.

To *Brassocattleya* × *speciosa* var. 'Lady Colman' (*B.-c. Digbyano-Mendelii* 'Fortuna' × C. *Schroederae*) (votes unanimous), from Sir Jeremiah Colman, Bt.

To *Odontoglossum* × 'Britannica' ('Solon' × 'The Czar') (votes 14 for, 2 against), from Messrs. Charlesworth. Flower large, claret-red with white margin, and some white lines between the blotches.

Award of Merit.

To *Laeliocattleya* × 'Petrograd' (parentage unrecorded) (votes 12 for, 1 against), from Sir H. S. Leon, Bt., Bletchley Park. Flowers large, Cattleya-like in form; sepals and petals white; lip ruby-purple with yellow disc.

To *Odontoglossum* × 'Gloriette' ('President Poincaré' × *crispum*) (votes 12 for, 1 against), from W. R. Fasey, Esq., Snaresbrook. Flowers white with claret-red blotches on the inner three-fourths of the segments.

To *Odontioda* × 'Grenadier' (*Sanderae* × 'Chantecler') (votes 12 for), from Messrs. Sanders. The plant bore a fine spike of many scarlet flowers.

Cultural Commendation.

To Mr. J. T. Barker (gr. to the Duke of Marlborough), for a finely flowered *Cattleya* × 'Suzanne Hye de Crom,' with a spike of four white flowers.

To Messrs. McBean, for well-flowered *C.* × 'Suzanne Hye de Crom.'

Other Exhibits.

C. J. Lucas, Esq.: hybrid Odontoglossums.

Sir Jeremiah Colman, Bt.: Laeliocattleya × 'Lady Evelyn.'

R. G. Thwaites, Esq.: Sophrocattleyas.

W. R. Fasey, Esq.: *Odontioda* × 'Bonar Law' (*Oda.* × 'Coronation' × *Odm.* × *ardentissimum*).

Messrs. Flory & Black: *Sophronitis* crosses.

ORCHID COMMITTEE, APRIL 5, 1921.

Sir JEREMIAH COLMAN, Bt., in the Chair, and fifteen members present.

Awards Recommended:—

Silver Flora Medal.

To H. T. Pitt, Esq., Rosslyn, for good species and hybrids.

To Messrs. Armstrong & Brown, for a group with specially fine hybrid Odontoglossums and Odontiodas.

To Messrs. Charlesworth, for hybrids and species, a fine specimen of *Vanda Parishii Marriotiana* being prominent.

To Messrs. Sanders, for a group with hybrid Dendrobiums and Cymbidiums.

To Messrs. S. Low, for a group of Cattleyas and Laeliocattleyas, with species of *Masdevallia*.

Silver Banksian Medal.

To E. R. Ashton, Esq., Tunbridge Wells, for rare hybrid Odontoglossums and Odontiodas.

First-class Certificate,

To *Laeliocattleya* × 'Orange Blossom' ('Elinor' × 'Trimyra') (votes 13 for), from Lt.-Col. Sir Geo. L. Holford, K.C.V.O., Westonbirt. The plant bore a spike of four large light orange-coloured flowers.

To *Odontonia* × 'W. R. Fasey' (*M.* × 'Venus' × *Odm.* × 'Louise') (votes unanimous), from W. R. Fasey, Esq., Snaresbrook. Inner parts of the flower white, spotted with claret-red; outer halves lilac, similarly spotted.

To *Odontoglossum* × 'Diamond' var. 'Perfection' ('King Arthur' × *eximium*) (votes 13 for), from Messrs. McBean. Flowers large, claret-red with white margins and some white intersecting lines.

Award of Merit.

To *Cattleya* × 'Mary Sander' (*Dusseldorfei* 'Undine' × 'Suzanne Hye de Crom') (votes unanimous), from Lt.-Col. Sir Geo. L. Holford. Flowers of fine form, pure white.

To *Odontoglossum* × 'Lady Avice Menzies' (parentage unrecorded) (votes 13 for), from Lt.-Col. Sir Geo. L. Holford. Dark violet-red on white ground.

To *Odontoglossum* × 'Barnaby Rudge' (parentage unrecorded), from W. R. Fasey, Esq. Large, violet-purple with white margin, and white front to lip.

To *Odontoglossum* × 'Sandow' var. 'Robert Venables' (*eximium* × 'Rosella') (votes 8 for), from W. R. Fasey, Esq. Ground colour white, with large violet blotches on the inner two-thirds of the segments.

Cultural Commendation.

To Mr. H. G. Alexander (gr. to Sir Geo. L. Holford), for a fine specimen of *Cattleya* × 'Mary Sander,' with a spike of four flowers.

Other Exhibits.

Lt.-Col. Sir Geo. L. Holford: Laeliocattleyas.
Sir Jeremiah Colman, Bt.: Brassocattleyas and Odontoglossums.
Baron Bruno Schröder: cut flowers of Orchids.
Col. Stephenson R. Clark: *Brassolaeliocattleya* × 'Grace.'
B. H. Smith, Esq.: *Odontioda* × 'Joan.'

ORCHID COMMITTEE, APRIL 26, 1921.

Sir JEREMIAH COLMAN, Bt., in the Chair, and nineteen members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To H. T. Pitt, Esq., Rosslyn, for Odontiodas, Odontoglossums, and Miltonias.

Silver Flora Medal.

To G. W. Bird, Esq., for group with white Brassocattleyas in the centre.

To Messrs. Charlesworth, for rare and showy hybrids.

Silver Banksian Medal.

To Messrs. Stuart Low, for Cattleyas, Laeliocattleyas and other hybrids.

To Messrs. Flory & Black, for Laeliocattleyas and white Cattleyas.

To Messrs. Sanders, for hybrids and species.

First-class Certificate.

To *Miltonia* × ' Venus ' var. ' Fascinator ' (*M. vexillaria* var. ' Mem. G. D. Owen ' × *M. Phalaenopsis*) (votes 13 for), from H. T. Pitt, Esq., Rosslyn. Flower large as *M. vexillaria*, rose pink with claret-coloured mask and radiating lines on the lip.

To *Odontoglossum* × ' Rosina ' var. ' Invincible ' (*eximium* × ' Lady Pirrie ' (votes 13 for), from Messrs. McBean. A large and finely-formed flower, heavily blotched with claret-red.

Award of Merit.

To *Odontoglossum* × ' Desdemona II.' (*illustrissimum* × *Rossii rubescens*) (votes unanimous), from W. R. Fasey, Esq. Ground colour pale yellow, the sepals blotched with dark violet, and the inner halves of the petals similarly coloured ; lip blush white.

To *Miltonia* × *Hyeana*, The Dell var. (*Bleuana* × *vexillaria*) (votes 10 for, 1 against), from Baron Bruno Schröder. A pretty blush white flower with triangular maroon base to the lip.

Other Exhibits.

Lt.-Col. Sir Geo. L. Holford, K.C.V.O. : *Sophrolaeliocattleya* × ' Falcon.'
Sir Jeremiah Colman, Bt. : *Odontioda* × ' Copper King.'
Messrs. Armstrong & Brown : three new seedling Odontoglossums.
W. R. Fasey, Esq. : Odontoglossums.
Pantia Ralli, Esq. : *Odontoglossum* × ' Doreen.'
Gurney Wilson, Esq. : *Orchis mascula* and albino variety.
Messrs. McBean : *Odontoglossum crispum lilacinum.*

ORCHID COMMITTEE, MAY 10, 1921.

Sir JEREMIAH COLMAN, Bt., in the Chair, and fifteen members present. Lt.-Com. Prince Tadashige Shimadzu, of the Imperial Japanese Orchid Society, also took a seat at the Committee table.

Awards Recommended :—

Silver-gilt Flora Medal.

To H. T. Pitt, Esq., Rosslyn, for hybrid Miltonias, Odontoglossums, etc.

First-class Certificate.

To *Odontioda* × *Joiceyi splendens* (*Odm.* × ' Promerens ' × *Oda* × ' Coronation ') (votes 8 for, 2 against), from Messrs. McBean. Flower large and broadly proportioned. Inner half of the segments blotched with claret-red, the outer parts lilac, with a few white markings.

Award of Merit.

To *Odontoglossum* × ' Chu-Chin-Chow ' (*Rossii* × *aspersum*) (votes 13 for), from W. R. Fasey, Esq. Sepals and petals yellow with red-brown blotches on the sepals, and a dark blotch at the bases of the petals ; lip white.

Certificate of Appreciation.

To Mons. H. Graire, St. Fuscien, Amiens, France, for work in raising *Odontocidium* × *Graireanum* (*Oncidium macranthum* × *Odm.* × *Thompsonianum*) with a slender spike of blackish-chocolate flowers.

Cultural Commendation.

To Mr. E. J. Seymour (gr. to W. R. Fasey, Esq.) for *Miltonia* × *Hyeana*, Fasey's var. with six spikes, bearing together twenty-seven large rose-coloured flowers.

Other Exhibits.

Lt.-Col. Sir Geo. L. Holford, K.C.V.O., *Odontioda* × *Lambeauiana*, Westonbirt variety, with a branched spike of bright scarlet flowers.
W. R. Fasey, Esq. : hybrid Odontoglossums.
Messrs. Sanders : hybrids.

ORCHID COMMITTEE, CHELSEA, MAY 24, 1921.

Sir JEREMIAH COLMAN, Bt., in the Chair, and twenty-three members present.

Awards Recommended :—

Lindley Medal.

Messrs. Charlesworth, for *Sophrolaeliocattleya* × ' Prince Hirohito.'
Messrs. McBean, for *Odontoglossum* × *crispo-Solon* var. ' Carminetta.'

First-class Certificate.

To *Odontioda* × ' Marion Worsley,' Orchidhurst var. (*Odm.* × *harvengtense* × *Oda.* × *Bradshawiae*) (votes unanimous), from Messrs. Armstrong & Brown, Tunbridge Wells. A noble, dark scarlet flower with yellow crest to the lip.

To *Brassocattleya* × ' Mrs. J. Leemann,' The Dell var. (*B. Digbyana* × *C. Dowiana*) (votes unanimous), from Baron Bruno Schröder. Flower of perfect form, lemon-yellow, with a slight emerald-green shade.

To *Sophrolaeliocattleya* × ' Prince Hirohito ' (*S.-l.-c.* × ' Marathon ' × *S.-l.* × ' Leda ') (votes unanimous), from Messrs. Charlesworth. Flower large; sepals and petals salmon-red with golden shade; lip ruby-crimson.

To *Odontoglossum* × *crispo-Solon* var. ' Carminetta ' (*crispum* × ' Solon ') (votes unanimous), from Messrs. McBean. Flower broad and finely formed, white with violet-purple blotching in the inner parts of the segments.

Award of Merit.

To *Odontoglossum crispum* ' Victor Newton ' (votes 10 for, 4 against), from Messrs. Armstrong & Brown. A model home-raised white variety with some purple markings on the lip.

To *Odontioda* × ' Grenadier ' var. ' Glow ' (*Oda.* × ' Chantecler ' × *Oda.* × *Sanderae*) (votes 13 for), from Messrs. Sander. Flowers scarlet, of good shape.

To *Laeliocattleya* × ' Champion ' (' Aphrodite ' × *Gottoiana*) (votes 13 for, 2 against). Sepals and petals pale rose; front of lip rose-purple.

To *Brassolaeliocattleya* × ' Jupiter ' var. ' Zeus ' (*B.-l.-c.* × *Veitchii* × *C.* × *armainvillierense*) (votes unanimous), from Messrs. Sander. Flower large and of good shape, white tinged with rose, the broad front of the lip rosy-mauve.

To *Oncidium Papilio Charlesworthii* (votes 12 for), from Messrs. Charlesworth. A very distinct form with slender incurved sepals, and broad petals and lip blotched with pale orange colour.

To *Brassolaeliocattleya* × ' Jupiter ' var. ' Nipon ' (votes 16 for), from Messrs. Charlesworth. A large rose-tinted flower with purple front to the lip.

To *Odontoglossum crispum* ' Ada Evans ' (votes 8 for, 2 against), from Messrs. McBean. A perfect home-raised white form.

Cultural Commendation.

To Mr. H. G. Alexander (gr. to Lt.-Col. Sir Geo. L. Holford), for a fine plant of *Laeliocattleya* × *Imperatrix Regina.*

ORCHID COMMITTEE, JUNE 7, 1921.

Sir JEREMIAH COLMAN, Bt., in the Chair, and fourteen members present.

Awards Recommended :—

Silver Floral Medal.

To H. T. Pitt, Esq., Stamford Hill, for hybrids and rare species.

To Messrs. Charlesworth, for Cattleyas, Laeliocattleyas, etc., and other hybrids.

To Messrs. Stuart Low, Jarvisbrook, Sussex, for a great variety of hybrids.

To Messrs. Hassall, for a group with fine forms of *Brassolaelio-cattleya* × ' Jupiter.'

Silver Banksian Medal.

To Messrs. Sander, St. Albans, for Odontoglossums, Odontiodas, etc.

First-class Certificate.

To *Laeliocattleya* × 'Mrs. Willoughby Pemberton' var. *magnifica* (× 'Baroness Emma' × *eximium*) (votes 10 for), from Baron Schröder. Sepals and petals rose, lip maroon-crimson with yellow lines from base.

To *Brassolaeliocattleya* × 'Jupiter' var. *majestica* (*B.-l.-c.* × *Veitchii* × C. × *armainvillierense*) (votes unanimous), from Messrs. Hassall. Flower eight inches across; sepals and petals blush-white; front of lip crimson-purple.

Award of Merit.

To *Miltonia vexillaria* 'Purple Emperor' (votes 9 for), from W. R. Fasey, Esq., Snaresbrook. A home-raised form with rosy-mauve flowers having a white base to the lip with a few purple lines.

To *Dendrobium* × 'Gatton Sunray' ('Illustre' × *Dalhousieanum luteum*) (votes 9 for), from Sir Jeremiah Colman, Bt. Habit of *D. Dalhousieanum*, but dwarfer. Flowers yellow with maroon blotch at the base of the lip.

To *Odontioda* × 'Dauntless,' Orchidhurst var. (*Odm.* × *Armstrongiae* × *Oda.* × 'Coronation') (votes unanimous), from Messrs. Armstrong & Brown, Tunbridge Wells. Flower approaching the Odontoglossum parent, large and of good shape, white blotched with violet-blue.

Cultural Commendation.

To Messrs. McBean, Cooksbridge, for *Odontoglossum* × 'Queen Mary' var. 'Arachne' with a spike of thirteen flowers.

Other Exhibits.

Prince Tadashige Shimadzu: album of Orchids grown in Japan, the Phalaenopses specially fine.

Sir Jeremiah Colman: *Odontoglossum* × *Wilckeanum Colmanii*.

Pantia Ralli, Esq.: Odontoglossums.

A. J. Hollington, Esq.: Laeliocattleyas.

W. R. Fasey, Esq.: Odontoglossums.

ORCHID COMMITTEE, JUNE 21, 1921.

Sir JEREMIAH COLMAN, Bt., in the Chair, and twelve members present.

Awards Recommended:—

Silver Floral Medal.

To Messrs. Charlesworth, for Miltonias, Odontoglossums, and Odontiodas.

To Messrs. Stuart Low, Jarvisbrook, for Cattleyas, Laeliocattleyas, etc.

Silver Banksian Medal.

To Messrs. Sanders, for Cypripediums, Odontoglossums, and Odontiodas.

First-class Certificate.

To *Cypripedium* × 'Enchantress' (*Curtisii Sanderae* × 'Alma Gevaert') (votes 7 for), from Messrs. Sanders. This hybrid preserves the albino character of the parents, the colours of the types, except green and white, being suppressed.

Award of Merit.

To *Laeliocattleya* × 'Victrix' (*C. Trianae Backhouseiana* × *L.-c.* × 'Aphrodite') (votes unanimous), from Baron Bruno Schröder. A good rosy-mauve flower, with ruby-purple front to the lip, which has a clear yellow disc.

Other Exhibits.

H. T. Pitt, Esq.: hybrid Odontoglossums.

W. R. Fasey, Esq.: Miltonias, Odontoglossums, and *Brassolaeliocattleya* × 'Jupiter.'

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EXTRACTS FROM THE PROCEEDINGS

OF THE

ROYAL HORTICULTURAL SOCIETY.

HOLLAND HOUSE SHOW.

JULY 4, 5, 6, 1921.

Awards made by the Council after consultation with the Judges.

Coronation Cup.

To Messrs. R. Wallace, for the most meritorious exhibit in the Show.

Wigan Cup.

To Mr. Elisha J. Hicks, for the best exhibit of Roses.

Clay Cup (for the best new Rose with the true old Rose scent).

To Messrs. Walter Easlea, for their Rose 'Prince of Wales.'

Cain Cup.

To Sir Jeremiah Colman, Bt. (gr. Mr. J. Collier), for Orchids.

ORCHIDS.

Gold Medal.

To Sir Jeremiah Colman, Bt. (gr. J. Collier), for Orchids.
To Messrs. Charlesworth, for Orchids.

Silver-gilt Flora Medal.

To Messrs. Mansell and Hatcher, for Orchids.

Silver-gilt Grenfell Medal.

To Messrs. Stuart Low, for Orchids.

Silver Flora Medal.

To H. T. Pitt, Esq., for Orchids.
To Messrs. Sanders, for Orchids.

FRUIT AND VEGETABLES.

Gold Medal.

To Messrs. Rivers, for fruit-trees in pots.

Silver-gilt Knightian Medal.

To Messrs. Bunyard, for fruit-trees in pots.

Silver Knightian Medal.

To Messrs. Laxton, for Strawberries.

Silver Lindley Medal.

To Messrs. Rivers, for cultivation of fruit-trees in pots.

Flowering and Foliage Plants.

Gold Medal.

To Messrs. James Carter, for flowering plants.

Silver-gilt Flora Medal.

To A. P. Brandt, Esq. (gr. Mr. J. W. Banks), for Crotons.
To Mr. Jas. Macdonald, for Grasses.
To Messrs. John Peed, for Caladiums, Crotons, and Gloxinias.
To Messrs. R. & G. Cuthbert, for Streptocarpus.
To Mr. L. R. Russell, for stove plants.

Silver-gilt Grenfell Medal.

To the Hon. Vicary Gibbs (gr. Mr. E. Beckett), for Pelargoniums.

Silver Flora Medal.

To Messrs. Ryder, for Gladioli.

Silver Grenfell Medal.

To Messrs. W. Cutbush, for flowering plants.
To Messrs. Carter Page, for Dahlias, Violas, and perennials.

Silver Banksian Medal.

To The Chalk Hill Nurseries, for Antirrhinums, Mimulus, Pansies, and Violas.
To Mr. H. N. Ellison, for Cacti, Ferns, and Palms.
To Messrs. Jarman, for annuals.
To Messrs. Stuart Low, for Gloxinias and Streptocarpus.

Formal Gardens.

Silver-gilt Flora Medal.

To Messrs. Cheal, for terrace garden.
To Messrs. W. H. Gaze, for formal garden and tennis court.
To Mr. Herbert Jones, for Dianthus garden.

Silver-gilt Banksian Medal.

To Mr. E. Dixon, for formal garden.
To Messrs. Ryder, for formal garden and tennis court.

Alpines, Rock, and Water Gardens.

Gold Medal.

To Messrs. R. Wallace, for water pool, Lilies and herbaceous plants.

Silver-gilt Flora Medal.

To Messrs. J. Piper, for water garden.
To Messrs. G. G. Whitelegg, for rock garden.

Silver-gilt Grenfell Medal.

To Messrs. R. Tucker, for alpines and herbaceous plants.

Silver Flora Medal.

To Mr. Clarence Elliott, for alpines.

Silver Grenfell Medal.

To Messrs. J. Cheal, for alpines.
To Mr. G. Reuthe, for rock garden.
To Mr. W. Wells, jr., for herbaceous plants.

Silver Banksian Medal.

To Messrs. W. H. Rogers, for alpines and alpine shrubs.
To Messrs. Maxwell & Beale, for alpines and herbaceous plants.

Hardy Herbaceous Plants and Alpines.

Silver Banksian Medal.

To Messrs. Waterer, Sons & Crisp, for herbaceous plants.

Silver Flora Medal.

To Mr. John Forbes, for herbaceous plants.
To Mr. B. Ladhams, for hardy flowers.
To Mr. G. W. Miller, for hardy flowers.

Silver Grenfell Medal.

To Messrs. Godfrey, for herbaceous plants.
To Messrs. Kelway, for Delphiniums.
To Messrs. G. G. Whitelegg, for herbaceous plants.
To Mr. F. G. Wood, for alpines.

Silver Banksian Medal.

To Messrs. R. H. Bath, for Delphiniums.
To Messrs. T. B. Grove, for herbaceous plants.
To Mr. H. Hemsley, for herbaceous plants.

Begonias.

Silver-gilt Flora Medal.

To Messrs. Blackmore & Langdon, for Begonias.

Silver Flora Medal.

To Messrs. R. J. Bastin, for Begonias.

Carnations.

Gold Medal.

To Messrs. Allwood, for Carnations.
To Mr. C. Engelmann, for Carnations.

Silver-gilt Grenfell Medal.

To Mr. James Douglas, for Border Carnations.

Silver Grenfell Medal.

To Messrs. Stuart Low, for Carnations.

Silver Banksian Medal.

To Mr. C. H. Herbert, for Pinks.

Sweet Peas.

Gold Medal.

To Messrs. Dobbie, for Sweet Peas.

Silver-gilt Flora Medal.

To Messrs. Alex. Dickson, for Sweet Peas.
To Messrs. Ireland & Hitchcock, for Sweet Peas.

Silver-gilt Banksian Medal.

To Messrs. J. K. King, for Sweet Peas.
To T. Hugh Mann, Esq., for Sweet Peas.

Silver Flora Medal.

To Dr. G. S. Leggatt, for Sweet Peas.

Silver Grenfell Medal.

To Messrs. S. Bide, for Sweet Peas.

Silver Banksian Medal.

To The Industrial Settlement, Aylesford, for Sweet Peas.
To Messrs. Sutton, for Sweet Peas.

Roses.

Gold Medal.

To Messrs. Alex. Dickson, for Roses.
To Mr. Elisha J. Hicks, for Roses.

Silver-gilt Grenfell Medal.

To Messrs. Ben R. Cant, for Roses.

Silver Flora Medal.

To Messrs. Frank Cant, for Roses.

Silver Grenfell Medal.

To Rev. J. H. Pemberton, for Roses.

Silver Banksian Medal.

To Messrs. Jarman, for Roses.
To Messrs. W. Paul, for Roses.
To Messrs. Stuart Low, for Roses.
To Mr. Charles Turner, for Roses.

Flowering Trees and Shrubs.

Silver-gilt Lindley Medal.

To Messrs. Hillier, for Conifers and Chinese plants.

Silver-gilt Flora Medal.

To Messrs. Waterer, Sons & Crisp, for shrubs.

Silver-gilt Grenfell Medal.

To The Donard Nursery, for new and rare plants.

Silver-gilt Banksian Medal.

To Messrs. Jackman, for Clematis.
To Mr. R. C. Notcutt, for flowering shrubs.

Silver Flora Medal.

To Messrs. Cutbush, for topiary trees.
To Mr. L. R. Russell, for Vitis, etc.
To Mr. G. Reuthe, for trees and shrubs.

Silver Banksian Medal.

To Messrs. Piper, for topiary.

Hardy Herbaceous Groups on the Ground.

Silver-gilt Flora Medal.

To Mr. Amos Perry, for ferns, herbaceous plants, and Lilies.

Silver-gilt Grenfell Medal.

To Messrs. Bakers, for herbaceous border.
To Messrs. Blackmore and Langdon, for Delphiniums.
To Mr. Maurice Prichard, for herbaceous plants.
To Messrs. G. Jackman, for herbaceous plants.

Silver-gilt Banksian Medal.

To Messrs. Harkness, for herbaceous plants, Poppies, &c.

Silver Flora Medal.

To Mr. G. Reuthe, for herbaceous plants and alpines.

Silver Grenfell Medal.

To Messrs. G. Gibson, for herbaceous plants.

Silver Banksian Medal.

To Messrs. Rich, for hardy flowers.
To The Maytham Gardens, for herbaceous border.

An exhibit illustrating the experimental work of the Society being carried out at Wisley was arranged by the Staff of the Laboratory.

July 5.—Lecture at 3 P.M. on " Some Plants from my Garden," by Mr. E. A. Bowles, M.A., V.M.H.

July 6.—Lecture at 3 P.M. on " Plants of interest exhibited at Holland House," by Dr. A. B. Rendle, F.R.S., M.A., D.Sc., V.M.H.

GENERAL MEETING.

JULY 26, 1921.

G. W. LODER, Esq., in the Chair.

Two hundred and sixty-four Fellows and three Associates were elected, and three Societies affiliated.
A lecture was given by Dr. W. Bateson on " Plant Breeding."

GENERAL MEETING.

AUGUST 9, 1921.

The Rt. Hon. Lord LAMBOURNE in the Chair.

Forty-three Fellows were elected, and three Societies affiliated.

GENERAL MEETING.

AUGUST 23, 1921.

The Rt. Hon. Lord LAMBOURNE in the Chair.

Fifteen Fellows were elected, and one Society affiliated.

GENERAL MEETING.

SEPTEMBER 6, 1921.

There was no business before the meeting on this day.

GENERAL MEETING.

SEPTEMBER 20, 1921.

VEGETABLE SHOW.

Awards made by the Council after consultation with the Judges.

The Sutton Challenge Cup.

To Mr. J. Jones, Ammanford, S. Wales, First Prize in Class I.

The R.H.S. Challenge Cup.

To Mrs. Jenner (gr. Mr. H. Wheeler), Cardiff, for highest number of points.

GENERAL MEETING.

SEPTEMBER 27, 1921.

G. W. LODER, Esq., in the Chair.

Fifty-three Fellows were elected and three Societies affiliated.
A lecture was given by Dr. A. B. Rendle on "Plants of Interest in the Day's Exhibition."

GENERAL MEETING.

OCTOBER 4, 1921.

Seventy-one Fellows and one Associate were elected.

25TH ANNUAL SHOW OF BRITISH FRUIT.

Chief Awards made by the Council after consultation with the Judges.

The Gordon-Lennox Cup.

To Sir Chas. Nall-Cain (gr. Mr. T. Pateman), for collection of hardy fruits.

The Affiliated Societies Cup.

To the Southampton and District Gardeners' Society.

The Bunyard Cup.

Recommended to Laxton Bros., for Apple 'Lord Lambourne.'

Gold Medal.

To Messrs. G. Bunyard, for collection of hardy fruits.

Silver-gilt Knightian Medal.

To Mr. T. Pateman for winning the Gordon-Lennox Cup.

GENERAL MEETING.

OCTOBER 18, 1921.

C. T. MUSGRAVE, Esq., in the Chair.

Sixty Fellows and nine Associates were elected, and one Society affiliated.
A lecture was given by N. H. Grubb, Esq., on "Some Aspects of Apple Pruning" (see p. 137).

GENERAL MEETING.

NOVEMBER 1, 1921.

Sir FREDERICK MOORE, M.A., V.M.H., in the Chair.

Sixty-three Fellows and one Associate were elected, and one Society affiliated.
A Conference on Barberries took place.

DEPUTATION TO LE MANS CHRYSANTHEMUM SHOW.

NOVEMBER 3, 1921.

Gold Medal.

To Vilmorin-Andrieux et Cie., Paris, for Chrysanthemums and vegetables.

Silver-gilt Knightian Medal.

To M. Chauffour, Versailles, for collection of fruits.

Silver-gilt Banksian Medal.

To M. Leloup-Grimoux, Le Mans, for Chrysanthemums.

GENERAL MEETING.

November 15, 1921.

W. A. Bilney, Esq., in the Chair.

Seventy-nine Fellows were elected, and one Society affiliated.

A lecture was given by W. F. Bewley, Esq., on "Diseases of Tomatos" (see p. 169).

National Potato Exhibition and Conference.

November 16, 17, and 18, 1921.

Awards.

Gold Medal.

To Messrs. Dobbie, for Potatos.
To Messrs. Sutton, for Potatos.

Silver Knightian Medal.

To Messrs. Webb, for Potatos.
To Mr. J. L. Clucas, for Potatos.
To Messrs. Kent & Brydon, for Potatos.

Silver-gilt Lindley Medal.

To the Dept. of Agric. and Tech. Inst., Ireland, for illustrations of Potato Diseases.

Silver Lindley Medal.

To the University of Leeds, for exhibit showing causes of and treatment for Common Potato Scab.

To Dr. Salaman and Mr. Lesley, for illustrations of Potato Genetics.

To Messrs. Dobbie, for illustrations showing varietal differences in Potatos.

To the Potato Research Laboratory, Wageningen, Holland, for illustrations of Mosaic and Leaf-Curl Diseases.

Certificate of Appreciation.

To the Imperial College of Science for work on Life History of Wart Disease Organisms.

To Miss Breeze, for work on Potato Anther Degeneration.

A full Report of the Conference with the Papers read during the three days has been published.

GENERAL MEETING.

November 29, 1921.

C. G. A. Nix, Esq., in the Chair.

Sixty-five Fellows were elected, and one Society affiliated.

GENERAL MEETING.

December 13, 1921.

The Rt. Hon. Lord Lambourne in the Chair.

Forty-eight Fellows were elected and three Societies affiliated.

SCIENTIFIC COMMITTEE.

JULY 26, 1921.

Mr. E. A. BOWLES, M.A., in the Chair, and four members, with Mr. ALLWOOD (visitor), present.

Hybrid Dianthus.—Mr. Allwood showed some crosses between the perpetual-flowering Carnation and the Sweet William; these and the second generation had mainly grey foliage and clustered flowers on tall stems; they appear to be sterile to their own pollen, but set seed freely with that of *D. barbatus*. They are readily propogated by cuttings.

Mr. Allwood said that Carnations and Sweet Williams have been crossed before, but the perpetual-flowering Carnation had not been used.

Injurious insects.—Mr. Fraser showed examples of *Cetonia aurata*, and of *Sirex gigas*.

Figure of Banana.—Mr. Fawcett showed a tracing of Banana made from an illustration dated 1618, in which the plant had the form of an apple tree—showing that it was not certainly known to botanists at that date.

Botanical Certificates.—At the instance of the Floral Committee, Botanical Certificates were recommended to two remarkable congested forms of *Scolopendrium vulgare* sent by Mr. Bolton of Halstead, viz. *undulatum cristatum* and *undulatum muricatum*.

Flowering of Koelreuteria paniculata.—Mr. Hales sent inflorescences of *Koelreuteria paniculata* from the garden at Chelsea. It had not flowered since 1911, when it set seed.

Alectorurus yedoensis was shown in flower from Mr. Bowles' garden—a rare Japanese Liliaceous plant.

Twin Apples.—From Mr. Bedford of Gunnersbury came several examples of twin fruits (connate fruits derived from separate flowers, sometimes with separate stalks) of the variety Potts' Seedling.

Crinum yemense.—Mr. Elwes showed specimens of a fine plant under the name *Crinum yemense* Hort., with the following note: "This plant has been known in our gardens since 1893, when W. W. in the *Gardener's Chronicle* for June 3, 1893, p. 658, wrote of it—'This was distributed as a new plant by Dammann & Co., Naples, last year. It has lately flowered at Kew and has been identified by Mr. Baker as *Crinum latifolium* Linn., a common species in Tropical Asia, and well known in English gardens.' I can find nothing more recorded of it. Hooker in the *Flora of British India*, vi. p. 283, unites many other described species with *latifolium*, and gives it a wide distribution in Tropical Asia and Africa. After comparing my plant, now in flower, with the figure in *Bot. Reg.* t. 1297, which is referred by Baker to *C. latifolium*, stated by Roxburgh to be a native of Bengal, I am confident that Baker was mistaken, and that though the species of *Crinum* are extremely hard to define by any fixed characters, as Hooker remarks, yet it is for horticultural purposes a very distinct species. I presume from its name that the plant is a native of Yemen in Arabia, and probably from the high mountains of the interior, as it proves so hardy in the open air that it ripened seed at Colesborne in the wet cold season of 1920. Sir Frederick Moore, who has grown it outside for some years at Glasnevin, considers it, as I do, the best hardy *Crinum* in cultivation." For comparison Mr. Elwes showed *Crinum* × *Powelli album*, the S. African *C. Moorei*, and a dwarf form of *C. longifolium* (*capense*), the flowers of which resemble very closely the plate of *C. latifolium* in *Bot. Reg.* t. 1297.

SCIENTIFIC COMMITTEE, AUGUST 9, 1921.

Mr. E. A. BOWLES in the Chair and eight members present.

Perpetual Carnation × *Sweet William.*—Mr. Chittenden said he had been unable to discover any very definite accounts in old literature of the raising of hybrids between these two plants, beyond the one to which Mr. Allwood referred when he showed at the last meeting those he had raised. The Committee would welcome any such accounts.

A far-travelled root.—Mr. Fraser reported that Mr. Boodle had come to the conclusion that the root which Mr. Bowles showed at the Committee some time since was not the root of an *Ailanthus*, but of some species of *Juglans*, and Mr. Bowles said that *J. nigra* was certainly growing on his lawn a very long distance from the place where the root had been found.

Double Antirrhinum.—Mr. Hay drew attention to the flowers of a double Antirrhinum which he showed. The spike was decidedly pretty and looked more like that of a stock than an Antirrhinum.

Flowers capturing wasps.—Mr. Bowles showed the petals of a flower of *Lilium Henryi*, to draw attention to the groove near their base into which wasps forced their way to get to the nectar, and were unable to extricate themselves afterwards.

Various hybrids.—Mr. Marsden Jones showed specimens of a hybrid between a double form of *Dianthus fragrans* and *D. barbatus*, which had double flowers and broader green instead of narrower glaucous leaves as in *D. fragrans*. He also showed a hybrid between *Delphinium nudicaule* and *D. cashmirianum*, the flowers of which showed traces of both parents.

Proliferation in Cardamine dentata.—Mr. Jones also showed drawings of a flower of *Cardamine dentata*, in which the ovary had opened and produced a vegetative growth from the base.

Mr. Praeger's Monograph on Sedum.—Mr. Hales moved and Mr. Hosking seconded the following resolution, which was carried unanimously: "This Committee desires to record its appreciation of the excellent work on Sedums by Mr. Lloyd Praeger which appeared in the last number of the Society's Journal; and they feel confident that work of this character must add to the prestige of their Journal."

Malformed Nemesia and Oenothera.—Specimens of these plants were shown, the one from Mr. E. H. Berkley, the other from Mr. C. E. Pearson, in which the flower buds were multiplied to an extraordinary extent. Each bud was perfect, though the parts had not developed to the full, and both ovary and anthers appeared to be empty. In the *Nemesia* the flower-stalk had elongated as usual, giving the plant the appearance of an umbellifer, while in the *Oenothera* (which had appeared in a sowing of 'Golden Glow' and had retained the reddish coloration of the upper roots which characterizes that variety), there being no flower-stalk, the inflorescence was more like that of a beet.

SCIENTIFIC COMMITTEE, AUGUST 23, 1921.

Rev. W. WILKS, M.A., in the Chair, three members, and Mr. E. A. BUNYARD (visitor), present.

Large leaf of Populus canadensis.—Mr. George Paul showed a leaf from a stool shoot of *Populus canadensis*, with one of *P. lasiocarpa* for comparison. The leaf exceeded that of the latter in size, measuring over eight inches in diameter.

Melanthera sp. from Kenya.—Mr. Van der Weyer sent flowers of a species of Melanthera from Kenya which had flowered in a greenhouse in 1920 and outdoors this year; apparently setting seed, and coming freely from cuttings.

Enations on Yucca filamentosa.—He also sent a piece of a leaf of *Yucca filamentosa* with a horn-like enation on the side near the apex similar to those which have before been shown to the Committee.

Hybrid Buddleias.—Some flowers of the F_2 generation of *Buddleia globosa* × *magnifica* were sent by Mr. Van der Weyer. The majority of the seedlings approached *B. magnifica* and none had given a cream spike. He also remarked that the F_2 generation of *B. globosa* × *B. madagascariensis* (which in F_1 gave flowers in orange balls slightly larger than those of *B. globosa* and without scent, the leaves being like those of *madagascariensis*) has leaves more like those of *B. globosa*.

Various plants.—Mr. H. J. Elwes showed various plants from his garden, including *Buphane* (poison bulb), which requires heat and good feeding (fig. in *Gard. Chron.* from Salisbury, Rhodesia, at the opposite time of the year); *Hedychium Elwesii*, about 2 feet 6 inches high, with bronzy green leaves, purple below; *H. coronarium* × *Gardnerianum*, a very sweet-scented, yellow-flowered cold-house plant like *Gardnerianum*; *Agapanthus inapertum*, a comparatively new species.

Solanum 'ovigerum.'—A plant shown under the name of *Solanum ovigerum* by the Hon. Vicary Gibbs was awarded a Botanical Certificate. [This plant was subsequently recognized as *S. texanum* (*S. integrifolium*).]

SCIENTIFIC COMMITTEE, SEPTEMBER 6, 1921.

Mr. E. A. BOWLES, M.A., in the Chair, and five members present.

Atriplex hortensis.—Mrs. Goldring sent *Atriplex hortensis ruber* to show its value as a red plant in borders, and the strength of its stem for staking purposes.

Colchicum.—Mr. Bowles showed *Colchicum Sibthorpei* from Salonika, *C. speciosum* and its varieties *giganteum, rubrum, Bornmulleri*; *C. cilicicum, Tenorei, laetum, byzantium,* and a small Spanish species resembling *alpinum* but flowering later.

Amaryllis Belladonna.—Mr. H. J. Elwes showed the flowers of the type, a supposed hybrid between it and *Brunsvigia,* known as *A.* × *Parkeri,* and a very fine deeply coloured form, the old flowers almost crimson, at all ages strongly orange on filaments and in the throat, and reported a white form now in flower at Kew, obtained from Messrs. Sander from among the original stock of *A.* × *Parkeri.*

Monstrous Vegetable Marrow.—A drawing of a vegetable marrow plant which had produced only two leaves in addition to the cotyledons, but which had made no further growth, was shown from Mr. Parkin.

SCIENTIFIC COMMITTEE, SEPTEMBER 20, 1921.

Mr. E. A. BOWLES, M.A., in the Chair, and six members present.

Hybrid Carnation and Sweet William.—Mr. Bliss wrote concerning the hybrid Carnation-Sweet William, drawing attention to the supposed origin of Fairchild's Pink, which by some is attributed to the Marguerite Carnation × Sweet William. Mr. Bowles said he had recently seen at Lanarth a fine scarlet cross between the Carnation ' Uriah Pike ' and the Sweet William.

Various plants.—Mr. H. J. Elwes showed a number of plants from his garden, including a *Rhodostachys,* probably *littoralis*; a hybrid *Vallota* (*V. purpurea* × *Gastronema*), which showed the trifid stigma of the *Gastronema*; *Hippeastrum brachyandrum,* which he regarded as nearly related to *Zephyranthes,* and which came to him from the late Canon Ellacombe's garden; *Gladiolus Masoniorum*; *Senecio pulcher,* which can be propagated by root cuttings; *Funkia cordata*; *Solidago humifusa*; *Dracocephalum Forrestii*; *Umbilicus* sp.; *Aralia edulis*; *Stapelia* sp.; the curious and rare *Mesembryanthemum Elishae*; *M. tuberculosum*; *Huernia aspera*; and others.

Various hybrids.—Mr. Marsden Jones showed *Geum coccineum* × *G. urbanum,* and various crosses of Chinese Delphiniums (including forms of *D. grandiflorum*).

Cyclamen with upright flowers.—Mr. Bowles showed flowers of *Cyclamen neapolitanum* with flowers erect instead of inverted as usual, and remarked that some had failed to draw down their seed for a considerable time. He also showed a curiously

Fasciated Holly from Earlham Hall, with a stem resembling that of an Opuntia.

SCIENTIFIC COMMITTEE, SEPTEMBER 27, 1921.

Mr. E. A. BOWLES, M.A., in the Chair, and four members present.

Ailanthus fruiting.—Mr. Bowles showed from a garden in Oxford ripe fruit of *Ailanthus glandulosus.*

Rhytisma acerinum.—He also showed leaves of Sycamore badly attacked by the fungus *Rhytisma acerinum.*

Narcissus viridiflorus.—Mr. Bowles showed from his garden a spike of three flowers of the sweet-scented green-flowered *Narcissus viridiflorus.* It was grown in a cold frame.

Fruits of *Akebia lobata* and *Stauntonia latifolia* were shown by Mr. Gerald Loder, who also showed fruit of *Actinidia chinensis* from a solitary plant of that species in his garden at Ardingley.

OCTOBER 4, 1921.

Mr. E. A. BOWLES, M.A., in the Chair, and six members present.

Koelreuteria fruiting.—Mr. W. Hales showed fruits of this beautiful tree from the Chelsea Physic Garden. He also showed a flowering shoot of the Japanese Loquat, *Eriobotrya japonica.*

Crocus forms.—Mr. Bowles showed a number of forms of species flowering in autumn, including the form *albus* of *C. speciosus* both in the veined and in the self-coloured form; a hybrid with cream anthers between *speciosus* and *pulchellus*; *pulchellus* and its white form; and *C. medius.*

Autumn-flowering Snowdrop.—Mr. Bowles showed also flowers of *Galanthus Olgae* which had this year opened on September 28.

Abnormalities in Linaria.—He also showed flowers of Linaria in which the spur appeared in other parts than at the base of the anterior petal, and in which sometimes more than one spur was developed.

SCIENTIFIC COMMITTEE, OCTOBER 18, 1921.

Mr. E. A. BOWLES, M.A., in the Chair, and four members present.

Various Plants.—Mr. Loder showed the following plants from his garden: *Aralia szechuanensis, Cornus Hessei* with bunches of white berries, and *Viburnum fragrans* in flower.

Mr. Hosking showed female flowers of *Salix Bockii* from Szechwan, *Buddleia Fallowiana* (?) similar to the plant generally grown as *B. yunnanensis, Veronica Veitchii, Pelargonium echinatum* raised from root cuttings, and an abnormal form of *Chrysanthemum Parthenium* with virescent flowers and heads closely approximated to one another.

Mr. Bowles showed *Clematis balearica* in flower from his garden.

Cones of Taxodium.—Mr. Notcutt sent cones of *Taxodium distichum* from Suffolk, and Mr. Loder mentioned the formation of knees on an old plant in his garden. These knees had not come above ground, but had been formed between stones on an island.

Malformation of Dahlia flowers.—Mr. G. F. Wilson sent photographs of Dahlias to illustrate the damage done by the punctures of the bug *Lygus pratensis,* causing the flower-head to expand in a one-sided manner. He found that mere puncturing did not produce the malformation, but if the juice of the bug were introduced into the puncture the malformation followed.

SCIENTIFIC COMMITTEE, NOVEMBER 15, 1921.

Mr. E. A. BOWLES, M.A., in the Chair, and five members present.

Rayless Helianthus.—Mr. Fraser showed a capitulum of the common Sunflower without rays, but with very numerous small capitula growing in the axils of the discal bracts, as in Echinops, and differing from that in having a common involucre.

Fruiting of Arauja sericifera.—Mr. Norman Hadden sent a shoot of *Arauja sericifera* from his garden at Porlock Weir, bearing many fruits. Mr. Hales said the plant had fruited freely outside with him this season.

SCIENTIFIC COMMITTEE, NOVEMBER 29, 1921.

Mr. E. A. BOWLES, M.A., in the Chair, and five members present.

Cotyledons of Rhamnus.—Mr. J. Fraser showed seedlings of *Rhamnus catharticus* and *R. Frangula* to illustrate their epigeal character in the former and hypogeal in the latter.

Buddleia madagascariensis.—Mr. van de Weyer showed the inflorescence of *Buddleia madagascariensis* from his garden, and said the plant which he had used in raising the hybrids referred to by him in communications to the Committee

did not agree in characters with the plant now shown and which was evidently the true thing. The other had not yet been identified.

Fasciated Wallflower.—A tall fasciated wallflower, nearly 3 ft. in height, and bearing at the top of the stem a densely leafy much-branched fasciated growth, was also exhibited.

SCIENTIFIC COMMITTEE, DECEMBER 13, 1921.

Rev. W. WILKS, M.A., in the Chair, and seven members present.

British Mints.—Mr. J. Fraser showed a series of beautifully preserved specimens of varieties and hybrids of *Mentha aquatica* and *M. hirsuta*, and of *rotundifolia* and *spicata*.

Yucca Whipplei seedling.—Mr. Chittenden mentioned the ripening of seed of *Yucca Whipplei* in Mr. M. Christy's garden at Emsworth this year. The seeds had germinated. It would be interesting, in view of the strange story of pollination in Yuccas, to hear of the occurrence of good fruit of this or other Yuccas in other parts of the country.

FRUIT AND VEGETABLE COMMITTEE.

JULY 5, 1921.

AT HOLLAND HOUSE.

Mr. J. CHEAL, V.M.H., in the Chair, and twenty-four members present.

Awards Recommended:—

Award of Merit.

To Cherry 'Ursula Rivers' (votes unanimous), from Messrs. Rivers, Sawbridgeworth. Fruits large, flat round, black; flesh black, very juicy and rich in flavour; stone small. The tree is a heavy bearer with a sturdy habit. This variety was raised from 'Emperor Francis' and is a mid-season Cherry of great promise.

To Melon 'Althorpe' (votes 17 for, 2 against), from Major Windham, Caversfield House, Briston. A medium-sized, roundish oval fruit with a freely netted green skin. The flesh is scarlet, thick, very luscious and melting. and of fine flavour. The seed cavity is small. It is said to be a cross between 'Triumph' and 'Frogmore Scarlet,' a free bearer, and of a sturdy vigorous habit.

Other Exhibit.

Messrs. Rivers, Sawbridgeworth: seedling Nectarine.

FRUIT AND VEGETABLE COMMITTEE, JULY 26, 1921.

Mr. J. CHEAL, V.M.H., in the Chair, and thirteen members present.

Awards Recommended:—

Award of Merit.

To Nectarine 'John Rivers' (votes unanimous), from Messrs. Rivers, Sawbridgeworth. A large handsome fruit of good flavour. It has the defect of being of a very distinct cling-stone type. The tree is stated to be a good grower and a free bearer, ripening very early. It is a cross between Peach 'Peregrine' and 'Duke of York.' The deputation who inspected the tree were very favourably impressed.

The following awards recommended to Mid-Season Culinary Peas, Strawberries, and Black Currants at Wisley by the Sub-Committee were confirmed:—

CULINARY PEAS, MID-SEASON.

Award of Merit.

Nos. 91, 92, 93, 94. 'Admiral Beatty,' sent by Messrs. Toogood, R. Veitch, Kelway & Carter.
No. 111. '1920 Marrow,' sent by Messrs. Carter.
No. 125. 'Elephant,' sent by Messrs. Carter.
No. 145. 'Alderman,' sent by Messrs. Nutting.
No. 150. 'King George,' sent by Messrs. Webb.

Highly Commended.

No. 7. 'Eldorado,' sent by Mr. W. J. Unwin.
No. 13. 'Dwarf Monarch,' sent by Messrs. Carter.
No. 15. 'Wonder,' sent by Mr. Unwin.
No. 20. 'Commonwealth,' sent by Messrs. Carter.
No. 26. 'James Kelway,' sent by Messrs. Kelway.
No. 30. 'The Commodore,' sent by Messrs. R. Veitch.
No. 35. 'Beauty,' sent by Mr. Unwin.
No. 42. 'Union Jack,' sent by Messrs. Kelway.
No. 46. 'The Southwark,' sent by Messrs. Cooper Taber.
No. 53. 'The Bell,' sent by Mr. D. Bell.

No. 61. 'Northern Record,' sent by Messrs. Dickson & Robinson.
No. 66. 'Duke of York,' sent by Messrs. Cooper Taber.
No. 76. 'Jersey Hero,' sent by Messrs. Nutting.
No. 81. 'Magnum Bonum.' (Purchased.)
No. 104. 'Peacemaker,' sent by Messrs. Kelway.
Nos. 108, 109. 'The Clipper,' sent by Messrs. Sydenham & Kelway.
No. 128. 'Standard,' sent by Messrs. Barr.
No. 136. 'King of Peas,' sent by Messrs. Dickson & Robinson.
No. 137. 'Belvoir Castle,' sent by Mr. W. J. Earl.
No. 146. 'Alderman,' sent by Messrs. Toogood.
No. 149. 'Reliance Marrowfat,' sent by Messrs. Webb.
No. 95. 'Premier,' sent by Mr. Bell.

Commended.

No. 11. 'Gladiator,' sent by Messrs. Cooper Taber.
No. 16. 'Pixie,' sent by Mr. Unwin.
No. 24. 'Advance Guard,' sent by Mr. Unwin.
No. 38. 'Ideal,' sent by Mr. Unwin.
No. 47. 'Lord Chancellor,' sent by Messrs. Carter.
No. 54. 'John Bull,' sent by Messrs. Carter. } Similar to
Nos. 63, 64. 'Senator,' sent by Messrs. Rice & Webb. } one another.
No. 62. 21/5 'Seedling,' sent by Messrs. Laxton.
No. 67. 'Danby Stratagem,' sent by Messrs. Carter.
No. 72. 'Lancastrian,' sent by Messrs. Dickson & Robinson.

STRAWBERRIES.

Award of Merit.

Nos. 7, 8, 9. Laxton's 'King George V.,' sent by Messrs. Laxton, Pearson, and Cousens.
Nos. 18, 81. 'Tuckswood Early' ('Early Evern') (for earliness), sent by Messrs. Cousens, and Scarlett.
Nos. 25, 26, 27. 'International,' sent by Messrs. Pearson, Cousens, and Laxton.
Nos. 37, 38, 39. 'Laxtonian,' sent by Messrs. Pearson, Cousens, and Laxton.
Nos. 46, 47. 'Sir Joseph Paxton,' sent by Messrs. Cousens, and Laxton.
No. 50. 'Sir Douglas Haig,' sent by Messrs. Laxton.

Highly Commended.

No. 22. 'Bedford Champion,' sent by Mr. Cousens.
No. 24. 'Bountiful,' sent by Messrs. Laxton.
Nos. 28, 29. 'The Queen,' sent by Messrs. Laxton, and Pearson.
Nos. 32, 84. 'Sturton Cross,' sent by Messrs. Cousens, and White.
Nos. 35, 36. 'The Duke,' sent by Messrs. Laxton, and Cousens.
No. 44. 'Rival,' sent by Messrs. Laxton.
Nos. 57, 58, 59. 'Laxton's Latest,' sent by Messrs. Laxton, Cousens, and Pearson.
Nos. 61, 62. 'Progress,' sent by Messrs. Laxton, and Cousens.
No. 78. 'Louis Gautier,' sent by Messrs. Pearson.

Commended.

Nos. 1, 2, 3. 'Royal Sovereign,' sent by Messrs. Laxton, Cousens, and Pearson.

BLACK CURRANTS.

Award of Merit.

No. 5. 'Hatton Black,' sent by Mr. H. Jones, Shrewsbury.

Highly Commended.

No. 6. 'Long Bunch,' sent by Mr. G. Trinder, Fleet, Hants.

Other Exhibits.

L. Ingham Baker, Esq., Crewkerne: Tomato 'Wayford Seedling.'
Messrs. Dobbie, Edinburgh: Autumn-sown Onions.

FRUIT AND VEGETABLE COMMITTEE, AUGUST 9, 1921.

Mr. C. G. A. NIX in the Chair, and twelve members present.

Awards Recommended:—

First-class Certificate.

To Black Currant 'Daniels' September Black' (votes unanimous), from Messrs. Daniels, Norwich. This excellent variety, which received an Award of Merit on September 12, 1916, received the higher award on this occasion on account of its great cropping qualities, large handsome fruit and its lateness.

Cultural Commendation.

To Earl Strafford (gr. Mr. H. Markham), Barnet, for Morello Cherries.

Other Exhibits.

Messrs. Bunyard, Maidstone: Apple 'Maidstone Favourite.'
R.H.S. Gardens, Wisley: Melon 'Anstrutheri.'

FRUIT AND VEGETABLE COMMITTEE, AUGUST 23, 1921.

Mr. J. CHEAL, V.M.H., in the Chair, and fifteen members present.

Awards Recommended:—

Silver-gilt Hogg Medal.

The Hon. Vicary Gibbs (gr. Mr. E. Beckett), Elstree, for Aubergines and Capsicums.

Silver-gilt Knightian Medal.

To Mrs. Reed (gr. Mr. Thayer), Devizes, for Grapes.

Other Exhibits.

Messrs. Chivers, Histon: Apples.
Messrs. Daniels, Norwich: Black Currant 'September Black.'
Messrs. Ladhams, Southampton: Blackberry 'Shirley Prolific.'
Messrs. Laxton, Bedford: Apples.
S. Morris, Esq., Norwich: Melon 'Fitt's Perfection.'

FRUIT AND VEGETABLE COMMITTEE, SEPTEMBER 6, 1921.

Mr. C. G. A. NIX in the Chair, and seventeen members present.

Awards Recommended:—

Silver Knightian Medal.

To Messrs. Whitelegg, Chislehurst, for fruit.

Silver Banksian Medal.

To Mr. L. Robson, Guildford, for Apple 'Worcester Pearmain,' packed for market.

Award of Merit.

To Apple 'Mrs. Wilmot' (votes unanimous), from Messrs. J. R. Pearson, Lowdham, Notts. Fruit of large size, deep, round, handsome, stalk thin, moderately inserted in a russety basin; eye partly closed in a shallow cavity; colour brilliant red, with a lighter colour on the shaded side. Flesh yellowish white, firm, very juicy, somewhat acid. The tree is said to be a moderate sturdy grower and good bearer. It should prove valuable for market, because of its colour, fineness, and excellent cooking qualities. A very promising variety.

Cultural Commendation.

To Earl Strafford (gr. Mr. H. Markham), Barnet, for 'Black Hamburgh' Grapes.

Other Exhibits.

Messrs. Daniels, Norwich: Black Currant 'September Black.'
The Forest and Orchard Nurseries, Falfield: seedling Peach.
Mr. G. Haskell, Bedford: Apple 'Queen's Park Beauty.'
Mr. H. Jones, Letchworth: Apple (sport from 'James Grieve').
Messrs. Lobjoit, Hounslow: Apple 'Harlow Pippin.'
Mrs. G. H. Metcalfe, Clare: seedling Apple.

FRUIT AND VEGETABLE COMMITTEE, SEPTEMBER 20, 1921.

Mr. C. G. A. NIX in the Chair, and twenty members present.

Awards Recommended:—

Gold Medal.

To Sir William Cain, Bt. (gr. Mr. Moore), Wargrave, for vegetables.

Silver-gilt Knightian Medal.

To Messrs. Dobbie, Edinburgh, for potatos and onions.

Silver Banksian Medal.

To Mr. J. L. Clucas, Ormskirk, for Savoys.
To Messrs. Whitelegg, Chislehurst, for Apples.

Cultural Commendation.

To Mr. J. L. Clucas, Ormskirk, for Savoys.

Other Exhibits.

Mr. H. Chapman, Rye: Apple 'Dartmouth Crab' and Capsicum 'Rotherside Mammoth.'
J. Henderson, Esq., Leatherhead: seedling Nectarine.
H. Jones, Esq., Letchworth: Apples.
Messrs. Neal, Wandsworth: seedling Apple.
Mr. H. L. Robson, Guildford: Apples.
W. Tayler, Esq., Godalming: Apple 'Joybells.'

FRUIT AND VEGETABLE COMMITTEE, SEPTEMBER 27, 1921.

Mr. C. G. A. NIX in the Chair, and seven members present.

Exhibits.

C. D. Eagleton, Esq., Penshurst: seedling Apple 'Penshurst.'
Mr. J. J. Kettle, Corfe Mullen: Raspberry 'Lloyd George.'

FRUIT AND VEGETABLE COMMITTEE, OCTOBER 4, 1921.

BRITISH FRUIT SHOW.

Mr. C. G. A. NIX in the Chair, and twenty-four members present.

Awards Recommended:—

The Gordon-Lennox Cup.

To Sir Charles Nall-Cain, Welwyn, for collection of fruit.

Cultural Commendation.

To E. Larner, Esq., Shepherd's Bush, for 'Black Hambro' Grapes grown in the open.

Other Exhibits.

Mr. Allan, Norwich: seedling Grape.
Messrs. W. & J. Brown, Stamford: seedling Apple.
Mr. T. Catherwood, Hornchurch; Apple 'Hornchurch Beauty.'
Mr. J. Fielder, Southampton: Apple 'Ruby.'
Mrs. Hall, Chard: Grape 'Mrs. Hall.'
A. Helsham-Jones, Esq., Newbury: Apple 'Abundance.'
Mr. J. J. Kettle, Corfe Mullen: Raspberry 'Lloyd George.'

Mr. W. H. Lambert, Rolvenden : Apple ' Lambert's Seedling.'
Messrs. Laxton, Bedford : seedling Apples.
Mr. G. W. Miller, Wisbech : Strawberry ' Rufus.'
Mr. E. J. Parsons, Worcester : Apple ' Queen Mary.'
Mr. F. G. Sage, Histon : seedling Cucumber.
F. C. Stoop, Esq., Byfleet : seedling Apples.
Messrs. R. Veitch, Exeter : Apple ' Exonia.'

FRUIT AND VEGETABLE COMMITTEE, OCTOBER 18, 1921.

Mr. J. CHEAL, V.M.H., in the Chair, and twenty-two members present.

Awards Recommended :—

Gold Medal.

To Messrs. Barr, Taplow, for vegetables.
To J. A. Nix, Esq., Crawley, for fruit.

Silver-gilt Banksian Medal.

To Messrs. Sutton, Reading, for Cabbages.

Silver Banksian Medal.

To Mr. H. L. Robson, Guildford, for Apples.

The following awards recommended at successive meetings by the Sub-Committee visiting Wisley to the undermentioned subjects on trial were confirmed.

MAINCROP POTATOS.

Award of Merit.

Nos. 7–10. ' Majestic,' sent by Messrs. W. G. Holmes, Barr, Dobbie, Veitch.
No. 59. ' Up-to-Date,' sent by Messrs. Barr.
Grown also as 42. ' Mein's Model,' sent by Messrs. Laing & Mather.
60. ' Factor,' sent by Messrs. Barr.
61. ' Longkeeper,' sent by Messrs. Carter.
62. ' Irish King,' sent by Messrs. Barr.
Nos. 69–74. ' Kerr's Pink,' sent by Messrs. Veitch, Clucas, Farmer & Backhouse, Dobbie, Barr, Bath.

Highly Commended.

Nos. 2–6. ' Bishop,' sent by Messrs. Clucas, Sutton, Carter, Dobbie, W. G. Holmes.
Nos. 33–35. ' King Edward,' sent by Messrs. Farmer & Backhouse, Barr, Carter.
Nos. 44–46. ' Ally,' sent by Messrs. Farmer & Backhouse, Dobbie, Poad.

CABBAGES SPRING SOWN—EARLIER VARIETIES.

Award of Merit.

No. 9. ' Paragon Drumhead,' sent by Messrs. Clucas.
No. 36. ' Autumn Exhibition,' sent by Messrs. Barr.
No. 37. ' Dwarf Best of All,' sent by Messrs. Barr.
No. 41. ' Little Queen,' sent by Messrs. Barr.
No. 43. ' Model,' sent by Messrs. Dickson & Robinson.
No. 51. ' Earliest and Best ' (for garden purposes), sent by Messrs. Dickson & Robinson.
No. 107. ' Early Nantes ' (for early garden use), sent by Messrs. Barr.
No. 109. ' Rosette Colewort ' (for trueness of stock), sent by Messrs. Simpson.
No. 112. ' Vesuvius Pickling,' sent by Messrs. Webb.

Highly Commended.

No. 17. ' St. John's Day ' (for garden purposes), sent by Messrs. Barr.
No. 49. ' Imperial,' sent by Messrs. Wheeler.
No. 72. ' Early Nonpareil,' sent by Messrs. Veitch.
No. 88. ' Early Jersey Wakefield,' sent by Messrs. Cooper Taber.
No. 96. ' Favourite ' (for trueness of stock), sent by Messrs. Webb.
No. 46. ' Defiance,' sent by Messrs. Cannell.

Commended.

No. 26. ' Early Morn,' sent by Messrs. Cooper Taber.

CABBAGES SPRING SOWN—LATER VARIETIES.

Award of Merit.

No. 6. ' Glory of Enkhuizen,' sent by Messrs. Rice.
No. 35. ' Earliest of All,' sent by Messrs. Wiboltt.

Highly Commended.

No. 27. ' Brunswick,' sent by Messrs. Barr.
No. 30. ' Dwarf Drumhead ' (Gibson), sent by Messrs. Barr.
No. 56. ' Early Wonder,' sent by Messrs. Finney.
No. 62. ' Ellam's Early,' sent by Messrs. Sydenham.
Nos. 101, 103, 104. ' Winnigstadt ' sent by Messrs. Sydenham, Rice, Dobbie.

Other Exhibits.

Rev. C. G. O. Bond, Churt : Apple for naming.
Mrs. Dalley, Kidderminster : Apple ' Mary Dalley.'
Mr. W. Engall, Louth : Apple ' Eclipse.'
Messrs. House, Westbury-on-Trym : Apple ' John Standish.'
J. Meikle, Esq., Blairdrummond : seedling Apple.
Messrs. Stevens, Sidmouth : Apples.
Lady Thornycroft, Bembridge : Apple ' Sir Douglas Haig.'
Major Windham, Briston : Melon ' Althorpe.'

FRUIT AND VEGETABLE COMMITTEE, NOVEMBER 1, 1921.

Mr. C. G. A. NIX in the Chair, and twenty members present.

Awards Recommended :—

Silver Hogg Medal.

To Hon. Mrs. Petre, Westwick, for ' Doyenne du Comice ' Pears.

Highly Commended for Market Growing.

To Apple ' John Standish,' as a market variety, sent by Messrs. House, Westbury-on-Trym.

Other Exhibits.

Messrs. Ballington, Matlock : seedling Apples.
Miss M. Biggs, Reading : seedling Apple.
Mr. J. W. Boyce, Welney : Apples.
Mr. G. P. Bury, Cullen House, Banffshire : Pears.
Lord Devonport, London : Apple ' Devonport Seedling.'
Viscount Elvedon, Pyrford : fruits of Japanese Medlar and Pomegranates grown out of doors.
Mr. A. C. Meek, Berkhamstead : Apples.
Mr. P. H. Miller, Marlow : Apples.
F. C. Stoop, Esq., Byfleet : Apple ' G. Carpenter.'
Lady Thorneycroft, Bembridge : Apple ' Sir Douglas Haig.'
Mr. G. Trinder, Fleet : Raspberry ' Golden Hornet.'
Messrs. Whitelegg, Chislehurst : Apple ' Bellefleur.'

FRUIT AND VEGETABLE COMMITTEE, NOVEMBER 15, 1921.

Mr. C. G. A. NIX in the Chair, and fifteen members present.

Awards Recommended :—

The following awards were recommended to Savoy Cabbages after trial at Wisley.

Award of Merit.

No. 10. ' New Year,' sent by Messrs. Barr.
*Nos. 18, 19, 39. ' Early Favourite,' sent by Messrs. Dickson & Robinson, Toogood, Barr.
No. 22. ' Latest of All,' sent by Messrs. Watkins & Simpson.

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* Award for earliness.

*No. 23. ' Belleville,' sent by Messrs. Watkins & Simpson.
No. 31. ' Selected Drumhead,' sent by Messrs. Dobbie.
Nos. 49, 50. ' Ormskirk Late,' sent by Messrs. Clucas, Bees.
Nos. 36, 37. ' Best of All,' sent by Messrs. Watkins & Simpson, Sydenham.

Highly Commended.

Nos. 32, 33. ' Drumhead,' sent by Messrs. Simpson, Barr.
No. 40. ' The Toogood,' sent by Messrs. Toogood.
Nos. 42, 43. ' Covent Garden Select Late,' sent by Veitch, Watkins & Simpson.
No. 46. ' Ormskirk Late,' sent by Messrs. Scarlett.

Other Exhibits.

T. Francis, Esq., Shillington : seedling Apple.
C. Hanbury, Esq., Dorchester : Pear ' Uvedale's St. Germain ' (weight, 2 lb. 2¾ oz.).
Mrs. Lewis, Stoke under Ham : seedling Apple.
Messrs. S. Low, Bush Hill Park : Apple ' Sops in Wine.'
Mrs. Miller, Marlow : preserves.
Messrs. Westmacott, London : South African preserves.

FRUIT AND VEGETABLE COMMITTEE, NOVEMBER 29, 1921.

Mr. J. CHEAL, V.M.H., in the Chair, and fifteen members present.

No awards were recommended on this occasion.

Exhibits.

T. Francis, Esq., Hitchin : seedling Apple.
Mrs. Miller, Marlow : preserves.
Messrs. Sale, Wokingham : Apple ' Wheeler's Russet.'
Miss Sewell, London : preserves.
Messrs. Westmacott, London : preserved South African fruits.

FRUIT AND VEGETABLE COMMITTEE, DECEMBER 13, 1921.

Mr. C. G. A. NIX in the Chair, and fifteen members present.

Awards Recommended :—

Silver Knightian Medal.

To Messrs. Sutton, Reading, for Leeks.

Award of Merit.

To Apple ' Orleans Reinette ' (votes unanimous), exhibited by Messrs. Bunyard & Co., Maidstone. This is an excellent dessert apple, whose origin seems doubtful, but it is said to be an old variety, mentioned in 1776, but now little known. The tree is of sturdy habit, short jointed, and fairly prolific. Fruit to medium size, bright on the sunny side, dull on the shaded side; flesh crisp, excellent and juicy; keeping well to the end of the year; one of the best dessert apples of its season; said to combine the Ribston and Blenheim flavours. Should be better known.

Other Exhibits.

Mr. J. C. Beck, Henley : Apples.
Mr. G. Carpenter, Byfleet : Apple ' G. Carpenter.'
Mrs. Miller, Marlow : preserves.
Messrs. Sale, Wokingham : Apple ' Wheeler's Russet.'
Miss H. G. Sewell, Kensington : preserves.

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* Award for garden use.

FLORAL COMMITTEE.

JULY 5, 1921.

AT HOLLAND HOUSE.

Mr. H. B. MAY, V.M.H., in the Chair, and thirty-one members present.

Awards Recommended:—

Award of Merit.

To *Begonia* 'Hilda Langdon' (votes 24 for), from Messrs. Blackmore & Langdon, Bath. A large double variety with rounded smooth petals of a lovely delicate pink shade.

To *Begonia* 'Pavlova' (votes 21 for), from Messrs. Blackmore & Langdon, Bath. A brilliant orange variety with prettily crimped margins to the petals.

To *Campanula* 'Spetchley' (votes unanimous), from Mrs. Berkeley of Spetchley, Worcester. A very charming and free-flowering Campanula growing about 9 inches high. Its flowers are pure white and semi-pendulous. The leaves are narrow and linear.

To Carnation 'Apricot Self' (votes 15 for), from Mr. J. Douglas, Great Bookham. A Border variety of excellent form and of an intense bright apricot colour which is very pleasing.

To Carnation 'Bookham Yellow' (votes 13 for, 1 against), from Mr. J. Douglas, Great Bookham. A large-flowered border carnation of excellent form and a soft yellow colour.

To Delphinium 'Cambria' (votes 15 for, 7 against), from Mr. W. E. Samuel, Wrexham. A large semi-double bluish-mauve variety with a dark eye.

To Delphinium 'Jenny Jones' (votes unanimous), from Mr. W. E. Samuel, Wrexham. A handsome semi-double variety having dark blue and purple petals and a dark eye.

To Delphinium 'Mrs. Christie Miller' (votes 14 for), from Messrs. Blackmore & Langdon, Bath. An excellent white-flowered variety.

To Delphinium 'Winsome' (votes 22 for, 3 against), from Mr. W. E. Samuel, Wrexham. A large dark blue variety with a prominent dark eye.

To *Dierama pulcherrimum* var. *album* (votes 16 for), from the Donard Nursery Co., Newcastle, Ireland. This plant bears numerous tall arching slender spikes of white flowers and, except in colour, is similar to the type *D. pulcherrimum*, which is well known in gardens.

To *Lilium* × *Pardalperryi* (votes 15 for, 3 against) from Mr. A. Perry, Enfield. This elegant lily is the result of a cross between *L. pardalinum* and *L. Perryi*. The blooms are widely expanded and are borne on long stems which hold them erectly. The colour is buff spotted with dark brown. The spikes shown were about 5½ feet high and one carried ten blooms.

To *Polystichum angulare divisilobum plumosum densum erectum* (votes unanimous), from Mr. A. Perry, Enfield. A very beautiful hardy fern with long erect densely plumose fronds.

To Rose 'Betty Uprichard' (votes unanimous), from Messrs. Alex. Dickson, Newtownards. A hybrid Tea rose of great charm. The outsides of the petals are deep reddish-crimson while the insides are deep peach colour. The blooms are very fragrant and become little more than semi-double when fully open.

To Rose 'Clara Curtis' (votes unanimous), from Messrs. Alex. Dickson, Newtownards. A beautiful soft yellow rose of good form and size.

To Rose 'Lady Inchiquin' (votes unanimous), from Messrs. Alex. Dickson, Newtownards. A bright reddish rose hybrid Tea variety of lovely form.

To *Scolopendrium vulgare crispum* 'Golden Queen' (votes 20 for), from Mr. A. Perry, Enfield. A very beautiful variety of the Hart's Tongue fern with yellowish green fronds, the margins of which are very prettily crinkled.

To Streptocarpus 'Baroness Inverforth' (votes 17 for, 1 against), from Messrs. Cuthbert, Southgate. A very large-flowered variety of an old-rose colour with a white throat.

Other Exhibits.

Messrs. Baker, Codsall: *Centaurea pulchra.*

Messrs. Bastin, Bexley Heath: Begonia 'Mrs. W. Wilson.'

Messrs. Carter, Raynes Park: Eschscholzias.

Messrs. Cutbush, Barnet : Roses.
Mr. G. R. Downer, Chichester : Gaillardias.
Messrs. Gibson, Bedale : Verbascums.
Messrs. Grove, Sutton Coldfield : *Helenium hybridum* ' Wyndley.'
Mr. J. M. Harvey, Evesham : Roses.
Mr. H. Hemsley, Crawley : hardy plants.
Mr. E. J. Hicks, Twyford : Rose ' Lady Reading.'
Mr. H. A. Inness, Darlington : Delphinium ' Bumble Bee.'
Messrs. Jackman, Woking : *Helenium cupreum* ' Crimson Beauty.'
Messrs. Maxwell & Beale, Broadstone : Lavender ' Dwarf French.'
Messrs. Paul, Cheshunt : Rose ' Dresden China.'
Mr. G. Reuthe, Keston : *Lilium Kelloggii.*
Mr. B. H. B. Symons-Jeune, London : *Allium Purdomii.*
Mr. H. van Hellemonde, Rynstroom : Delphinium ' F. Koppuis.'
Messrs. Veitch, Exeter : *Notospartium Carmicheliae.*
Messrs. Wallace, Tunbridge Wells : *Lilium* × *sulphurgale.*
Mr. W. Wells, jun., Merstham : *Campanula persicifolia* ' Coronna.'

FLORAL COMMITTEE, JULY 26, 1921.

Mr. H. B. MAY, V.M.H., in the Chair, and eighteen members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Mr. H. J. Jones, Lewisham, for Phloxes.
To Mr. M. Prichard, Christchurch, for hardy plants.
To Messrs. J. Vert, Saffron Walden, for Hollyhocks.

Silver Flora Medal.

To Mr. C. Engelmann, Saffron Walden, for Carnations.
To Messrs. Kelway, Langport, for Gladioli.

Silver Banksian Medal.

To Messrs. Cheal, Crawley, for shrubs.
To Messrs. Ladhams, Southampton, for hardy plants.
To Rev. J. H. Pemberton, Romford, for Roses.
To Mr. A. Perry, Enfield, for hardy plants.
To Messrs. Russell, Richmond, for foliage plants.
To Messrs. Waterer Sons & Crisp, Twyford, for hardy plants.
To Mr. F. Wood, Ashtead, for Statices.

Bronze Flora Medal.

To Messrs. Maxwell & Beale, Broadstone, for hardy plants.

Bronze Banksian Medal.

To Mr. G. R. Downer, Chichester, for hardy plants.

Award of Merit.

To *Lilium philippinense* var. *formosanum* (votes unanimous), from Messrs. Wallace, Tunbridge Wells. A very graceful white trumpet-shaped Lily having the outside streaked with a reddish tint and the inside pale green. This is the alpine form of the Philippine Island Lily. It grows very freely from seed which it sets in the open and will flower in the year following sowing. It has distinct grassy foliage, and was originally collected by W. R. Price in Formosa.

The following awards recommended to Annual Candytufts, Annual Chrysanthemums, and Sweet Peas at Wisley by the sub-Committee were confirmed :

ANNUAL CANDYTUFT.

Award of Merit.

Nos. 4–5. Tom Thumb White, sent by Messrs. Watkins & Simpson, & R. Veitch.

No. 23. Lilac, sent by Messrs. Simpson.

No. 25. Delicate Pink, sent by Messrs. Simpson.
No. 31. Rose Beauty, sent by Messrs. Barr.

No. 26. Rose Cardinal, sent by Messrs. Watkins & Simpson.
No. 30. Rose Cardinal Improved, sent by Messrs. Barr.

No. 36. Selected Crimson, sent by Messrs. Dobbie.

ANNUAL CHRYSANTHEMUMS.

Award of Merit.

No. 3. Snowball, sent by Messrs. Watkins & Simpson.

No. 9. Morning Star, sent by Messrs. Toogood.
Nos. 22 to 26. Morning Star, sent by Messrs. Webb, Dobbie, Watkins & Simpson, Sydenham, Barr.

No. 27. Star of the East, sent by Messrs. Dicks.

Nos. 37 to 41. Northern Star, sent by Messrs. Veitch, Webb, Barr, Watkins & Simpson, Dobbie.

SWEET PEAS.

(See Report, p. 72.)

Other Exhibits.

Mr. W. Bunn, Malvern: Geranium 'Fascination.'

Chalk Hill Nurseries, Reading: hardy plants.

Messrs. C. Elliott, Stevenage: *Lysimachia pseudo-Henryi* and *Campanula* 'R. B. Loder.'

F. M. Remnant, Esq., Hutton: Border Carnation 'Mrs. Rhoda Remnant.'

Messrs. Sander, St. Albans: Anthuriums.

Miss E. Willmott, Great Warley: *Pentstemon cordifolius* and *Lobelia laxiflora.*

FLORAL COMMITTEE, AUGUST 9, 1921.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-five members present.

Awards Recommended:—

Silver-gilt Banksian Medal.

To Mr. H. J. Jones, Lewisham, for Phloxes.
To Messrs. Kelway, Langport, for Gladioli.

Silver Flora Medal.

To Messrs. Ryder, St. Albans, for Gladioli.

Silver Grenfell Medal.

To Rev. J. H. Pemberton, Romford, for Roses.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Mr. C. Engelmann, Saffron Walden, for Carnations.
To Messrs. Hopman, Hillegom, for Gladioli.
To Mr. G. Reuthe, Keston, for hardy plants.

Bronze Flora Medal.

To Messrs. Rich, Bath, for hardy plants.

Award of Merit.

To Gladiolus 'Byron L. Smith' (votes 18 for, 2 against), from Major Churcher, Alverstoke. This variety produces a shapely spike of dainty light pinkish-mauve flowers, which are marked with greenish-yellow in the interior.

To Gladiolus 'Utopia' (votes 18 for), from Major Churcher, Alverstoke.

A large-flowered variety of the Primulinus section, having deep ruddy apricot flowers, which are hooded as in the type.

To Montbretia ' Pocahontas ' (votes 13 for, 6 against), from S. Morris, Esq., Norwich. The flowers of this variety are of a reddish terra-cotta colour with a pale orange zone in the middle. They are widely expanded, star-shaped, and of good size, though not as large as those of ' Star of the East.'

Other Exhibits.

W. E. Long, Esq., Saxmundham : Dahlia ' Aline Long.'
Mr. F. G. Wood, Ashtead : hardy plants.
Messrs. Woolman, Leicester : Geranium ' Pink Profusion.'

FLORAL COMMITTEE, AUGUST 23, 1921.

Mr. H. B. MAY, V.M.H., in the Chair, and seventeen members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. Kelway, Langport, for Gladioli.

Silver Flora Medal.

To Messrs. Cheal, Crawley, for Dahlias and Phloxes.
To Messrs. Carter Page, London, for Dahlias and Gladioli.
To Mr. G. Reuthe, Keston, for hardy plants.

Silver Grenfell Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Mr. C. Engelmann, Saffron Walden, for Carnations.
To Rev. J. H. Pemberton, Romford, for Roses.

Silver Banksian Medal.

To Messrs. Low, Bush Hill Park, for Carnations.
To Messrs. Maxwell & Beale, Broadstone, for hardy plants.
To Messrs. Russell, Richmond, for flowering and foliage plants.
To Mr. F. W. Smith, Weybridge, for Delphiniums.
To Mr. W. Wells, jun., Merstham, for *Gentiana Farreri.*

Bronze Flora Medal.

To Messrs. Ladhams, Southampton, for Lobelias.
To S. Morris, Esq., Norwich, for Montbretias.
To Messrs. Rich, Bath, for hardy plants.

Award of Merit.

To Gladiolus ' Miss Dorothy Yorke ' (votes 12 for, 3 against), from Messrs. Kelway, Langport. The flowers of this variety are borne in a good bold spike and are pale cream deeply suffused with pink. The middle lower petal is blotched with crimson.

To Gladiolus ' Yellow Perfection ' (votes unanimous), from Mr. H. J. Jones, Lewisham. A very handsome variety of Dutch origin. The flowers are pale yellow slightly tinted with pink at the edges. The middle lower petal is a little deeper in colour than the others.

To *Kniphofia gracilis* ' Prince of the Netherlands ' (votes 11 for), from Messrs. Krelage, Haarlem. A very striking variety with a six-inch pendulous spike of bright fiery orange flowers.

The following Dahlias were selected by a Joint Committee of the R.H.S. and the National Dahlia Society for trial at Wisley :—

From Messrs. Cheal, Crawley : ' Cheal's ' White (Dec.), ' Crimson Star ' (Star), ' Reigate Star ' (Star).

From Messrs. Stredwick, St. Leonards : ' Champion ' (Cactus), ' Comrade ' (Dec.), ' Novelty ' (Dec.), ' Yeoman ' (Cactus).

Other Exhibits.

Major Churcher, Alverstoke : Gladioli.
Messrs. Peed, Streatham : Dahlias.

FLORAL COMMITTEE, SEPTEMBER 6, 1921.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-two members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. Carter Page, London, for Dahlias.
To Mr. M. Prichard, Christchurch, for hardy plants.

Silver Flora Medal.

To Messrs. F. Cant, Colchester, for Roses.
To Messrs. Velthuys, Hillegom, for Dahlias and Gladioli.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. Cutbush, Barnet, for Dahlias.
To Mr. C. Engelmann, Saffron Walden, for Carnations.
To Rev. J. H. Pemberton, Romford, for Roses.
To Mr. G. Reuthe, Keston, for hardy plants.
To Mr. W. Wells, jun., Merstham, for hardy plants.
To Mr. J. T. West, Brentwood, for Dahlias.

Bronze Flora Medal.

To Chalk Hill Nursery, Reading, for Antirrhinums.
To Messrs. Cheal, Crawley, for flowering and berried shrubs.
To Mr. H. J. Jones, Lewisham, for Pelargoniums.
To Messrs. Maxwell & Beale, Broadstone, for hardy plants.
To Messrs. Russell, Richmond, for Cannas, Clematis, &c.
To Mr. C. Turner, Slough, for Dahlias.

Bronze Banksian Medal.

To Messrs. Rich, Bath, for hardy plants.

Award of Merit.

To Gladiolus ' Odin ' (votes 16 for), from Messrs. Velthuys, Hillegom. A charming salmon-pink variety, having the lower petal blotched with crimson.

To Gladiolus ' Souvenir ' (votes 9 for), from Messrs. Velthuys, Hillegom. An excellent deep-yellow *primulinus* hybrid.

To Rose ' Dresden China ' (votes 19 for), from Messrs. G. Paul, Cheshunt. A very free-flowering, sweetly scented China rose of moderate size and a pleasing carmine-rose colour.

The following Dahlias were selected by a Joint Committee of the R.H.S. and the National Dahlia Society for trial at Wisley :—

From Messrs. Burrell, Cambridge : ' Blanche ' (Dec.), ' Trixie ' (Min. Pæony).

From Messrs. Cheal, Crawley : ' Cuckfield Star ' (Star), ' Kingswood Beauty ' (Dec.), ' Mamie ' (Single), ' Miss Willmott ' (Single).

From Messrs. Stredwick, St. Leonards : ' Big Ben ' (Dec.), ' Dauntless ' (Dec.), ' Gallant ' (Dec.), ' Goldfish ' (Pæony), ' Miss Mallison ' (Dec.), ' Pilot ' (Coll.), ' Princess ' (Cactus).

From Messrs. Topsvoort, Aalsmeer : ' Artis ' (Dec.).

From Messrs. Velthuys, Hillegom : ' Salmonea ' (Dec.), ' The Rose ' (Dec.), ' Vesuvius ' (Dec.), ' White Queen ' (Dec.).

Other Exhibits.

Col. Stephenson Clarke, Cuckfield : *Petrocosmea nervosa.*
Messrs. Piper, Langley : Dahlia ' Oakwood Beauty.'
Messrs. Thyne, Dundee : Dahlia ' Waterloo Scarlet.'

FLORAL COMMITTEE, SEPTEMBER 20, 1921.

Mr. H. B. MAY, V.M.H., in the Chair, and sixteen members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. Cheal, Crawley, for Dahlias and shrubs.

Silver-gilt Banksian Medal.

To Mr. M. Prichard, Christchurch, for hardy plants.
To Mr. J. B. Riding, Chingford, for Dahlias.

Silver Flora Medal.

To Messrs. Carter Page, London, for Dahlias.

Silver Grenfell Medal.

To Messrs. Cutbush, Barnet, for Michaelmas Daisies.
To Messrs. House, Bristol, for Scabious.
To S. Morris, Esq., Norwich, for Montbretias.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Mr. C. Engelmann, Saffron Walden, for Carnations.
To Messrs. Piper, Langley, for Dahlias and ornamental shrubs.
To Mr. G. Reuthe, Keston, for hardy plants.
To Messrs. Russell, Richmond, for stove and greenhouse plants.
To Messrs. Waterer Sons & Crisp, Twyford, for Michaelmas Daisies.
To Mr. J. T. West, Brentwood, for Dahlias.

Silver Lindley Medal.

To H. J. Elwes, Esq., Cheltenham, for Nerines.

Bronze Flora Medal.

To Messrs. R. Veitch, Exeter, for shrubs, Nerines, etc.

Award of Merit.

To Carnation 'Maine Sunshine' (votes 11 for, 4 against), from Messrs. Luxford, Harlow. A pale-yellow perpetual-flowering variety of excellent form and good substance. It has non-bursting calyces, wiry stems, and a faint but pleasing perfume.

Cultural Commendation.

To Messrs. Veitch, Exeter, for *Witsenia corymbosa.*

The following Dahlias were selected by a Joint Committee of the R.H.S. and the National Dahlia Society for trial at Wisley :—

From Messrs. Burrell, Cambridge : 'Aglaia' (Dec.), 'Candida' (Pæony), 'Cantab' (Dec.), 'Fedora' (Dec.), 'Judith' (Min. Pæony), 'Marcus' (Dec.), 'Melitta' (Pæony), 'Mrs. F. J. Sage' (Dec.), 'Psyche' (Dec.).
From Messrs. Cheal, Crawley : 'Balcombe Star' (Star), 'Brighton Star' (Star), 'Novelty' (Dec.)
From Messrs. Stredwick, St. Leonards : 'Chagford' (Cactus), 'Seagull' (Pæony), 'St. Leonards' (Pæony).
From Mr. C. Turner, Slough : 'Matador' (Pæony).

Other Exhibits.

Mr. E. Ballard, Colwall : Michaelmas Daisies.
Major Churcher, Alverstoke : Gladioli.
Hon. Vicary Gibbs, Elstree : *Solanum integrifolium.*
W. H. Gifford, Esq., Horsell : Phloxes.

The Awards recommended by the Sub-Committee to Dahlias on trial at Wisley were confirmed. (See Report of Trial.)

French and African Marigolds.

Award of Merit.

No. 4. Legion of Honour, sent by Dobbie.

Highly Commended.

No. 18. Silver King, sent by Barr.
No. 29. Lemon Queen, sent by Dobbie.
No. 41. Prince of Orange, sent by Dobbie.

Commended.

No. 12. Dwarf Gold Striped, sent by Barr.
No. 13, 15. Golden Ball, sent by Watkins & Simpson, R. Veitch.
No. 17. Pigmy Golden, sent by A. Dickson.
No. 19. Extra Dwarf Orange, sent by Barr.
} Identical.
No. 16. Pigmy Canary Bird, sent by A. Dickson.
No. 27. Tall Orange, sent by J. Carter.
No. 37. African Primrose, sent by Barr.
No. 40. Orange Prince, sent by Webb.
No. 42. Prince of Orange, sent by Dickson & Robinson.

FLORAL COMMITTEE, SEPTEMBER 27, 1921.

Mr. H. B. MAY, V.M.H., in the Chair, and sixteen members present.

Awards Recommended:—

Gold Medal.

To Mr. H. J. Jones, Lewisham, for Michaelmas Daisies.

Silver-gilt Banksian Medal.

To Messrs. B. R. Cant, Colchester, for Roses.
To Messrs. Cutbush, Barnet, for Michaelmas Daisies.
To Mr. M. Prichard, Christchurch, for hardy plants.

Silver Flora Medal.

To Messrs. Cheal, Crawley, for Dahlias and shrubs.
To Mr. E. J. Hicks, Twyford, for Roses.
To Messrs. Ladhams, Southampton, for hardy plants.
To Mr. J. B. Riding, Chingford, for Dahlias.

Silver Grenfell Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. Carter Page, London, for Dahlias.
To Mr. C. Engelmann, Saffron Walden, for Carnations.
To Mr. G. Reuthe, Keston, for hardy plants.
To Mr. J. T. West, Brentwood, for Dahlias.

Silver Banksian Medal.

To H. J. Elwes, Esq., Cheltenham, for Nerines.
To Messrs. House, Westbury-on-Trym, for Scabious.
To Messrs. Jarman, Chard, for Dahlias.
To Messrs. Low, Bush Hill Park, for Carnations.
To Rev. J. H. Pemberton, Romford, for Roses.

Bronze Flora Medal.

To the Burbage Nurseries, Hinckley, for Roses.
To Messrs. Piper, Langley, for Michaelmas Daisies.
To Messrs. Rich, Bath, for hardy plants.
To Messrs. Russell, Richmond, for stove and greenhouse plants.
To Messrs. Waterer Sons and Crisp, Twyford, for Michaelmas Daisies.

Award of Merit.

To Gladiolus ' Snow Glory ' (votes 8 for, 2 against), from Major G. Churcher, Alverstoke. A beautiful white variety with slight violet streaks on the lower segments, which are also faintly tinted with cream. The segments are ruffled and of very tough texture. The foliage is strong, and the long spike carries as many as fifteen open flowers and buds. Raised by Mr. A. E. Kunderd and introduced in 1917.

The following awards recommended to Perennial Lobelias on trial at Wisley were confirmed :—

Award of Merit.

No. 13. Lobelia ' Coccineus,' sent by Messrs. Ladhams.
No. 19. Lobelia ' Shirley Beauty,' sent by Messrs. Ladhams.

Highly Commended.

No. 5. Lobelia 'Attraction,' sent by Messrs. Ladhams.
No. 10. Lobelia 'Southampton,' sent by Messrs. Ladhams.
No. 20. Lobelia 'Mrs. de Bunsen,' sent by Messrs. Bath.

The following Dahlias were selected by the Joint Committee of the R.H.S. and the National Dahlia Society for trial at Wisley :—

From Messrs. Burrell, Cambridge : 'Briton' (Pæony), 'Elfreda' (Pæony), 'Faithful' (Pæony), 'Fusee' (Min. Pæony), 'Tartar' (Min. Pæony), 'Vida' (small Dec.).
From Messrs. Cheal, Crawley : 'Betah' (Single), 'Doreen' (Double), 'Lady Beatty' (Min. Pæony), 'Silver Queen' (Dec.).

Other Exhibits.

Messrs. Fromow, Chiswick : Solanums.

FLORAL COMMITTEE, OCTOBER 4, 1921.

Mr. H. B. MAY, V.M.H., in the Chair, and eighteen members present.

Awards Recommended :—

Award of Merit.

To Chrysanthemum 'Golden Almirante' (votes unanimous), from Mr. W. F. Gullick, Salisbury. A golden-yellow sport from 'Almirante,' having the centre of the flower rather fuller than is usual in that variety. It is a good market variety and produces good sprays of well-formed medium-sized flowers.
To *Crocus longiflorus* 'Venustus' (votes 7 for, 3 against), from Messrs. H. Chapman, Rye. This charming pale-lavender Crocus is somewhat paler and has broader petals than the type. It has pretty violet streaks at the base.
To *Oxalis purpurata* (votes 12 for), from S. Morris, Esq., Norwich. This species which comes from the Cape is a good one for cultivation in an alpine house. It has large, fleshy, deep green, obovate leaves, and large, bright-rose flowers. The height of the plant is from six to eight inches.

The following Dahlias were selected by the Joint Dahlia Committee for trial at Wisley :

From Messrs. Burrell, Cambridge : 'Connie' (Min. Pæony), 'Fanny' (Min. Pæony), 'Lillah' (Min. Pæony), 'Mrs. Courtney Page' (Pæony), 'Picture' (Min. Pæony), 'Vanity' (Pæony), 'Varuna' (Dec.).
From Messrs. Cheal, Crawley : 'Kent Star' (Star).

Other Exhibits.

Mr. P. Ladds, Swanley Junction : Chrysanthemum 'Consuelo.'
Messrs. S. Low, Bush Hill Park : Carnations.
Mr. R. C. Notcutt, Woodbridge : *Elsholtzia Stauntonii.*
Mr. C. Turner, Slough : Dahlias.

FLORAL COMMITTEE, OCTOBER 18, 1921.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-two members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. Dickson & Robinson, Manchester, for Michaelmas Daisies.
To Messrs. Sutton, Reading, for Antirrhinums.

Silver-gilt Banksian Medal.

To Mr. H. J. Jones, Lewisham, for Chrysanthemums.
To Messrs. Waterer Sons & Crisp, Bagshot, for shrubs.

Silver Flora Medal.

To Messrs. B. Cant, Colchester, for Roses.
To Mr. E. J. Hicks, Twyford, for Roses.
To Messrs. Carter Page, London, for Dahlias.
To Messrs. Wells, Merstham, for Chrysanthemums.

Silver Grenfell Medal.

To Messrs. Russell, Richmond, for stove plants.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. Barr, Taplow, for Nerines.
To Messrs. Blackmore & Langdon, Bath, for Begonias.
To Messrs. F. Cant, Colchester, for Roses.
To Messrs. Cheal, Crawley, for shrubs and Dahlias.
To Messrs. Cutbush, Barnet, for Dahlias.
To Mr. C. Engelmann, Saffron Walden, for Carnations.
To Messrs. House, Westbury-on-Trym, for Scabious.
To Mr. J. B. Riding, Chingford, for Dahlias.
To Mr. G. Reuthe, Keston, for hardy plants.

Bronze Banksian Medal.

To Messrs. Luxford, Harlow, for Chrysanthemums.
To Messrs. S. Low, Bush Hill Park, for Carnations.
To Messrs. Maxwell & Beale, Broadstone, for alpines.
To Rev. J. H. Pemberton, Romford, for Roses.
To Messrs. Piper, Langley, for shrubs.
To Messrs. Rich, Bath, for hardy plants.
To Mr. F. G. Wood, Ashtead, for alpines and Statice.

Award of Merit.

To Chrysanthemum 'Little Dorothy' (votes 11 for, 5 against), from Mr W. T. A. Roots, Cranford. A small but very free-flowering light-pink variety with a pale-yellow centre. The flowers are borne in nice sprays and the variety is especially suitable for cutting.

To *Dianthus Allwoodii* 'Betty' (votes 16 for), from Messrs. Allwood, Haywards Heath. A very pretty white variety with a dark-crimson centre. It has a double row of petals.

To *Schizostylis coccinea* 'Mrs. Hegarty' (votes 6 for, 2 against), from Mrs. Hegarty, Clonbur, Co. Galway. A good free-flowering rose-pink variety of *Schizostylis coccinea.*

Collerette Dahlia 'Tiger' from Messrs. Dobbie, Edinburgh, was selected for trial at Wisley.

Other Exhibits.

Mr. S. Aish, Dunstable: Chrysanthemums.
Messrs. Reamsbottom, Geashill: Anemones.
Duchess of Wellington, Basingstoke: *Vitis heterophylla* var.
Mr. W. Wells, jun., Merstham: hardy plants.

FLORAL COMMITTEE, NOVEMBER 1, 1921.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-five members present.

Awards Recommended:—

Gold Medal

To Mr. H. J. Jones, Lewisham, for Chrysanthemums.
To Sir Charles Nall-Cain, Bt., Welwyn, for Begonias.

Silver-gilt Flora Medal.

To R.H.S. Gardens, Wisley, for Barberries and Pyracanthas.
To Messrs. Wallace, Tunbridge Wells, for shrubs.

Silver Flora Medal.

To Messrs. Hill, Edmonton, for ferns.
To Messrs. Russell, Richmond, for stove plants.

Silver Grenfell Medal.

To Messrs. Cheal, Crawley, for shrubs.
To Mr. E. J. Hicks, Twyford, for Roses.

Silver Banksian Medal.

To the Lady Aberconway and Hon. Henry McLaren, M.P., Talycafn, for Barberries.
To Mr. C. Engelmann, Saffron Walden, for Carnations.
To Messrs. Godfrey, Exmouth, for Chrysanthemums.
To Messrs. S. Low, Bush Hill Park, for Carnations, etc.
To Rev. J. H. Pemberton, Romford, for Roses.
To Mr. G. Reuthe, Keston, for hardy plants.

Bronze Flora Medal.

To Mr. S. Aish, Dunstable, for Chrysanthemums.
To Messrs. Allwood, Haywards Heath, for Carnations.

Bronze Banksian Medal.

To Messrs. House, Westbury-on-Trym, for Scabious.
To Mr. Riley Scott, Horsham, for Chrysanthemums.
To Mr. Yandell, Maidenhead, for Chrysanthemums.

Award of Merit.

To *Berberis* × 'Autumn Cheer' (votes 21 for), from the R.H.S. Gardens, Wisley. A very free-fruiting *Berberis* bearing thick axillary clusters of roundish bright coral-red berries. The leaves of this variety had assumed a beautiful red autumn tint.

To *Berberis* × 'Fireflame' (votes 26 for), from the R.H.S. Gardens, Wisley. This variety produces long arching sprays bearing dense axillary bunches of small round deep-red berries which are produced with wonderful freedom. The individual berries are smaller than those of 'Autumn Cheer.'

To *Berberis* × 'Sparkler' (votes 25 for), from the R.H.S. Gardens, Wisley. This Berberis has a graceful pendulous habit and bears handsome coral-red fruits shaped like those of *B. rubrostilla* but considerably smaller.

To Chrysanthemum 'Horsham Amber' (votes 17 for), from Mr. Riley Scott, Horsham. An excellent rich amber Chrysanthemum of the reflexed Japanese type.

To Pelargonium 'Rossway Crimson' (votes 11 for, 2 against), from Major-General Sir C. F. Hadden, K.C.B., Berkhamsted. This useful bedding plant is of sturdy habit and bears large trusses of large round crimson scarlet flowers. The leaves are entirely green and have no zone.

Other Exhibits.

Messrs. H. Chapman, Rye: Nerines.
Messrs. Cutbush, Barnet: Carnations.
Messrs. Luxford, Harlow: Chrysanthemums.
Reedens School of Gardening, Newick: Violets and Chrysanthemums.
Messrs. Rich, Bath: Hardy plants.
Rt. Hon. Lord Ventry, Dingle: New Zealand Flax.

FLORAL COMMITTEE, NOVEMBER 15, 1921.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. Wells, Merstham, for Chrysanthemums.

Silver Flora Medal.

To Mr. H. J. Jones, Lewisham, for Chrysanthemums.
To Messrs. Luxford, for Chrysanthemums.

Silver Banksian Medal.

To Mr. S. Aish, Dunstable, for Chrysanthemums.
To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. Cutbush, Barnet, for rock garden.
To Mr. C. Engelmann, Saffron Walden, for Carnations.
To Messrs. S. Low, Bush Hill Park, for Carnations, Begonias, etc.

Bronze Banksian Medal.

To Mr. F. G. Wood, Ashtead, for rock garden.

Award of Merit.

To Chrysanthemum Hillier's Apricot' (votes 16 for), from Messrs. Hillier, Winchester. A robust-growing and very free-flowering single variety. The flowers are of a pale buff colour tinged with pink.

To Chrysanthemum 'H. Sleet' (votes 8 for), from Mr. G. Carpenter, Byfleet. A large Japanese exhibition variety of fine form with long florets of a striking reddish-copper colour and having an old-gold reverse.

To Chrysanthemum 'Margaret' (votes 18 for), from Mr. P. Ladds, Swanley. A large terra-cotta single variety with a yellow zone round the centre. The individual blooms measured five inches across.

Other Exhibits.

Mr. T. W. Cowburn, Thelwall: Chrysanthemums 'Cuerdon Sunflower.'
N. G. Hadden, Esq., West Porlock: fruits of *Araujia sericifera.*
Mr. W. Hall, Alresford: Chrysanthemums.
Countess of Northbrook, Micheldever: Chrysanthemum 'Countess of Northbrook.'
Lady Sanderson, Lewes: Chrysanthemum 'Lady Sanderson.'
Mr. S. E. Thatcher, West Lavington: seedling Chrysanthemum.

FLORAL COMMITTEE, NOVEMBER 29, 1921.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-one members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Mr. C. Engelmann, Saffron Walden, for Carnations.
To Messrs. Wells, Merstham, for Chrysanthemums.

Silver-gilt Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. Luxford, Harlow, for Chrysanthemums.

Silver Flora Medal.

To Mr. S. Aish, Dunstable, for Chrysanthemums.
To Messrs. Cutbush, Barnet, for ornamental shrubs.
To Messrs. S. Low, Bush Hill Park, for Begonias and Carnations.

Silver Banksian Medal.

To Major-General Sir Charles Hadden, Berkhamsted, for Chrysanthemums.
To Mr. G. Reuthe, Keston, for conifers.

Bronze Banksian Medal.

To Messrs. Russell, Richmond, for foliage and berried shrubs.

Award of Merit.

To Chrysanthemum 'Helena Margerison' (votes 7 for, 1 against), from Messrs. Luxford, Harlow. A large Japanese variety with narrow long curled florets, creamy-white in colour, edged with lilac pink.

To Chrysanthemum 'Susan' (votes 16 for), from Mr. S. Legg, Warter Priory Gardens, York. A very distinct and striking single variety of large size. The

ground colour is yellow heavily suffused with bright old rose pink and there is a yellow zone round the eye. This curious colour combination is very effective under artificial light.

Other Exhibits.

Mary Countess of Ilchester, Kensington : *Astelia Banksii.*
Mr. A. Perry, Enfield : Nerine ' Princess Mary.'

FLORAL COMMITTEE, DECEMBER 13, 1921.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-one members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. S. Low, Bush Hill Park, for Begonias and Carnations.

Silver Flora Medal.

To Mr. S. Aish, Dunstable, for Chrysanthemums.
To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. Blackmore and Langdon, Bath, for Cyclamen.
To Mr. C. Engelmann, Saffron Walden, for Carnations.
To Messrs. Luxford, Harlow, for Chrysanthemums.

Silver Banksian Medal.

To Messrs. Godfrey, Exmouth, for Chrysanthemums.
To Mr. G. Reuthe, Keston, for shrubs.

Bronze Banksian Medal.

To Mr. E. Dixon, Putney, for a formal garden.
To Messrs. Russell, Richmond, for shrubs.

Award of Merit.

To Chrysanthemum ' Autocrat Reflexed ' (votes unanimous), from Messrs. Lowe & Shawyer, Uxbridge. An excellent pure white reflexed Chrysanthemum of a medium and very useful size. It is a sport from ' Autocrat Incurved.'

Other Exhibits.

Messrs. H. Chapman, Rye : Nerine ' Yuletide.'
Major-General Sir Charles Hadden, Berkhamsted : Chrysanthemum ' Master Adrian.'
Mr. J. Rodda, Oxshott : Chrysanthemum ' James J. Morrish.'

ORCHID COMMITTEE.

HOLLAND HOUSE, JULY 5, 6, 7.

Sir JEREMIAH COLMAN, Bt., in the Chair, and fourteen members present.

Awards Recommended:—

First-class Certificate.

To *Odontioda* × *magna subra* (*Oda.* × 'Coronation' × *Odm.* hybrid) (votes unanimous), from Messrs. Armstrong & Brown, Tunbridge Wells. A near approach to the desired scarlet Odontoglossum. The plant bore a spike of seven large scarlet flowers with a cherry-red shade, and very slight white margin.

Award of Merit.

To *Laeliocattleya* × 'Soulange,' Ralli's var. (*L.-c.* × 'Lustre' × *C. Dowiana aurea*) (votes 9 for, 1 against), from Pantia Ralli, Esq. In size and shape closely approaching the Cattleya parent, sepals and petals light-rose, lip ruby-red.

ORCHID COMMITTEE, JULY 26, 1921.

Sir JEREMIAH COLMAN, Bt., in the Chair, Prince Tadashige Shimadzu of Japan and eight members present.

Awards Recommended:—

Silver Floral Medal.

To H. T. Pitt, Esq., Rosslyn, Stamford Hill, for a group including a fine set of varieties of *Miltonia vexillaria.*

Award of Merit.

To *Laeliocattleya* × 'General Maude,' var. 'Rubens' (*L.-c.* × 'Rubens Lambeauiae' × *C.* × *Hardyana*) (votes 6 for, 3 against), from H. T. Pitt, Esq. A large flower with very broad rose-pink petals, and fine ruby-crimson lip with gold lines at the base.

Other Exhibits.

R. G. Thwaites, Esq., *Odontioda* × *beechensis* and two specimens of the large white *Miltonia vexillaria* var. 'Queen Alexandra.'

ORCHID COMMITTEE, AUGUST 9, 1921.

Sir JEREMIAH COLMAN, Bt., in the Chair, Prince Tadashige Shimadzu and fourteen members present.

Awards Recommended:—

Silver Banksian Medal.

To Messrs. McBean, for hybrid Odontoglossums, Odontiodas, and Cattleyas.
To Messrs. Sanders, for hybrids and rare species.

First-class Certificate.

To *Laeliocattleya* × 'Golden Glow' (*L.-c.* × 'Sunrise' × *C.* × 'Venus') (votes unanimous), from Baron Bruno Schröder. The plant bore a four-flowered inflorescence, the sepals and petals chrome yellow with bright orange shade. Lip mauve purple with yellow margin.

Award of Merit.

To *Cattleya* × 'Falco' (*Dowiana aurea* × *Dupreana*) (votes unanimous), from Messrs. McBean. A large-flowered true Cattleya, well showing the *C. Warneri* in *C.* × *Dupreana.* Sepals and petals mauve-purple. Lip dark violet with gold lines from the base.

To *Laeliocattleya* × 'Vivid' (*C.* × 'Rhoda' × *L.-c.* × 'Thyone') (votes 9 for, 1 against), from Messrs. Flory & Black, Slough. A dwarf hybrid with sepals and petals, buttercup-yellow and ruby-red lip.

Other Exhibits.

Pantia Ralli, Esq.: Odontoglossums.
The Duke of Marlborough: *Brassocattleya* × 'Ida' var. 'Sunset,' and *Laeliocattleya* × 'Fazeana.'

ORCHID COMMITTEE, AUGUST 23, 1921.

Sir HARRY J. VEITCH in the Chair, Prince Tadashige Shimadzu and seven members present.

Awards Recommended:—

Silver Flora Medal.

To H. T. Pitt, Esq., Rosslyn, Stamford Hill, for Laeliocattleyas and Cattleyas, including white forms of *C.* × *Hardyana*, and rare species.

Silver Banksian Medal.

To Messrs. Sanders, St. Albans, for hybrids with Brassocattleyas and yellow Laeliocattleyas, especially good.
To Messrs. McBean, Cooksbridge, for Cattleyas, including home-raised *C. Dowiana aurea.*
To Messrs. Hassall, Southgate, for Brassocattleyas and Cattleyas.

Award of Merit.

To *Laeliocattleya* × 'Canary II' (*C.* × *Fabia alba* × *L.-c.* × 'Thyone') (votes 7 for, 1 against), from Pantia Ralli, Esq., Ashtead Park, Surrey. A clear yellow flower with rose-purple lip and yellow lines from the base.
To *Laeliocattleya* × 'Sargon,' Ralli's var. (*L.-c.* × 'Lustre' × *C.* × *Hardyana*) (votes unanimous), from Pantia Ralli, Esq. Flower large of *C.* × *Hardyana* class. Sepals and petals rosy mauve; lip ruby-purple with yellow disc.
To *Laeliocattleya* × 'Allamanda' (*L.-c.* × 'Helius' × *C. Dowiana aurea*) (votes unanimous), from Messrs. McBean. Buttercup yellow with ruby band on the front of the lip extending over the margins of the side lobes.
To *Cattleya* × 'Prince Shimadzu' (*Hardyana* × 'Tityus') (votes unanimous), from Messrs. Flory & Black, Slough. Of large size and good shape. Sepals and petals mauve, lip crimped at the margin, ruby-crimson with gold lines from the base.

Other Exhibits.

Baron Bruno Schröder: *Brassolaeliocattleya* × 'Amber.'
Pantia Ralli, Esq.: Odontoglossums.
A. J. Hollington, Esq.: *Cattleya* × 'Gertrude Hollington.'
Messrs. Stuart Low: *Laeliocattleya* × 'Oenius.'
Messrs. Flory & Black: Laeliocattleyas.

ORCHID COMMITTEE, SEPTEMBER 6, 1921.

Sir HARRY J. VEITCH in the Chair, and thirteen members present.

Awards Recommended:—

Gold Medal.

To His Grace The Duke of Marlborough, Blenheim, Woodstock, for a very fine group of Orchids, mostly raised at Blenheim.

Silver Flora Medal.

To J. J. Bolton, Esq., Claygate, for hybrids, especially white forms of *Cattleya* × *Hardyana.*
To Messrs. Charlesworth, for Odontoglossums, Odontiodas and other hybrids.
To Messrs. Sanders, St. Albans, for showy hybrids and rare species.

Other Exhibits.

The Duke of Marlborough: *Brassocattleya* × 'Blenheim Gladys' (*B.-c.* × *speciosa* × *C. Schroederae*).

Messrs. Stuart Low: *Cattleya* × 'Mrs. Pitt,' Low's var., and *Sophrolaeliocattleya* × 'Ilene.'

Messrs. Flory & Black: hybrid Cattleyas and Laeliocattleyas.

Mr. C. F. Waters, Balcombe: *Laeliocattleya* × 'General Fleury.'

ORCHID COMMITTEE, SEPTEMBER 20, 1921.

Sir HARRY J. VEITCH in the Chair, and eleven members present.

Awards Recommended:—

First-class Certificate.

To *Brassolaeliocattleya* × *maculata aurea* (*B.-l.-c.* × 'The Baroness' × *L.-c.* × 'Thyone') (votes unanimous), from Baron Bruno Schröder. Closely resembling *B.-l.-c.* × 'The Baroness'; large and of good shape, light chrome-yellow, darker in the centre of the lip and changing to cream-white at the margin. The original form had small dark spotting.

Award of Merit.

To *Odontonia* × 'Melia' (*M. Bleuana* × *Odm.* × *Groganiae*) (votes unanimous), from Messrs. Charlesworth. Scape tall, slender, bearing nine violet-purple flowers, each two inches across, and having well-defined Miltonia characters. The colour comes from *Odm. Edwardii* in *Odm.* × *Groganiae*.

Other Exhibits.

Richard G. Thwaites, Esq.: *Cattleya* × 'Venus,' var. (*Iris* × *Dowiana*).

Messrs. Charlesworth: *L.-c.* × 'Pyramus' (*L.-c.* × 'St. Gothard' × *C.* × *Thurgoodiana* and *C.* × 'Cicely' ('Antiope' × 'Rhoda').

Messrs. Sanders: *Cattleya* × 'Grenadier' (*Dowiana* × 'Naidia').

Messrs. R. Veitch: *Cypripedium* × *Youngianum* var. 'Mildred' (*philippinense* × *superbiens*).

Messrs. Stuart Low: *Sophrolaeliocattleya* × 'Pixie' (*S.-l.* × *Mariottiana* × *C. Percivaliana*).

Mr. C. F. Waters: *Cattleya* × *Hardyana* var.

ORCHID COMMITTEE, SEPTEMBER 27, 1921.

Sir JEREMIAH COLMAN, Bt., in the Chair, Prince T. Shimadzu, and ten members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. Charlesworth, for rare hybrids, including some new crosses.

Silver Flora Medal.

To H. T. Pitt, Esq., Rosslyn, Stamford Hill, for hybrid Cattleyas, Laeliocattleyas and other hybrids and rare species.

To Messrs. Sander, for white petalled Cattleyas.

Silver Banksian Medal.

To Messrs. Flory & Black, Slough, for rare hybrids.

Vote of Thanks.

To Sir Jeremiah Colman, Bt., for a group of rare species.

To Messrs. Cypher, for Cattleyas, Laeliocattleyas, and Cypripediums.

Award of Merit.

To *Brassolaeliocattleya* × 'Golden Crown' (*B.-l.-c.* × 'Joan' × *C.* × 'Venus') (votes unanimous), from H. T. Pitt, Esq. A large and well-formed flower of old-gold colour, darker in the centre of the crimped lip, and lighter at the margin. The spike bore three flowers.

To *Brassocattleya* × 'Sofrano' var. 'Prince of Orange (*C.* × *iridescens* × *B.-c.* × 'Mrs. J. Leemann' (votes unanimous), from Messrs. Charlesworth. Flowers chrome-yellow, the lighter lip with its expanded front bearing evidence of the *C. bicolor* in *C.* × *iridescens*.

Other Exhibits.

General Sir A. Paget, Kingston Hill: *Cattleya* × 'Krishna' ('Chloe' × *Harrisoniana*).

Messrs. Stuart Low: *Cattleya* × 'Vishnu' (*Dusseldorfei* 'Undine' × *Luddemanniana* 'Empress').

ORCHID COMMITTEE, OCTOBER 4, 1921.

Sir JEREMIAH COLMAN, Bt., in the Chair, and seven members present.

Awards Recommended:—

Award of Merit.

To *Laeliocattleya* × 'Copper King' (*C.* × 'Oberon' × *L.-c.* × 'Phoebus') (votes 6 for, 1 against), from Sir Jeremiah Colman, Bt., Gatton Park. A complex hybrid in which the orange-red *Laelia cinnabarina* in its ancestry, combined with *C. Dowiana aurea*, is the chief feature. Sepals and petals copper-orange. Lip orange-yellow streaked with claret-red.

To *Cattleya* × 'Elfin' (*Mantinii nobilior* × *Peetersii* (votes unanimous), from His Grace the Duke of Marlborough. A perfectly shaped flower, deep mauve with ruby-red front to the lip, which has thin yellow lines from the base.

Other Exhibits.

The Duke of Marlborough: *Cypripedium* × 'Duchess of Marlborough' ('Lord Ossulston' × *Leeanum Clinkaberryanum*), *Brassolaeliocattleya* 'Blenheim King' (*B.-c.* × 'Bayard' × *L.-c.* × 'St. Gothard') and *Laeliocattleya* × 'Rajah.'

ORCHID COMMITTEE, OCTOBER 18, 1921.

Sir JEREMIAH COLMAN, Bt., in the Chair, and nineteen members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Baron Bruno Schröder, for finely flowered *Laeliocattleya* × 'Ivannoe' and *L.-c.* × *Schroederae*.

To Messrs. Stuart Low, for showy hybrids, including yellow Laeliocattleyas and albinos.

Silver Flora Medal.

To Messrs. Sanders, St. Albans, for Miltonias, Cattleyas, and some rare species.

First-class Certificate.

To *Laeliocattleya* × 'Ivanhoe,' The Dell variety (*L.-c.* × *eximia* × *C. Dowiana aurea*) (votes 14 for), from Baron Bruno Schröder. The plant bore a fine spike of four large rosy-mauve flowers with ruby-red lip, having gold lines from the base.

To *Odontoglossum* × *Armstrongii* (parentage unrecorded) (votes 12 for), from Messrs. Armstrong & Brown. A new type with large pure white flower, having clusters of straw-yellow blotches in the segments.

Award of Merit.

To *Cattleya* × 'Fabia,' Holford's variety (*labiata* × *Dowiana aurea*) (votes 15 for), from Lt.-Col. Sir Geo. L. Holford, K.C.V.O. The darkest of the fine strain with *C. Dowiana* as the seed-bearer. Flowers large, mauve colour, the broad ruby-crimson lip having a chrome-yellow disc.

To *Cypripedium* × *Bedfordiae* ('Actaeus' *revolutum* × 'Shogun') (votes 16 for, 3 against), from Dr. F. Bedford, Fulford, Yorks. Dorsal sepal large, white with greenish base and spotted lines of purple. Petals and lip honey-yellow, tinged brown.

Other Exhibits.

E. R. Ashton, Esq.: *Brassolaeliocattleya* × 'Tucuman,' Broadlands var. (*B.-l.-c.* × *Cooksonii* × *C.* × 'Rhoda'), a fine yellow flower.
Pantia Ralli, Esq.: hybrid Cattleyas.
A. J. Hollington, Esq.: Laeliocattleyas.
Sir Geo. L. Holford: *L.-c.* × 'Madame Brasseur Hye.'
Messrs. Hassall: *Brassolaeliocattleya* × 'Thyone.'
Messrs. Flory & Black: hybrids.
Messrs. A. J. Keeling: Cypripediums.

ORCHID COMMITTEE, NOVEMBER 1, 1921.

Sir JEREMIAH COLMAN, Bt., in the Chair, and twenty-three members present.

Awards Recommended:—

First-class Certificate.

To *Brassocattleya* × 'Heatherwood' var. 'Prince of Wales' (*B. c.* × 'Ilene' × *C.* × 'Octave Doin') (votes 14 for), from J. J. Joicey, Esq., Witley. Flower large sepals and petals rosy-mauve; the broad lip violet-purple with gold lines from the base to the centre.

Award of Merit.

To *Cattleya* × *Pittportia* var. 'Lady Leon II' ('Mrs. Pitt' × 'Portia') (votes unanimous), from Sir H. S. Leon, Bletchley Park. The plant bore two spikes of fine flowers of good shape, deep carmine-red with light base to the lip.

To *Cypripedium* × 'Lady Leon' (*Dowleri* × *Hormoriae*) (votes 14 for), from Sir H. S. Leon. A fine *C. Godefroyae* hybrid with white flowers densely spotted with purple.

To *Laeliocattleya* × 'Athene' var. 'Our Prince' (*callistoglossa* × 'St. Gothard') (votes 18 for), from Messrs. Charlesworth. A perfect flower with bright rose sepals and petals and Tyrian-purple lip.

To *Odontonia* × 'Thais' (*M.* × *Bleuana* × *Odm.* × 'Aglaon') (votes 15 for, 4 against), from Messrs. Charlesworth. Sepals and petals lanceolate, white with blotched claret lines. Lip white with purple markings at the base.

GROUPS.

Special awards were recommended as follows:

AMATEUR EXHIBITS.

Large Challenge Cup.

To Baron Bruno Schröder, for Laeliocattleyas, Brassocattleyas, and other hybrids of superb quality.

Small Challenge Cup.

To J. J. Joicey, Esq., The Hill, Witley, for specially well-grown rare hybrids.

Gold Medal.

To Sir Jeremiah Colman, Bt., Gatton Park, for hybrids and rare species in great variety.

Silver-gilt Grenfell Medal.

To H. T. Pitt, Esq., Stamford Hill, for hybrids and species.

Silver-gilt Flora Medal.

To Pantia Ralli, Esq., Ashtead Park, for *Vanda coerulea* and Cypripediums.
To Dr. Miguel Lacroze, Roehampton, for hybrids.

TRADE EXHIBITS.

Gold Medal.

To Messrs. Charlesworth, for showy hybrids.

Silver-gilt Grenfell Medal.

To Messrs. Armstrong & Brown, for a group with specially good Odontoglossums.

To Messrs. Sanders, for a group with many hybrid Cattleyas.

To Messrs. McBean, for showy Odontiodas and other hybrids.

To Messrs. Stuart Low, for finely grown Laeliocattleyas with Sophronitis crosses.

Silver Floral Medal.

To Messrs. Cypher, for good Cypripediums and Brassocattleyas.

To Mr. H. Dixon, Wandsworth Common, for hybrid Cattleyas.

Silver Banksian Medal.

To Messrs. Mansell & Hatcher, for a group.

To Messrs. Hassall, for Cattleyas and Laeliocattleyas.

ORCHID COMMITTEE, NOVEMBER 15, 1921.

Sir JEREMIAH COLMAN, Bt., in the Chair, and twelve members present.

Awards Recommended :—

Silver Flora Medal.

To the Rev. J. Crombleholme, Clayton-le-Moors, for a group of *Cypripedium* × *Arthurianum Sanderae*, 'St. Mary' var. (*Fairrieanum* × *insigne Sanderae*), the flowers showing partial albinism acquired through the yellow form of *C. insigne*.

First-class Certificate.

To *Vanda coerulea* 'Bodnant Rose' (votes unanimous), from Lady Aberconway, Bodnant, Tal-y-Cafn. A remarkable variety with white flowers tinged and veined with rose instead of the blue tint seen in the type, a specimen of which was also shown.

Award of Merit.

To *Sophrocattleya* × 'Dorea,' Low's var. (*S.-c.* 'Doris' × *C. Dowiana*) (votes unanimous), from Messrs. Stuart Low. Approaching *C. Dowiana* in size and form, yellow, tinged and veined with scarlet, the lip having a cerise-red front.

Preliminary Commendation.

To *Odontoglossum* × 'Prince of Wales' (*Lambardeanum* × 'Perfection'), from Messrs. Armstrong & Brown. The very small seedling bore one large broadly proportioned flower, dark violet with a few white markings.

F. J. Hanbury, Esq., East Grinstead: the new *Cattleya* × 'Miss Phyllis Marshall' (*Clarkiae* × *labiata*).

ORCHID COMMITTEE, NOVEMBER 29, 1921.

Sir JEREMIAH COLMAN, Bt., in the Chair, and nineteen members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Stuart Low, for Cattleyas, Laeliocattleyas, and other hybrids.

To Messrs. Sanders, for Cypripediums, Cymbidiums, and Odontoglossums.

First-class Certificate.

To *Sophrolaeliocattleya* × 'His Majesty' (*S.-l.-c.* × 'Marathon' × *C. Trianae Backhouseana*) (votes 12 for, 4 against), from Messrs. Charlesworth. Flower equal to *C. Trianae*. Sepals and petals light mauve with a gold shade; lip crimson with yellow disc and basal lines.

Award of Merit.

To *Odontoglossum* × *Phillipsianum* (*eximium* × *luteo-purpureum Vuylstekeanum*) (votes 14 for, 1 against). Flower resembling *O. crispum*, white with the inner two-thirds of the segments salmon-rose, crest of lip yellow. From Pantia Ralli, Esq., Ashtead Park.

To *Cypripedium* × 'Nydia' ('Niobe' × *nitens-Leeanum*) (votes unanimous), from Lt.-Col. Sir Geo. L. Holford, K.C.V.O. Flower of the 'Niobe' type. Dorsal sepal white with thin purple lines. Petals and lip yellowish with red-brown flush.

To *Cypripedium* × 'Asion' ('Queen Alexandra' × *aureum* 'Oedippe') (votes 10 for, 2 against), from Messrs. Charlesworth. Dorsal sepal white with broad median purple stripe; petals and lip tinged with reddish-purple.

To *Brassocattleya* × 'Admiral Jellicoe' var. 'Rosita' (*B.-c.* × *Digbyano-mossiae* × *C.* × 'Lord Rothschild') (votes 14 for), from Messrs. Stuart Low. Flowers 8 inches across, bright rosy-mauve, the lip darker and with chrome-yellow disc.

To *Odontioda* × 'Enchantress' (*Odm.* × *harvengtense* × *Oda.* × 'Madeline') (votes unanimous), from Messrs. McBean, Cooksbridge. The plant bore a spike of sixteen flowers, white, densely spotted with claret-red.

Other Exhibits.

Lt.-Col. Sir Geo. L. Holford: Cypripediums.
Messrs. Charlesworth: Cypripediums.
Messrs. Sander: *Cymbidium* × 'Hebe' (*erythrostylum* × *Pauwelsii*).

ORCHID COMMITTEE, DECEMBER 13, 1921.

Sir JEREMIAH COLMAN, Bt., in the Chair, and twenty-two members present.

Awards Recommended:—

Gold Medal.

To Lt.-Col. Sir Geo. L. Holford, for a grand group of Cypripediums raised at Westonbirt.

To Sir Jeremiah Colman, Bt., for a large and varied group of hybrids and species.

Silver-gilt Flora Medal.

To Messrs. Armstrong & Brown, for Odontoglossums and Odontiodas.

Silver Flora Medal.

To Messrs. Charlesworth, for Odontoglossums, mainly white seedling *Odm. crispum.*

To Messrs. McBean, for showy hybrids.

Silver Banksian Medal.

To Sir C. F. Hadden, for Cypripediums.

Award of Merit.

To *Odontioda* × 'Juno' (*Oda.* × 'Coronation' × *Odm. eximillus*) (votes 16 for), from R. Gerrish, Esq., Milford Manor, Salisbury. Flower large, blood-red with slight white markings.

To *Odontoglossum* × *eximillus* var. 'Rex' (*eximium* × *illustrissimum* (votes 13 for), from Messrs. Armstrong & Brown. Flowers red with a gold shade and white margins and tips to the segments.

To *Odontoglossum* × 'St. George' var. 'Vulpus' (*Alexandrina* × *eximium* (votes 10 for), from Messrs. McBean. The fourth of the cross to receive an award. Colour, deep claret on white ground.

Other Exhibits.

J. J. Bolton, Esq.: Odontoglossums.
Pantia Ralli, Esq.: Odontoglossum St. George.
E. R. Ashton, Esq.: Odontoglossums.
David Barnard, Esq.: Cypripediums.
Messrs. Flory & Black: hybrids.
Messrs. Sanders and the Rev. J. Crombleholme: Cypripediums.

NARCISSUS AND TULIP COMMITTEE.

FEBRUARY 8, 1921.

Mr. E. A. BOWLES, V.M.H., in the Chair, and thirteen members present.

There were no novelties before the Committee on this occasion.

The death of Mrs. R. O. Backhouse was reported and the Hon. Sec. was requested to send a letter of sympathy from the Committee to the bereaved family of this very successful raiser of Daffodils.

Awards Recommended :—

Silver Banksian Medal.

To Messrs. Ryder, St. Albans, for a display of Tulips arranged in baskets.

NARCISSUS AND TULIP COMMITTEE, FEBRUARY 22, 1921.

Mr. E. A. BOWLES, V.M.H., in the Chair, and thirteen members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Jas. Carter, Raynes Park, for Tulips arranged on a floor space in the form of a large bed.

Silver Grenfell Medal.

To Messrs. Bath, Wisbech, for a group of Daffodils and Tulips grown in fibre in pots.

NARCISSUS AND TULIP COMMITTEE, MARCH 8, 1921.

Mr. E. A. BOWLES, V.M.H., in the Chair, and fourteen members present.

The Hon. Sec. was requested to convey the deep sympathy of the Committee to the family of the late Mr. J. Coey, of the Donard Nursery Co.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. Bath, for a group of Daffodils and Tulips in pots.

First-class Certificate.

To *Narcissus* ' Magnificence ' (votes 11 for, 0 against), a handsome trumpet variety which gained an Award of Merit in March 1920. Shown by the Donard Nursery Co., Newcastle, Co. Down.

NARCISSUS AND TULIP COMMITTEE, MARCH 22, 1921.

Rev. G. H. ENGLEHEART, V.M.H., in the Chair, and fourteen members present.

Awards Recommended :—

Silver-gilt Grenfell Medal.

To Messrs. Bath, for Daffodils and Tulips.

Silver-gilt Banksian Medal.

To Messrs. R. & G. Cuthbert, Southgate, for early Tulips in pots ; also a *Cultural Commendation.*

Silver Flora Medal.

To Messrs. H. Chapman, Rye, for a group of the newer Daffodils.
To Messrs. Barr, Covent Garden, for a group of Daffodils.

Silver Grenfell Medal.

To Messrs. Carter, for a floor group of Daffodils.

NARCISSUS AND TULIP COMMITTEE, APRIL 5, 1921.

Mr. E. A. BOWLES, V.M.H., in the Chair, and twenty members present.

On the motion of the Rev. G. H. Engleheart, seconded by Mr. G. W. Leak, the Peter Barr Memorial Cup was awarded to Mr. Alex. M. Wilson, Presteign, for the ensuing year.

Awards Recommended:—

Gold Medal.

To Messrs. Barr, for a group of Daffodils.
To the Donard Nursery Co., for a group of Daffodils.

Silver-gilt Flora Medal.

To Messrs. Bath, for Daffodils.
To Anglesey Bulb Growers' Association, for Daffodils.

Silver-gilt Grenfell Medal.

To Messrs. Sutton, Reading, for a group of Daffodils.

Silver-gilt Banksian Medal.

To Messrs. J. R. Pearson, Lowdham, for a group of Daffodils.
To Messrs. Cartwright & Goodwin, Kidderminster, for Daffodils.

Silver Grenfell Medal.

To Messrs. Ryder, for Daffodils.

Silver Banksian Medal.

To W. F. M. Copeland, Esq., for new Daffodils.

Award of Merit.

To *Narcissus* 'Enez' (votes 10 for, 4 against), a large Leedsii variety, greenish primrose, with a frilled wide-mouthed cup, shown by W. F. M. Copeland, Esq., Shirley, Southampton.

NARCISSUS AND TULIP COMMITTEE, APRIL 26, 1921.

Mr. E. A. BOWLES, V.M.H., in the Chair, and thirteen members present.

The Chairman reported that the Council considered the publication of a new edition of the *List of Daffodil Names* would prove costly. Several members urged the need of a new edition as the latest issue was already five years old. Finally it was agreed to leave the matter with Mr. Bowles and Mr. Dykes, and if a reasonable estimate for printing could be obtained the work should be carried out.

Awards Recommended:—

Silver-gilt Grenfell Medal.

To Messrs. Ryder, for Daffodils and Tulips.
To Messrs. Bath, for a group of Tulips.

NARCISSUS AND TULIP COMMITTEE, MAY 10, 1921.

There was an exceptionally fine display of Tulips in the Hall on this occasion, no fewer than nine groups of these flowers being staged.

Awards Recommended :—

Gold Medal.

To Messrs. Dobbie, Edinburgh, for a group of Tulips.
To Messrs. Alex. Dickson, Newtownards, for a group of Tulips.
To Messrs. Barr, for a group of Tulips.

Silver-gilt Flora Medal.

To Messrs. Bath, for Tulips.
To Messrs. Ryder, for Tulips.

Silver-gilt Grenfell Medal.

To Anglesey Bulb Growers' Association, for Tulips.

Silver Flora Medal.

To Messrs. Geo. Bunyard, Maidstone, for Tulips.

Silver Grenfell Medal.

To Messrs. Robertson.

Awards of Merit.

To Tulip 'Amber' (votes 9 for, 0 against), a shapely Darwin variety, of soft amber colour, with yellow base. Shown by Messrs. Krelage, Haarlem.

To Tulip 'Carrara' (votes unanimous), a beautiful white Darwin variety of large size and fine form. Shown by Messrs. Krelage.

To Tulip 'James Watt' (votes 7 for, 0 against), a stately variety of the Louis XIV style; deep purple, shaded with brownish bronze. Shown by Messrs. Krelage.

To Tulip 'Orange Perfection' (votes 10 for, 0 against), a short-petalled, salmon-cerise Darwin variety; white, blue-starred base. Shown by Messrs. Krelage.

To Tulip 'King George V' (votes 10 for, 0 against), a fine rosy cerise Darwin variety of good shape and size; deep blue base. Shown by Messrs. Krelage.

To Tulip 'Fantasy' (votes 7 for, 0 against), a handsome Parrot variety; pink, with green markings on the outside, finely fringed. Shown by Messrs. Sutton, Reading.

To Tulip 'Arethusa' (votes 10 for, 0 against), a delightful Cottage variety of beautiful clear, rich yellow colour. Shown by Mr. C. J. Van Tubergen, jun., Haarlem.

To Tulip 'Rosabella' (votes 10 for, 0 against), a Cottage variety of excellent shape; soft pink, with rosy carmine shading on the centre of the outside of the segments; cream-coloured base. Shown by Mr. C. J. Van Tubergen, jun.

To Tulip 'Marjorie Bowen' (votes 8 for, 0 against), this variety is rich cerise-pink, almost scarlet; very bright and attractive. There is a pale pink line down the centre of each segment; base clear yellow. Shown by Mr. C. J. Van Tubergen, jun.

On the occasion of the Chelsea Show, owing to the recent hot weather, there were no Tulips brought forward for the consideration of the Committee.

At a subsequent meeting the Schedule Committee considered the Schedule of Classes for the 1922 Show. Mr. Dykes, on behalf of the Council, made various suggestions regarding Classes and Awards, and though some members of Committee demurred at some of the proposals, these were carried as set out in the Schedule published.

BOOKS PRESENTED, PURCHASED, OR REVIEWED DURING THE YEAR 1921, AND DEPOSITED IN THE LIBRARY.

1 = Purchased.
2 = Sent for Review.
3 = Presented by F. C. Stern, Esq.
4 = ,, ,, Gurney Wilson, Esq., F.Z.S.
5 = ,, ,, the Author.
6 = ,, ,, Mrs. H. E. Irene Hall.
7 = ,, ,, W. B. Gingell, Esq.
8 = ,, ,, the Trustees of the British Museum.
9 = ,, ,, S. B. Dicks, Esq.
10 = ,, ,, Prof. C. S. Sargent.

Abbreviations.—cor. = corrected; il. = illustrations; introd. = introduction; pl. = plates; col. pl. = coloured plates; frontis. = frontispiece; port. = portrait; enl. = enlarged; coloph. = colophon; pref. = preface; rev. = revised.

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—— The florist containing sixty plates of the most beautiful flowers regularly dispos'd in their succession of blowing. To which is added an accurate description of their colours, with instructions for drawing and painting them according to nature. London, [1760 ?]. pl. sm. 4to. (1)
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BARON, P. Nouveau principes de taille des arbres fruitiers. . . . [2me éd.] Paris, 1858. pl. 8vo. (1)
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BENNETT, IDA D. The making of a flower garden. New York, 1919. il. plans. frontis. 8vo. (1)
BERGERET, J. Flore des Basses-Pyrénées. Augmentée par E. BERGERET. . . . Nouvelle éd. . . . par G. BERGERET. Pau, 1909. 8vo. (1)
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INGALL, W., Louth. Gooseberry 'Ingall's Gem' (included in trial).
IRELAND & HITCHCOCK, Messrs., Marks Tey. Sweet Peas (see p. 74).
JARDINE, C. A., London. Médoc sécateurs for trial.
JOHN INNES HORTICULTURAL INSTITUTION, Merton. Cuttings of *Salix Bockii*; Apple trees and grafts.
JOHNSON, Messrs., Boston. Cabbage 'Johnson's Market Garden' and Onion 'Johnson's New Victory' (included in trials).
JONES, H., Norwich. Apple grafts.
JONES, H., Market Drayton. Black Currant 'Peplow Black' (for trial).
JONES, H. J., Lewisham. Phloxes (included in trial).
KELWAY, Messrs., Langport. Peas (see p. 81).
KEW, ROYAL BOTANIC GARDENS. Cuttings *Ribes niveum*; collection of seeds.
KING, Messrs., Coggeshall. Pea 'Moneymaker' (see p. 81).
KIRKBY, Mrs., West Kirkby. Donation to the Society's funds.
KRELAGE, Messrs., Haarlem, Holland. Dahlias (see p. 56).
LADHAMS, Messrs., Southampton. Lobelias.
LAFONE, A. W., Walton. Plant sent for identification.
LAMB, T. A., Newcastle. Tomato 'Lamb's Northumberland Plate.'
LA MORTOLA, Ventimiglia, Italy. Collection of seeds.
LAXTON, Messrs., Bedford. Peas (see p. 81); Tomatos; Gooseberries (included in trial).
LODER, G. W., Ardingly. Cuttings *Cornus oblonga*; *Helianthemum alpestre*; seeds of Liliums; trees and shrubs (planted in garden).
LOFTHOUSE, T. A., Middlesbrough. Seeds collected in Switzerland.
LOW, Messrs., Enfield. Carnations (included in trial).
LOWNDES, G. R., Ringwood. *Campanula argyrotricha.*
MACDONALD, J., Ringwood. Potato 'Zenith' (see p. 90).
MAGOR, E. J. P., St. Tudy. Seedlings of *Primula burmanica* and miscellaneous seeds.
MARTIN, Miss E. S., Newton Abbot. Seed of *Loasa sp.*
MASON, W., Cirencester. Potato 'Siddington Beauty' (see p. 90).
MAUGER, Messrs., Guernsey. Tomato 'Mauger's Re-selected Kondine Red.'
MESSEL, Lt.-Colonel R., Handcross. Seedling *Rhododendron rotundifolium.*
MILLER, G. W., Wisbech. Tomatos.
MILLER, H., Heybridge. Celery 'Miller's Perfection' (included in trial).
MONRO, Messrs., Covent Garden. Potato 'Mitchell's Advance' (see p. 90).
MOORE, Sir F. W., Dublin. Collection of Tradescantias (planted in garden).
MORGAN, A. J., Devoran. Raspberry for trial.
MORRIS, M., Bromley Common. Apple grafts.
MORRIS, S., Norwich. *Euonymus intermedius.*
MORSE, Messrs., San Francisco, U.S.A. Onions (included in trial).
MORTIMER, S., Farnham. Stock 'All the Year Round' (to be tried 1922).
MURPHY, Messrs., Mortlake. 'Alvesco' Winter Wash for trial.
NATIONAL INSTITUTE OF AGRICULTURAL BOTANY, London. Potato 'Irish Chieftain' (see p. 90).
NEWDEGATE, Sir FRANK, Hobart, Tasmania. Collection of seeds.
NUTTING, Messrs., London. Peas (see p. 81); Candytufts; Marigold 'French Striped'; Cabbages; Savoys; Celery 'Grove Pink'; Antirrhinums (included in trial); Cabbages and Onions (included in trial).
ORD, Messrs., Newcastle. Cabbage 'Chirton Selected' (included in trial).
ORR, W., Lancaster. Black Currant 'Orr's Seedling.'
PAICE, J. A., Watford. Pea 'Paice's Quite Content Improved.'

Pam, Major A., Broxbourne. Bulbs of *Hymenocallis Amancaes*.
Paul, F. F., Botley. Tomatos for trial.
Paul, Messrs., Cheshunt. Gooseberries (included in trial).
Pearson, Messrs., Lowdham. Sweet Peas (see p. 74); Apple grafts; seed *Nicotiana rustica*; Gooseberries (included in trial).
Phillips, R., Walton. Tiger nuts for trial.
Philpott, S. W., Holmwood. Unnamed Onion (included in trial).
Pike, L. G., Wareham. Privet from N.W. China (planted in garden).
Poad, Messrs., York. Potatos (see p. 90).
Powell, C. E., Binfield. Raspberry 'Binfield Seedling.'
Prichard, M., Christchurch. Phloxes (included in trial).
Proskau Botanic Garden. Collection of seeds.
Rendle, Dr. A. B., Kensington. Seed of *Juniperus Cedrus*.
Rice Seed Co., Cambridge, U.S.A. Celery and Celeriac; Cabbages; Peas (see p. 81); Radishes and Beet.
Riding, J. B., Chingford. Dahlia 'Dr. Tevis' (see p. 56).
Rogers, Miss M. W., New York. Collection of seeds from Colorado.
Rogers, R. E., Launceston. Seeds and bulbs of small white Iris; seeds *Begonia Haageana* and *Phyllostachys sulphurea*.
Ross of Bladensburg, Sir John, Rostrevor. Collections of seeds.
Ruys, B., Messrs., Dedemsvaart, Holland. Red and White Currants; Phloxes (included in trial).
Ryder, Messrs., St. Albans. Collection of vegetable and flower seeds for trial.
Salmon, C. E., Reigate. Seed *Silene italica*.
Scarlett, J. W., Musselburgh. Cabbages and Savoys.
Scheepers, Messrs., New York, U.S.A. Dahlias (see p. 56).
Scorgie, D. L., Aberdeen. Potatos (see p. 90).
Sharp, J. C., Barrowfield. Gooseberry 'Lancashire Printer' (included in trial).
Shrubshall, A. H., Christchurch, N.Z. Seeds of *Sophora tetraptera*, *S. prostrata*, *Leptospermum Nichollii*.
Simpson, Messrs., Birmingham. Candytufts; Marigolds; Cabbages; Savoys; Celery and Celeriac; Peas (see p. 81); Tomatos; Antirrhinums and Cabbages (included in trials).
Skandinavisk Frø Kompagni & R. Wiboltt, Nakskov, Denmark. Cabbages; Celeriac; Tomato; Cabbages (included in trial).
Smith, W., Bishops Stortford. *Iris reticulata*.
Smyth, H. G., London. Tomato 'Jim Smyth.'
Smythe, J. H. R., Bournemouth. Seeds of Melon-shaped Cucumber.
Somers, Major, Ripley. Amaryllis bulb.
Speed, H. J., Evesham. Tomato 'Grove's Reliance.'
Stark, Messrs., Great Ryburgh. Tomato 'The Amateur'; Sweet Peas (see p. 74).
Staward, R., Ware. Cabbages (included in trial).
Stevenson, J., Wimborne. Sweet Peas (see p. 74).
Stevenson, T., Cowley. *Lilium chalcedonicum*.
Stiles, W. W., Ealing. Buds of Apple.
Stokes, Messrs., Trowbridge. Lobelia; Carnations and Phloxes (included in trial).
Stuart & Mein, Messrs., Kelso. Cabbages; Tomato 'Mein's Favourite'; Pea 'Mein's Reliance' (see p. 81); Potato 'Mein's Model' (see p. 90); Onion 'Mein's Monarch' and Cabbage 'Mein's Pioneer' (included in trial).
Summers, M., London. Seed of late Melon for trial.
Sutton, Messrs., Reading. Potatos (see p. 90); Tomatos; Sweet Pea 'Sutton's Frilled Pink' (for trial 1922).
Sydenham, Messrs., Birmingham. Chrysanthemum 'Morning Star'; Marigolds; Candytuft 'Giant White'; Tomatos; Savoy 'Best of All'; Cabbages; Cabbages and Onions (included in trial).
Taylor, G., Edinburgh. Gooseberry 'Hepburn Prolific' (included in trial).
Tebbs, Mrs. F., Ryde. Seeds from Kashmir and Kasauli.
Thrussell, H., Mayfield. Tomato 'Mayfield Hero.'
Toogood, Messrs., Southampton. Vegetable seeds for trial; Antirrhinums (included in trial); Cabbages and Onions (included in trials).
Trail, A., Biggar. Antirrhinum 'Trail's New Double Pink' (included in trial).
Treseder, Messrs., Cardiff. Semi-dwarf Bean 'Treseder's Premier' (for trial); Dahlias (see p. 56).
Tucker, Messrs., Oxford. Collection of Saxifrages for rock garden.
Turner, C., Slough. Dahlias (see p. 56).
Unwin, W. J., Histon. Peas (see p. 81); Onions (included in trial).

Uppsala Botanic Garden, Sweden. Collection of seeds.
Veitch, Sir Harry, Kensington. Books for Library.
Veitch, Messrs., Exeter. Nerines; Peas (see p. 81); Potatos (see p. 90); Cabbages; Marigolds; Candytufts; Chrysanthemums; Celery and Celeriac; Savoys; Antirrhinums (included in trial).
Vereker, F. M., Salcombe. *Acacia melanoxylon.*
Voss, Messrs., Millwall. Pterokyl Insecticide; Carlton Arsenate of Lead Paste; Safety Cyanide Packages.
Wadds, A. B., Reading. Tomato for trial.
Wakely, C., Chelmsford. Apple grafts.
Wallace, R. W., Tunbridge Wells. Rhododendrons; plants for rock and wild garden; shrubs.
Ward, W., Walton. Adjustable plant support for trial.
Watkins & Simpson, Messrs., London. Celery and Celeriac; Savoys; Tomatos; Marigolds; Chrysanthemums; Candytufts; Cabbages and Onions (included in trials).
Watson, J. H., Manchester. Bulbs of *Lilium pardalinum* 'Red Giant.'
Watts, W. A., St. Asaph. Tomato 'Bryn Red' for trial.
Webb, Messrs., Stourbridge. Marigolds; Candytuft; Chrysanthemums; Celery and Celeriac; Savoys; Peas (see p. 81); Sweet Peas (see p. 74); Cabbages, Tomatos, Antirrhinums, Onions, and Cabbages (included in trials).
West, J. T., Brentwood. Dahlia 'Dr. Tevis' (see p. 90); Phloxes (included in trial).
Wheeler, H. J., Warminster. Cabbage 'Wheeler's Imperial.'
White, F. B., Bursledon. Potato 'The Netley' (see p. 90).
White, H., Windlesham. *Rhododendron brachyanthum* and *R.* 'Nellie.'
Wilks, Rev. W., Shirley. Seeds *Cistus ladaniferus, Papaver pilosum*; *Meconopsis cambrica* var. *aurantiaca* (for distribution to Fellows); seeds of white *Clematis uncinata*; Shirley Poppy seed for distribution; seed of Shirley Foxglove and *Papaver rupifragum*; seed *Cistus nigricans* and *Genista aethnensis.*
Williams, A., Jedburgh. Carnation 'Mrs. Arthur Williams' (included in trial).
Williams, J. E., Llandaff. Seeds.
Williams, P. D., St. Keverne. Cuttings of Ericas; Rhododendrons; seeds of *Rhododendron Cunninghami*, Crataegus, and Berberis.
Wilson, H. F., Madison, U.S.A. Wilson & Vickery's List of Aphididæ for Library.
Woodward, C., Wolverhampton. Savoys.
Wray, C., Hindhead. Plants for rock garden.
Wright, R., Formby. Tomato 'Formby Favourite.'
Yandell, W., Maidenhead. Tomatos for trial.
Yeld, G., York. *Hemerocallis* 'Corona.'

CERTIFICATES OF DILIGENT INTEREST.

Awarded in 1921.

To Cecil Billins, Alexandra School, Hounslow, for School gardening
To John Cameron ,, ,, ,,
To Wm. Connisbee ,, ,, ,,
To James Falconer ,, ,, ,,
To Charles Freeman ,, ,, ,,
To Percy Harries ,, ,, ,,
To Wilfred Harries ,, ,, ,,
To George Mills ,, ,, ,,
To Stanley Ravening ,, ,, ,,
To Fred Harrison ,, ,, ,,
To Frank Vince ,, ,, ,,
To Ronald Whittaker ,, ,, ,,

AWARDS TO SUNDRIES, 1920–21.

Award of Merit.

Eclair No. 1 Sprayer from Messrs. Cooper, Pegler & Co., 24 Christopher St., London.

Knapsack Pump Sprayer from Messrs. Goodman & Son, 24 Lime St., E.C. 3.

Cloche Clip from the Cloche Clip Co., Guildford, for holding glass over plants, &c.

Flora Insecticide from Mons. Steynert-Verhelle of Langerbrugge-lez-Gard, Belgium, for use against aphides on plants under glass.

Carlton Arsenate of Lead Paste from Messrs. Voss & Co., Millwall, E. 14, for biting insects.

Pterokyl from Messrs. Voss & Co., for sucking insects.

Universal Sprayer (10-gallon size on wheels) from Universal Sprayers, Ltd., Audlem, Cheshire.

Jax Sprayer for hand use, mixing and spraying simultaneously from a water supply, from Mr. J. J. Kendall, Australia.

Highly Commended.

Catterscab from Messrs. Voss, Millwall. A combined insecticide and fungicide.

Torpille Dry Sprayer from Messrs. Cooper, Pegler & Co., for spraying dry insecticides and fungicides.

Vermorite from Messrs. Cooper, Pegler & Co., as a fungicide very effective for mildew, less so for potato blight.

Sternwash from Messrs. Stern, Finsbury Sq., E.C. 2, as a contact insecticide for aphis and bugs.

Solomia from Solomia, Ltd., 182–183 Fleet St., E.C. 4, as an aphis and mildew wash.

Commended.

Alvesco Winter Wash from Messrs. Murphy, Mortlake, S.W. 14, for fruit trees.

Homco Soluble Paraffin from The Hull Oil Manufacturing Co., Stoneferry, Hull, for use as a contact spray.

Wall-clips from House and Garden Sundries, Bishopsgate, London.

Other sundries have been received from—
Messrs. Murphy (weed-killer, nicotine substitute, petroleum emulsion).
Mr. Warren (seed-sower).
Messrs. Hunter & Gow (insecticide).
Messrs. Wood (dust distributor).
Mr. Waters (seed drills and pricking machine).
Mr. Ward (seed sowers for garden and pots).

AWARDS TO SUNDRIES LAPSING 1923.

Awards are made to Horticultural Sundries after trial and under the regulations published in the R.H.S. Book of Arrangements. These awards are good for ten years from the date at which they were made: at the end of ten years they lapse.

The following awards are therefore no longer valid after 1923. The articles referred to are described in the R.H.S. JOURNAL, vol. xxxix. pp. cclxii–cclxvii.

Awards of Merit Lapsing.

Abol Knapsack Sprayer from Messrs. E. A. White.
Eclair No. 1 Sprayer from Messrs. Cooper, Pegler.
Eclair Etamé Sprayer from Messrs. Cooper, Pegler.
Abol Patent Syringe, No. 5, from Messrs. E. A. White.
Demon Continuous Spray Syringe from Boundary Chemical Co.
Undentable Syringe, No. 9, from Four Oaks Spraying Machine Co.
Bentley's Nicotine Soap Insecticide from Messrs. Bentley.
Lawn Edge Clipper from Messrs. Barford and Perkins.
Motor Cultivator from Mr. C. W. Polito.
'Godiva' Bowling Green Mower from Messrs. Barford and Perkins.
'Godiva' Lawn Mower from Messrs. Barford and Perkins.
'Silens Messor' Standard Mower from Messrs. Green.
'Silens Messor' Mower, Special, from Messrs. Green.

Highly Commended Certificates Lapsing.

Battle Spraying and Lime-washing Machine, Four Oaks Spraying Machine Co.
Four Oaks Nozzles from Four Oaks Spraying Machine Co.
Double Charge Pump from Messrs. H. Hartjen.
Hand Diffuser from The Alpha Co.
Knapsack Sprayer, overhead handle, from Four Oaks Spraying Machine Co.
Bentley's Compound Liquid Quassia Extract from Messrs. Bentley.
Naphtho-Nicotyl from Messrs. Voss.
Watson's Lawn Sand from Messrs. A. J. Barbour.
Bulb Dibber from Messrs. Barr.
Bulb Planter from Messrs. Barr.
'Through Water-way' Garden Hose Reels from Messrs. Headley and Edwards.
'Board's Patent Wire Tension Greenhouse' from Messrs. Skinner, Board & Co.
'Pennsylvania' Lawn Cleaner from Messrs. Lloyd Lawrence.
Motor Cultivator, Large size, from C. W. Polito.
Motor Roller from Messrs. Barford and Perkins.
V.T.H. Patent Slug Trap from Mr. V. T. Hill.
'Tenax Grafting Wax' from Messrs. Corry.
Garden House from Messrs. Wood.

Commended Certificates Lapsing.

Holder Hand Sprayer, Type D, from Messrs. Hartjen.
Knapsack Sprayer from Messrs. Benton and Stone.
No. 2 Arnold Syringe from Messrs. Purser and Messrs. Corry.
Pneumatic Sprayer, No. 1087, from Messrs. Benton and Stone.
Vermorel Hand Sprayer from Messrs. Cooper, Pegler.
Utility Sprayer from Messrs. Benton and Stone.
Clift's Fluid Insecticide from Messrs. Robinson.
Acme Weed Killer from The Acme Chemical Co.
Bentley's Double Strength Weed Destroyer from Messrs. Bentley.
Cooper's Weedicide from Messrs. Cooper and Nephews.
Watson's Weed Killer from Messrs. Barbour.
Double Wheel Planet Jr. Hoe, No. 11, from Messrs. Lloyd Lawrence.
Pennsylvania Lawn Mower from Messrs. Lloyd Lawrence.
'The Selborne' Nesting-boxes from The Selborne Society.
'Handy Plant Protector' from Mr. F. R. Durham.
Raffia Tape reels and coils from Mr. C. E. West.
Vesey's Patent Spreader from Messrs. Corry.
Cane Chairs and Settees from the Dryad Works.

INDEX.

The references in italics are to figures and illustrations, those in thick type to forms here described for the first time.

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