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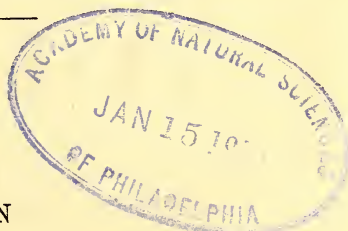
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F. J. CHITTENDEN, F.L.S.

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Vol. XLII. has been issued in two parts, each containing the "Journal" proper, paged with Arabic figures, and "Extracts from the Proceedings," paged with Roman numerals. This title and contents sheet should be placed first and be followed by pages 1 to 208, then by pages 209 to 528. After that should come the "Extracts from the Proceedings," pages i to lxxx, lxxxix to ccxvi, concluding with the General Index.

JOURNAL
OF THE
ROYAL HORTICULTURAL SOCIETY.

VOL. XLII. 1916.

PART I.

THE ECONOMIC STATUS OF WILD BIRDS.

By WALTER E. COLLINGE, M.Sc., F.L.S., F.E.S., Hon. F.R.H.S.,
The University, St. Andrews.

[Read January 25, 1916; E. A. BOWLES, M.A., in the Chair.]

FOR some years past there has been evidence of an awakening in the public mind to the importance of the subject of Economic Ornithology, or the status of wild birds in relation to agriculture, horticulture, forestry, and fisheries. This is reflected in the annual newspaper correspondence on the injuries inflicted on farm crops, fruit orchards, &c., by various species of wild birds; in the numerous writings in the agricultural and horticultural Press; and the recent suggestion that our Board of Agriculture should "establish a Bureau of Ornithology, such as has long been at work both on the Continent and in the United States." (*Nature*, Oct. 15, 1915, p. 177.) Further, the subject is one of such great importance to all who are interested in the products of the land that I need offer no apology for introducing it before the members of this Society.

As one who has devoted considerable time and means to the subject during the past twelve years, I claim your attention to a rapid survey of the many problems it presents, and its very important bearings to mankind.

The problem is no easy one, and the longer one works at the subject the more complicated does it seem to be, so that we can quite understand Professor THEOBALD stating that it "is one that can be

approached in so many different ways that it is almost impossible to formulate any satisfactory plan of treating this important matter."

On the one hand there are those who would destroy almost every species of wild bird we possess, whilst, on the other hand, the enthusiastic bird-lover would take equally stringent measures to preserve them, exclaiming "We do not protect birds solely because they are useful, but chiefly from ethical and æsthetical reasons, as birds give beauty and animation to Nature. We also wish to preserve their species, and hence the protection of birds signifies the preservation of the monuments of Nature."

As I have elsewhere stated, "the wholesale destruction of birds for the purpose of protecting crops and orchards is, economically, an unsound policy," but the bird-lover is equally wrong in his or her sentimental enthusiasm, and the argument quoted above might quite logically be advanced for the rat, the mosquito, and numerous other obnoxious animals.

In any investigation upon such a subject as this, if the results are to be of any value, we must place on one side all sentimental considerations and be guided alone by the conclusions obtained by careful and detailed work extending over a considerable period of time.

Much of the earlier work carried out in this country is very crude ; further, many opinions are annually expressed in the Press founded upon insufficient knowledge. The economic status of any particular species of bird can only be ascertained after prolonged and careful investigation by trained and experienced investigators. The setting of senior students in our agricultural colleges and universities to undertake such investigations is hardly likely to further our knowledge ; on the other hand, with the semblance of authority, it is very likely to prove misleading.

Bearing in mind the many difficulties that confront the investigator, experience has shown that a very accurate knowledge may be gained of a bird's feeding habits and the nature of its food by the employment of the following methods :—

Firstly, it is necessary to examine the food contents found in the whole of the intestinal tract frequently, during the different seasons of the year. The nature of these and their bulk must be accurately identified. The nature of the food brought to the nest by the parents during the breeding season must also be taken into account. "Any investigation on the economic status of most species of wild birds is incomplete, and to a large extent misleading, that does not deal" with this important matter, "for during the nesting period the food of the parent birds consists largely of insects, slugs, spiders, and worms, and that of the young almost entirely so, and the amount of the food consumed is greater than at any other season of the year."

Secondly, the nature of the fæces, and also of the fæcal matter extruded from the nest, must receive attention.

Thirdly, the rate of digestion of different kinds of food and in different species of birds is another important factor.

Finally, it is all-important that we should have careful observations made in the field.

If the collection of this information extends over the whole of the months of the year and for successive years, and the birds examined are received from many localities in a given district or series of districts, and provided that sufficient care is exercised in the identification of the food materials and their percentages, then I believe that it is possible to arrive at a fairly correct answer to the question "Is this or that particular species of bird beneficial, neutral, or injurious?"

With regard to these methods I should like to add a few comments. The examination of the food contents of the intestinal tract is frequently misleading if it covers only a portion of the year or any particular season, for there are species that would appear to be distinctly injurious if the verdict has to be pronounced upon the food consumed by them during the months of July, August, and September, but when the nature of the food for the remaining nine months of the year is also considered a very different result is obtained.

Hitherto it has been the custom to examine the contents of the crop (where present) and stomach, but this is not enough, for in many species of birds weed seeds and other matter of an indigestible nature pass into the intestine and are not accounted for unless the whole of the intestinal tract is opened and the contents washed out and examined.

In a like manner very valuable results are obtainable from a proper examination of the *fæces*.

Respecting the rate of digestion, from what little we know by actual experimentation, it is fairly safe to conclude that the majority of birds consume daily a bulk of food equal to $3\frac{1}{2}$ -4 times the capacity of the stomach.

Finally let me, as the result of many years' practical experience, utter a word of caution with regard to field observations. Over and over again have I seen, or read of, hasty conclusions formed, due to lack of experience or knowledge or imperfect observation.

The question of the economic status of any particular species of bird may, at first sight, appear to be one of only secondary importance, and it is not until we realize the magnitude of the industries connected with the land and the fisheries that we appreciate how important all economic factors are that bear upon either or both of them.

According to a recent authority the fishing industry in Great Britain employs upwards of 27,000 vessels, manned by more than 90,000 seamen, who land annually nearly a million tons of fish, valued at some £10,000,000. Excepting that portion destined for curing, the whole of this huge mass of food has to be rapidly distributed over the country, and daily the process is repeated, so that in addition to the actual fishermen we have a small army of packers, coopers,

salesmen, hawkers, &c., and to these we may add the large number of railway employees engaged in the transfer.

On all hands we are told that our fish supply could be increased if the fisheries were worked on more scientific principles; in short, if we knew more of the numerous scientific problems affecting them.

With respect to the importance of agriculture little need be said. "I have always regarded agriculture (in its widest sense)," says the Right Hon. JESSE COLLINGS,* "as the chief national concern, and as the only basis on which the real welfare of a country can be securely established. If we have purchased commercial supremacy at the cost of a permanent decay of that great industry, we have bought it at a ruinous price."

The probable extension of cereal cultivation in the near future and also that of fruit cultivation, in addition to a large increase in small farms and small holdings, will increase our rural population greatly, so that once again we shall see agriculture taking its proper place amongst the industries of this country, and any factor that makes it difficult to cultivate this or that crop at a profit will have to be more carefully inquired into than in the past.

We are already told that economic forces will compel thousands of women to enter the fields of agriculture and horticulture at no distant date, and anything that handicaps the large grower will tell with double force against those in a smaller way, and, in most cases, with but small capital.

The question therefore arises, "How does the subject of the feeding habits of wild birds affect these great national industries?" It affects them in three ways, viz. :—

1. In that many species are protected which are distinctly injurious, and as a consequence hundreds of thousands of pounds' worth of food is destroyed by them annually.

2. That many species which are beneficial are destroyed, and so vermin, upon which they largely subsist, exact an enormous toll upon the produce of the land.

3. There are a number of species with reference to which we yet require much more detailed information before it can be decided to which class they belong.

With reference to the first class, there is now a considerable mass of evidence, much of which is founded upon careful scientific investigation. Take, for instance, the case of the rook and the starling. GILMOUR in 1896 examined the stomach contents of 355 rooks; THRING in 1910, 141; FLORENCE in 1912, 162; and the writer 689. Here we have a total, from all parts of the country, of 1,347, the cumulative evidence from which goes to show that of recent years there has been a large increase in the numbers of this bird, and with the present large number a grain diet is preferred.

Respecting the starling, we have witnessed an enormous increase during the past twelve or thirteen years, due partly to migration and partly to the protection afforded it. As the result of an extended

* *Land Reform*, London, 1906, p. x.

inquiry in which the stomach contents of 328 adult birds and 94 nestlings were examined, numerous field observations made, and a careful examination of the fæces, I have no hesitation in stating that for some years to come this species annually requires drastically reducing in numbers, and that at present it is a source of considerable financial loss to the farmers of this country.

That gamekeepers, farmers, and others annually destroy large numbers of birds whose food consists largely of voles, mice, rats, and insect larvæ, is common knowledge. Such birds as the kestrel and all the species of owls are far too precious to the farmer to permit the ignorance of a gamekeeper to continue to destroy them wantonly. When we consider that the brown rat alone is annually exacting food to the value of some millions of pounds sterling, it is surely time that such offences as mentioned above were made punishable by more severe sentences. Another striking instance is the lapwing. The value of this bird to the farmer is universally admitted and cannot be over-estimated, and yet the apathy displayed by agriculturists in reference to it is pitiful. "Long ago the bird and its eggs should have been more strictly protected than game or any other birds. It is the farmer's best friend, and whilst his crops annually suffer more and more from wireworms and surface larvæ he stands and watches its gradual reduction with indifference."

With reference to the majority of species of birds we do not possess any accurate or detailed knowledge as to the nature of their food, and of quite a large number of common species our knowledge is imperfect.

The need of continued investigation upon a subject so intimately related to our food supply must be patent to even the most casual inquirer, for without a thoroughly reliable and extensive knowledge of the subject it is impossible to frame wise and beneficial laws relating thereto.

In this country we have five Acts of Parliament affording protection to wild birds or relating thereto. One presumes that the main object of these Acts, and the intentions of their framers, was to protect all species that were non-injurious and also those that were rare. If this were so, then they have failed hopelessly, for many of our non-injurious species are rarer to-day than in 1880, whilst many other species have become so numerous as almost to constitute a plague to the agriculturist.

These Acts may have been framed with the best of intentions, but there is no evidence to show that those who framed them ever took into serious consideration what would probably be the ultimate effect of such legislation. The farmers, fruit-growers, and probably the fishermen of this country are now suffering, and have done so for some years past, from their effects.

After reviewing these Acts at some length, a recent writer states "that they were all passed, not in the interests of agriculturists of any class, but to satisfy the outcry against bird destruction raised by the bird-loving public at large."

Most people are familiar to a certain extent with the huge flocks of sea-birds that frequent our coasts, but how few have any idea as to what they feed upon! Some are mere scavengers of the shore, devouring anything left by the tide; others travel inland and feed upon different kinds of insect larvæ; some cause considerable damage on game preserves, but the diet of the majority is marine organisms, the bulk of which consists of fish. Very few systematic investigations have been made upon the food of these birds, in consequence of which our information is meagre and often misleading.

In a recent report of an investigation made on the Suffolk and Essex coasts, the committee conclude by stating "that it would be manifestly unfair to draw any definite conclusions from it as to the feeding habits of gulls in general. But since gulls have taken to feeding on grain the balance would appear to be against the gull; and from an economic point of view we consider an exhaustive inquiry is indicated in consequence of the enormous rate at which these birds are increasing throughout the land."

Without thorough and exhaustive inquiry any legislation affecting our sea-birds, or even any wild birds, is both unscientific and likely to prove highly mischievous, and the longer such inquiry is deferred the country is the poorer by hundreds of thousands of pounds through its ignorance. Such an inquiry would at least indicate where our present course of conduct is wrong, and would possibly lead to new and more beneficial legislation in the future.

The subject is one that demands constant study and inquiry, for a species of bird that at one period is distinctly beneficial may in a very few years become equally injurious. There are many cases on record of the change in feeding habits due in some cases to a great increase in the number of a particular species and a consequent scarcity of food. In other cases there is an abundance of a particular kind of food, due to artificial cultivation, and the birds have not been slow to avail themselves of the changed condition. Such points as these require very careful consideration in any attempt to rightly estimate the value of any particular species.

Unfortunately, in this country we have no continued systematic study on a large scale in operation. Hitherto the matter has been left to the private individual, but what is now required is continuous work, judiciously planned, and carried out with every care. Such investigations are beyond the means of most: the labour alone of recording and tabulating the results obtained is no mean task. Government action, at the present time, scarcely seems likely, but it might possibly be within the range of practical politics, with some financial assistance from the Development Fund, to found a Chair of Economic Ornithology, in connexion with one of our universities, where such work might be carried out. Of one thing I am sure, viz., that it would prove of great scientific interest and of inestimable value to that all-important and increasing community, the food providers of this country.

SOME ESSENTIAL POINTS OF ORCHID CULTIVATION.

By GURNEY WILSON, F.L.S.

[Read February 22, 1916; Dr. F. W. KEEBLE, F.R.S., in the Chair.]

BEFORE one can achieve fame as an expert cultivator of Orchids it is necessary for him to obtain as complete a knowledge as possible of the conditions under which these plants exist in their native home, and even if an amateur desires merely to grow them with only moderate success it is important that the essential points of cultivation be clearly understood. Too often one sees a greenhouse devoted to Orchids belonging to several distinct classes, each accustomed to widely different atmospheric conditions, yet all expected by the owner to thrive with the same success as his Roses or herbaceous borders. As Orchids are found in practically all parts of the world where vegetation exists, they are subject to an extremely wide range of temperature and moisture; some species will withstand a few degrees of frost, while others require constant tropical heat; not a few are quite happy in parched desert air, while some fail to grow unless the atmosphere is almost at saturation point. How, then, is it possible for one glass structure to accommodate successfully a collection of plants having such varied requirements?

The eagerness with which an amateur attempts to make his collection representative of the family is the real reason why he so often fails in the matter of cultivation. The surest and quickest way to success is to decide what kind of atmosphere can be most easily maintained, and then to select plants accustomed to these conditions. Extensive collections demand a whole range of houses, in each of which a definite temperature and state of moisture are maintained; it is then possible to cultivate a very varied collection, for there is every facility for providing conditions corresponding to those in which the plants have existed for countless years.

The first essential point is that Orchids, although growing in a variety of situations in their native homes, may be separated into two important divisions. The first, the Terrestrial, includes those found growing in the soil, just like ordinary plants; the second, the Epiphytal, embraces a larger number which secure themselves to the trunks of trees, or other suitable places, at different heights from the ground. It will perhaps be advisable to state that the remarks in this lecture apply more particularly to Orchids usually seen under cultivation, and not so much to the less conspicuous ones commonly known as "Botanical Orchids," many of which require

special treatment quite outside the sphere of an ordinary garden collection.

Terrestrial Orchids.—Of all the terrestrial Orchids, *Cypripediums* are the most popular. In many gardens they form the only representatives of the family, and although their cultivation requires a minimum of skill and attention they cannot be entirely omitted from our consideration. *Cypripediums* in their native home enjoy a remarkable uniformity of temperature, an almost continually moist condition of the soil, and a high degree of atmospheric humidity throughout the year; under these conditions they continue to grow, practically without interruption. With such surroundings as these, ever in the most favourable condition for the existence of the plant, there is no need whatever for the pseudo-bulbs so necessary in the case of Orchids requiring reserve material to carry them through periods of drought.

Briefly, the essential points of cultivation are a fibrous, loamy compost, continual moisture at the roots as well as in the atmosphere, and judicious shading whenever bright sunshine is likely to scorch the foliage. Although the best results are obtained with a minimum night temperature of 55–60° F., there are many elegant hybrids, chiefly of *C. insigne*, that will withstand without harm a temperature of 45° F. Even with the *Cypripediums* requiring considerable warmth but little harm will accrue if on cold wintery nights the thermometer drops to 45° F., provided that the amount of moisture is considerably reduced.

Nothing is so detrimental to these plants as a dry compost, a sunny situation, or an airy and dry atmosphere. Speaking generally, *Cypripediums* succeed well in warm houses where ferns and other shade-loving plants are cultivated with success. An examination of the roots of a *Cypripedium* will show that they are abundantly supplied with root-hairs for the purpose of more readily collecting the nutritive material from the surrounding soil.

Epiphytic Orchids.—Having somewhat briefly dwelt upon the nature of the terrestrial section, we will pass on to the epiphytic Orchids, which embrace by far the largest number of plants seen in collections, while their extreme beauty renders them of first-class importance.

To many admirers of these wonderful flowers the term epiphytic does not signify much more than a condition of “living on the air.” Many illustrations of the past depicted these plants clinging to the trunks or branches of trees, and gained from them the name of “air plants.”

In order to understand clearly the nature of an Epiphytic Orchid it may assist to examine three distinct methods by which plants “live upon others.”

(1) *Parasites.*—These plants, of which the Mistletoe is a well-known example, obtain the greater part, if not all, of their nutritive requirements from the plant upon which they dwell; they, in fact,

steal their food from the supply existing *in* the living organism upon which they are situated.

(2) *Saprophytes*.—Not a few plants nourish themselves by living upon decaying remains of animals and plants and other organic substances.

(3) *Epiphytes*.—These plants, although often found growing on other plants, neither *steal* their nourishment from the living nor the dead. They have an independent existence, and it matters but little whether they are situated on trees or rocks, or cultivated in baskets or pots.

How, then, do epiphytic Orchids obtain their requisite nutriment? Soon after the commencement of the new growth the root system becomes active in order to procure the nutriment necessary for sustaining the plant in a vigorous condition. If the roots fail to find the requisite food the plant will soon exhaust itself and the bulbs assume a shrivelled appearance. An examination of the roots of epiphytic Orchids will show that in the majority of cases they are covered with a sponge-like material, known as the velamen, which has the power of absorbing atmospheric moisture as well as liquid nutriment, and by this means supplies the bulbous stems of the plant with food and water. Where long periods of drought are experienced, Nature has provided the plants with correspondingly larger bulbs, so that a greater amount of food material may be preserved.

It has already been pointed out that epiphytic Orchids exist chiefly on the trunks and branches of trees and on other exposed positions. The small amount of nutriment existing in these places would very soon be utilized by the plant, were it not for the further supplies continually being washed down from adjoining positions by every shower of rain. These additional supplies are obtained from partly decomposed vegetable fibre, leaves, and moss which have accumulated in hollow places on the trunks and branches of trees, or in crevices of the rock-like soil. Thus we can see how it was that cultivators of bygone days who fastened their Orchids to blocks of wood rarely reaped success for more than a single season; the plant quickly absorbed the small quantity of food material on the dead block, and, having used up all its reserve, died for want of further supplies.

Many cultivators may here say with truth that the system of securing Orchids to blocks of wood has long since been discarded. But is the present method employed by many amateurs much better? Instead of a block of wood they use a basket, pot, or pan filled with fibrous material, which may answer very well for one season, but the nutriment is then, if not before, practically exhausted; yet the cultivator rarely thinks of replenishing the supply of food, which, in the plant's natural home would be brought to it by every shower of rain or by the roots continually extending themselves to pastures new. The fibrous material usually remains firm long after its nutritive properties are exhausted, but it is then as useless to the plant as the

dead block of wood. Although we may fix our Orchids to blocks of wood, or secure them in baskets, pots, and pans by means of suitable fibrous material, all these means soon become mere mechanical devices for keeping the plants in any desired position. The essential point always to be borne in mind is never to let the plant suffer through an insufficient supply of food material.

The Supply of Nutriment.—In supplying nutriment to the plant care must be taken that it is not carried to excess. Some cultivators use far too large a pot with an unnecessary amount of compost, fully believing that by so doing the plant will benefit accordingly. Any one who has had experience in the feeding of animals knows how injurious is an over-abundant supply of food, and with plants there is little difference. Too large a supply of compost turns sour long before its constituent nutriment is required by the plant, and thus it becomes a source of danger by preventing the extension of the roots, and even causing rapid decay. Considering the many sizes of pots and pans used in a collection, it is almost impossible to lay down any definite rules, but a little practical experience will soon show when the plant is in need of food, and then the cultivator must decide whether something in the way of top-dressing or inserting fresh compost in needful places may be effected. This may be required every two or three months in the case of small plants, and less frequently with large ones. Speaking generally, all Orchids require a thorough re-potting once every year. There is an old saying, "It is the master's eye that fattens the cattle," and this may be applied with equal truth to Orchid cultivation, for it is the practised eye of the cultivator that decides just when a plant requires a fresh supply of food.

Almost all Orchids are shade-loving plants. Their habit of dwelling on trees or on the ground below is a guide to the way we should treat them when under artificial conditions. During the summer season, when growth is vigorous, the foliage of the forest protects them from the burning rays of the sun, while the fall of the leaf in autumn allows the diminished power of the sun to ripen up the bulbs and prepare them for their winter rest. Thus it will be seen how much depends on the correct application of artificial shading. It must always be in accordance with the requirements of the plants beneath. Where the cultivation of Orchids from various climates is attempted in one small house considerable difficulties and disappointments are sure to arise, hence one cannot too strongly urge the commencing amateur to decide upon the maintenance of some definite climate and then to select plants suitable to it ; by this means will success be best achieved. *Odontoglossums* are well-known examples requiring a cool, moist, and shady atmosphere ; *Cattleyas* may be selected for a warmer and lighter house ; *Mexican Laelias* require considerable light, as well as ventilation, only a slight shade during the middle part of the summer days being necessary ; and there are a few genera which can be cultivated successfully only in high temperatures with an abundance of atmospheric moisture.

Notwithstanding this wide diversity of essential conditions, the majority of Orchids, when placed in a suitable atmosphere, are far easier to grow than many other plants; in fact, a little practical assistance obtained through a kind friend will enable any amateur to achieve the most unexpected pleasure and success, and his green-houses will ever afterwards be the envy of his neighbours and a never-failing interest to one and all concerned.

An essential point to bear in mind in cultivating old plants is that too many bulbs may act as a hindrance to the development of the new one. By carefully shaking a plant out of the compost it will generally be noticed that the live roots are attached to the newer portion of the rhizome; therefore the older portion of the plant, usually without any roots whatever, must be sustained at the expense of the new bulb. This can easily be proved by selecting a suitable plant and running a knife through the rhizome at a point three or four bulbs back from the newest growth; all the bulbs further back from this cutting will soon commence to shrivel, thus proving that they formerly derived their food supply through this source. By carrying out this treatment all the energy of the root system is directed to the newest portion, and improved results are readily obtained. Although these remarks refer principally to imported Cattleyas and similar kinds, they will be found equally applicable to garden-raised hybrids that have been in cultivation for at least five years. These back portions, instead of being a probable hindrance to the development of the plant, may be turned to profitable account if preserved until they commence active growth on their own account, which in the majority of cases they will do, when they may be placed in separate pots.

While the majority of warmth-loving Epiphytic Orchids make their growth or form the new bulb during the summer months, many of the cool-growing section, such as *Odontoglossums*, commence activity in the autumn months and continue through the winter. But in practically all cases this period of activity is followed by one of rest, during which the amount of heat and water should be lessened. In this matter many untrained amateurs frequently bring about trouble by being too severe, and unnecessarily lowering the vitality of the plant. The main point to remember is that the plant, when at rest, requires just sufficient water to prevent it from visibly shrivelling, and, at the same time, a slightly lower temperature.

Rain-water is by far the best water to use, and it should be stored inside the house, so that it may be kept about the same temperature. Manure in all forms should be avoided; only in the most experienced hands does it yield beneficial results, and then only in the case of large specimen terrestrial plants, such as pot-bound *Cypripediums* and *Cymbidium*s.

In their native home the roots of epiphytic Orchids are more or less exposed to the atmosphere, and any material they enter is usually of a porous nature. These conditions must be followed as closely as circumstances permit, and amateurs cannot exercise too much care

in the selection of a suitable compost. Clean fibre, either *Osmunda*, A.I., or first-class peat, kept moist by the addition of a small quantity of living *Sphagnum*, forms the best material. A few clean oak-leaves roughly chopped up or rubbed through a riddle may with advantage be added to the compost intended for small pots, but with large plants, requiring re-potting less frequently, the leaves are best omitted, as they are likely to cause a sodden condition by holding too much water. The smaller the pot and amount of compost so much the quicker does it become dry, hence it is advisable to include a larger proportion of *Sphagnum*, especially near the surface; medium-sized pots answer well when the moss is placed only in the upper portion of the compost, while many of the plants in the largest pots thrive well in only fibrous material. But in this matter nothing definite can be said, so much depends on the amount of atmospheric moisture, the structure of the house, and the actual means adopted by the one in charge of the collection.

THE CONTROL OF PLANT DISEASES DUE TO FUNGI IN GREAT BRITAIN.

By A. S. HORNE, D.Sc., F.L.S., F.G.S.

[Read March 7, 1916 ; Sir J. T. D. LLEWELYN, V.M.H., in the Chair.]

OWING to the activities manifested by foreign Powers in the establishment of phytopathological services prior to the outbreak of war, and in view of future relations with other countries and particularly our great Dependencies and present Allies, the question of controlling the diseases of plants due to fungi is of first importance to horticulturists. It deserves and needs very serious attention, but before the problem of control can be solved, whether by the individual or the State, it is imperative to obtain a thorough knowledge of these diseases.

The steady progress of mycological work in India during the last few years must be attributed to the fact that the tangle of factors contributory to first one and then another of the chief plant maladies of India was first skilfully unravelled, and then, after a careful survey of the position, a practical method of control was speedily devised. Nowhere is this more evident than in BUTLER'S study of the bud-rot of Palms. Here the method and rate of spread of the trouble, the relation to rainfall and the monsoons &c., the symptoms of the disease and habits of the parasite (*Pythium palmivorum*) are thoroughly considered, and as a result suggestions for an organized attempt to stamp out the disease in the infected area were made to the Government of Madras in 1906, and the sum of 5,000 rupees was provided for a trial in a limited area ; larger proposals were given effect to in the following year, and led to a great campaign which dealt systematically with every part of the whole infected area. Again, BUTLER and HAFIZ in 1913, by discovering infection in apparently sound setts, were able to show in red rot of the sugar-cane why sett selection, the most hopeful method of checking the disease, had hitherto failed.

In these Indian studies it proved essential to understand the parasite and its habits in both active and passive forms, its methods of sporulation, and distributive and infective powers. I will now give some additional examples to show how mere cultural work with fungi may elucidate points of practical importance. Everyone knows the common fruit-rot fungus, *Monilia fructigena*, but it is from NORTON we learn that this fungus is an ascomycete : the ascigerous stage, *Sclerotinia*, according to WHETZEL, can bring about a shot-hole effect in leaves of the Cherry and Peach. Again, *Sphaeropsis Malorum*

Berk., the cause of the so-called "New York" canker* of apple twigs, leaf-spot, and rotting of apples in America, according to HESLER, proves but the pycnidial condition of another ascomycete, *Physalospora Cydoniae*, which in the ascigerous stage can exist upon both the Quince and *Hamamelis*. The fungus *Gloeosporium rufomaculans*, a conidial form described by BERKELEY as a *Septoria*, the cause of another apple-rot, according to the work of CLINTON, and of SPAULDING and VON SCHRENK, also possesses an ascigerous *Glomerella* stage. Much has been done by the method of inoculation to ascertain the relation existing between the many *Gloeosporia* which have received different specific names according to their hosts: thus grapes have been inoculated successfully with the apple *Gloeosporium* and the reciprocal operation performed by SOUTHWORTH; the apple with the Quince form by STONEMAN; whilst conidial forms from the grape (*G. rufomaculans*), apple (*G. fructigenum*), fig (*G. Elasticae*), and species from the Cranberry, *Gleditschia*, *Ginkgo*, and bean (*Colletotrichum Lindemuthianum*) have yielded the same ascigerous stage in pure culture (SHEAR and WOOD). This list has been extended by J. J. TAUBENHAUS, of the Delaware Station, to include anthracnose of the Sweet Pea. In absence of knowledge of this kind it is easy to see how difficult it is to control fungi. We fail to avert apple-rot because the fungus passes its existence in another form in the quince, or we fail to dislodge a Sweet Pea parasite because the same fungus abides in several hosts.

During the last quarter of a century there has been a great awakening in the United States of America; we have witnessed the growth of a world-eminent school of bacteriology founded by ERWIN SMITH, whose great achievement in isolating bacteria causing tumours in plants will be within your recollection. A Phytopathological Society and Journal ("Phytopathology") have arisen within the last few years, and great practical campaigns have been instituted and are being carried out against fungal pests of crops and orchards. Can we in Britain chronicle progress at all comparable with that in other countries and worthy of our position as the centre of this great Empire? For example, have we pursued the problem of potato disease with sufficient vigour? We do not yet know the source,† nor can we prophesy the course, of the *Phytophthora* outbreak throughout the country. It is not enough to obtain records of the distribution of such pests, invaluable as the records are; we must know the conditions governing their occurrence and intensity, and be prepared to chart the course of an epidemic in relation to climatic and natural features somewhat on the lines adopted by GY. DE ISTVANFFI, GY.

* E. S. SALMON announced the occurrence of "New York" canker in England in the *Gardeners' Chronicle* No. 3617, April 1910, p. 258, being apparently unaware that the fungus responsible, *Sphaeropsis Malorum* Berk., was discovered in England by Berkeley on apples at King's Cliffe in 1836.

† I. E. MELHUS states that *Phytophthora* can remain forty-five days latent in tubers after planting, that it can spread and reach the sprout, and that it can extend into dwarfed shoots in the field.

PALINKAS, and F. SAVOLY in Hungary in connexion with vine mildew ; we must study the behaviour of the fungi causing epidemics, the growth of mycelium, the germination of spores, perithecia, &c., in relation to temperature, humidity, and other environmental influences, following the example of MENGEL, RAVAZ, VERGE, and other investigators in France.

Clearly we have not yet sufficiently applied our scientific knowledge, whether of fungi, of physical conditions, or of chemical reactions. Let us take care, however, that the application is aptly made, bearing always in mind MARSHALL WARD's review of the great chemist LIEBIG's influence on biological science. "That Liebig was indispensable in 1811-1850 is one thing ; but that his influence should extend to the present day is quite another, and his inevitable mistakes were almost as powerful for future evil as his clear exposition of the chemistry of his day was productive of immediate good."

Some examples of the kind of pitfall awaiting the botanist or mycologist who attempts to deal with practical problems without sufficient field experience may be taken from the writings of the brilliant author of "Disease in Plants" himself. Writing of potato disease and the symptoms presented in the foliage, in "Diseases of Plants" MARSHALL WARD explains that *Phytophthora* passes down the haulm of the plant and reaches the growing tubers. Forthwith attention became fixed on the haulm as the carrier of infective mycelium, and the idea once rooted became firmly established, and on this basis spraying efforts were devised to prevent the infection of tubers, but often foredoomed to failure, as I shall presently show. Now, as a matter of fact, the course of the fungus down the haulm had not been demonstrated to occur, or at all events to any extent, under field conditions, and recently DASTUR has shown that the castor oil *Phytophthora*, *P. parasitica*, shows no propensity to travel either upwards or downwards from a stem inoculation. Neither is there any weight of field evidence to support this view. In the 1915 epidemic, which threatened at one time a potato failure of serious dimensions, the attack took place by way of the "eye" and skin, a fact clearly demonstrable at the *Daily Mail* show held at Vincent Square, in a number of exhibits derived from all parts of the country. Again, with regard to direct infection of growing tubers by the zoospores of *Phytophthora*, we are told that infection can only succeed as a rule when the tubers are still young, since the coat of the older potatoes, being thick and corky, resists the inroads of the fungus. Here the lenticels, skin affections, or abrasions due to soil and weather conditions, as providing means of ingress, are presumably ignored. Again, the power of dormancy was ascribed to *Phytophthora* ; it could be assumed that *Phytophthora* is present in healthy tubers, and some authorities held even that tubers are rarely free from it. But this is certainly not the case ; the mycelium can winter only in the diseased tissue of diseased tubers. The view arises apparently from a false comparison with certain rust fungi

which hibernate in their respective hosts. Again, in the case of the finger-and-toe organism (*Plasmodiophora Brassicae*) MARSHALL WARD states that the plasmodium is able to pass slowly from one cell to another, devouring their contents. We find a similar view obtaining later to explain the extensive infection of potato tubers by *Spongospora Solani*, a parasite closely related to *Plasmodiophora*. Here, although the plasmodia of the non-parasitic Myxomycetes are capable of movement, it does not at all follow that those of the intracellular parasitic species can migrate from cell to cell and tissue to tissue, and in fact they do not behave in this way. Thus time after time the descriptive matter of "Diseases of Plants" covers a subtle passing from fact to theory, presenting pictures more imaginative than derived from actual experiences.

A short time ago, in the *Gardeners' Chronicle*,* a correspondent complained that mycologists could not yet distinguish between bitter pit and fruit-spot of apple. This is unfortunately true of more than one disease. Incomplete knowledge of the habits of fungi leads to confusion of symptoms. As an example we may take the case of brown rot in potato tubers; much brown rot was of course known to be *Phytophthora* rot, but there were cases sometimes attributed to *Phytophthora*, sometimes to *Fusarium*, sometimes to no organism at all. After devoting some time to this matter I was able to show that in *Phytophthora* rot, or a rot due to a combined incursion of *Phytophthora* and bacteria, the tubers show pronounced external symptoms, and the fungus, or traces of its existence, can be detected in the air spaces; in blotch and streak, where a bacterial factor is suspected, external symptoms are rarely presented, but the flesh is peculiarly marked; in both these types wound cork is formed, whereas in "bruise," often wrongly held to be an after-effect of *Phytophthora* attack, wound cambium does not arise. In the last case the diseased areas possess a grey or black coloration and the cells appear to be progressively poisoned. Many other so-called diseases also need analysis; for example, in fig disease what is the relation between shoot die-back, cankered branches, and the strangely mottled leaves, or in peach what connexion is there, if any, between the shoot die-back and curl?

There are several problems under investigation in other countries that need study here in special relation to the conditions obtaining in this country. Amongst these a disfigurement of apples, especially of dessert varieties—the apple fruit-spot to which I have just referred—claims serious attention. This spot or blotch has exercised mycologists in the United States for many years, and several bulletins have been issued both from the Bureau of Plant Industry and the Experimental Stations of the chief States in the Union. In several cases the trouble has been attributed to fungi such as *Sphaeropsis Malorum* Berk., species of *Alternaria*, *Phoma Pomi* Passer. (= *Cylindro-*

* See *Gardeners' Chronicle*, November 28, 1914.

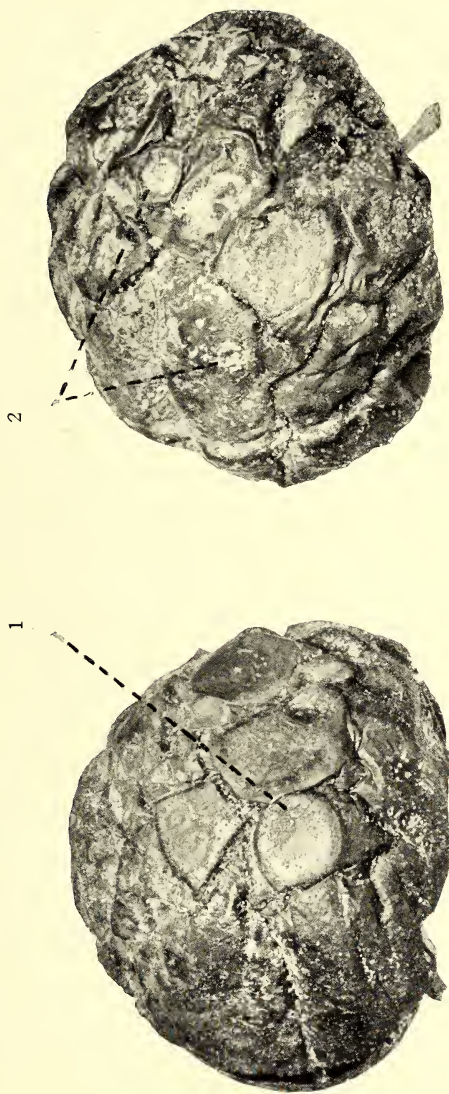


FIG. 1.—FRUIT-SPOT OF APPLE. LATE STAGE, SHOWING (1) THE ORIGINAL SPOTTED AREA BEARING FUNGAL BODIES OF A SCLEROTIAL AND PYCNIDIAL NATURE, AND (2) ERUPTIVE WHITE MYCELIUM IN ADDITION.

[To face p. 16.



FIG. 2.—POTTER'S ODONTOGLOSSUM SPOT ON (A) ODONTIODA × 'EUTERPE,'
AND (B) ONCIDIODA × COOKSONIAE.

[Note: These figures represent negative images.]

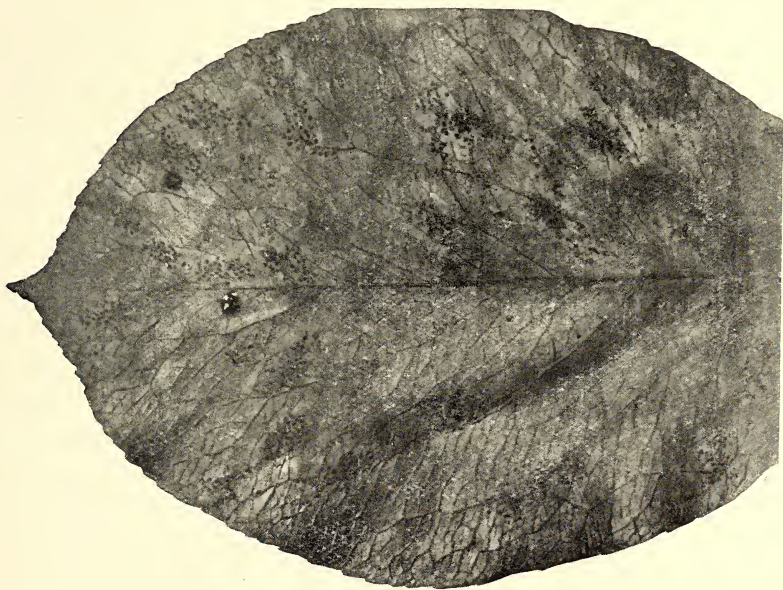


FIG. 3.—PEAR LEAF BEARING PYCNIDIA OF
GYMNOSPORANGIUM SABINAE.

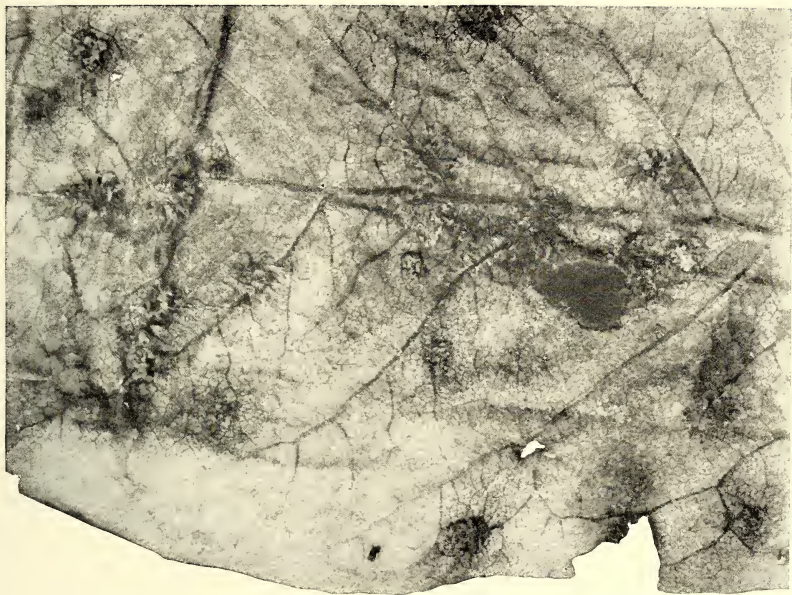
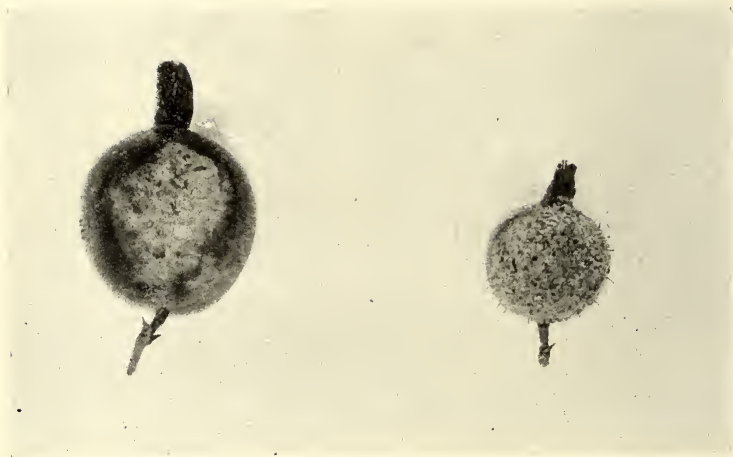


FIG. 4.—QUINCE LEAF (ENLARGED) SHOWING GROUPS
OF AECIDIA OF *GYMNOSPORANGIUM CONFUSUM*.



1

2

FIG. 5.—GOOSEBERRY, (1) SHOWING MILDEW KILLED AFTER SPRAYING WITH LIVER OF SULPHUR AS USED AT WISLEY, AND (2) FROM AN UNSPRAYED BUSH.

[To face p. 17.]

sporium Pomi Brooks),* *Coniothyrium Fuckelii*, *Phoma Mali* &c. ; in other cases the trouble has been regarded as of a physiological character (SCOTT—Jonathan apples), whilst NORTON claims to have imitated some types of spotting by the action of certain gases. This fruit-spot is certainly on the increase in Britain. Everyone will agree that it is as important for us as for the United States to keep fruit clean both in the orchard and the store, whether offered for sale or grown for exhibition. But first we must be able to diagnose the symptoms and distinguish them from bitter-pit characters and to distinguish fungal from non-fungal spotting. If the spotting is of a fungal character, it is important to discover what fungi are implicated, their degree of parasitism and their hosts, for it does not at all follow that the fungi found here will be the same as those isolated in the United States or elsewhere.† (Fig. 1.) The success of practical schemes we may devise for combating this trouble will depend on our knowledge of these things.

Again, there is a blemish so vexing to orchidists that appears in the form of spots, blotches, or mottlings in the leaves of some favourite or valuable Orchid. (Fig. 2.) This trouble has caused much controversy ; some argue, and on occasion quite rightly, that cultural conditions alone are to blame, whilst others maintain that fungi or bacteria are the cause. For a time the fungus *Gloeosporium* was thought to be the culprit, and species were described as causing spot on *Oncidium* (*G. Oncidii* Oud.—Amsterdam), *Odontoglossum* (*G. Bidgoodii* Cooke—England), *Cattleya* (*Gloeosporium* sp.—Paris), and other Orchids (*G. cinctum* B. and C. ; *G. pallidum* Karst. ; *G. orchidearum*, Karst., on Mexican Orchids), whilst a species as yet unnamed was found at Wisley in 1915. But the evidence in most cases is merely that of association. We do not know at all to what extent these fungi are able to cause disease in Orchids. To obtain this information one must cultivate the fungi and understand their behaviour. More recently several instances of spotting due to bacteria have been recorded. PAVARINI has described no less than four new species—*Bacterium Cattleyae*, *Bacillus Polacii*, *Bacterium Krameriani*, and *Bacillus Farnetianus*, which he has isolated from and reproduced spotting by inoculation in *Cattleya Harrisoniae*, *Odontoglossum citrosum*, *Oncidium Kramerianum*, and *Oncidium ornithorhynchum* respectively ; in Japan, HORI has obtained a bacillus causing brown rot in *Cypripedium*—*Bacillus Cypripedii*.

* BROOKS first described his fungus as *Cylindrosporium Pomi* in *Bull. Torr. Club* 35, 423-456 (1908) but later, on incomplete evidence, transferred it to Passerini's *Phoma*—*Phoma Pomi*, for which see CHARLES BROOKS and CAROLINE A. BLACK in *Phyt.* ii. (1912), pp. 63-72. The supposed *Cylindrosporium* fructification is therein regarded as a *Cylindrosporium* stage in the life-cycle of the *Phoma*, but this organ is very unlike the characteristic acervulus of a *Cylindrosporium* which in the case of *C. Padi* has been clearly described by B. B. HIGGINS in *Amer. Jour. Bot.*, vol. i. No. 4, pp. 145-173 (April 1914).

† I have succeeded in isolating several fungi in pure culture at the Pathological Laboratories of the Imperial College of Science, including species of *Stemphylium Alternaria* and *Pleospora* from spotted areas in certain varieties of British apples ; see "Rept. Sci. Com. Roy. Hort. Soc." *Journal R.H.S.* xli. p. cv.

In each case the organism was isolated in pure culture and the disease was subsequently reproduced artificially upon inoculation. To what extent is spotting in British collections due to bacteria? In one particular spot of *Odontoglossum* first but incompletely described in the *Gardeners' Chronicle**—a pellucid spot with a dark centre—the agency of bacteria is already suspected. First recorded only on *Odontoglossum Uro-Skinneri*, it is now found on several *Odontoglossum* species and hybrids, including *Odontoglossum crispum*, *O.* × *Loochristiense*, *O.* × *Thwaitesii*, *O. eximium*, and in the hybrid genus *Odontioda*, for example *Odontioda* × “*Euterpe*” (= *Odontoglossum Uro-Skinneri* × *Cochlioda Noezliana*), also in species of *Oncidium*, the hybrid genus *Oncidioida*, and in *Cattleyas*. It is surely important for Orchidists to know definitely whether this spotting is of bacterial origin or not; if the latter, attention to cultural conditions alone will eliminate the trouble, and there would be no need for anti-septic treatment; if the former, precautions should be taken to prevent the spread of the spot from one plant to another and from one collection to another.

Amongst the diseases which have remained practically unstudied is a wilt of *Clematis*; the leaves first droop and wither and then the stem dies; the roots are frequently affected with a black rot, apparently of a bacterial nature. Here it is important to know whether the wilt and root-rot are due to the same cause, and upon this, I am told, depends the issue as to whether the use of a favourite *Clematis* stock shall or shall not be discontinued.

In attempting to avert or mitigate maladies of plants, one must, as in human diseases, direct special attention to the needs of the body and the conditions under which health is best maintained; in plants, unsuitable climate, inclement weather, insanitary surroundings, undue competition with surrounding plants, improper, injudicious, or unsuitable grafting or budding, planting, tending or feeding render the organism more or less susceptible to ailments, trivial or serious. Perhaps one could check many diseases if it were only known exactly what factor is wrong and if one possessed the means to set it right; but there are certainly many that cultural skill alone cannot subdue. The horticulturist may be to a certain extent the victim of his environment, which perhaps favours outbreaks of disease. His soil perchance shelters the potato tumour (*Chrysophlyctis endobiotica*) or canker (*Spongospora Solani*) or finger-and-toe (*Plasmodiophora Brassicae*) organisms; or he may be the victim of his own habits or design; he may, by cutting back hard when removing rose blooms, and incidentally foliage, weaken the plant and render it more susceptible to mildew, or by excessive removal of *Chrysanthemum* foliage predispose the plant to rust, or by disbudding Peaches leave wounds open to the ingress of a parasite, or by removing immature figs † provide

* “Leaf-spot of *Odontoglossum Uro-Skinneri*,” *Gard. Chron.* March 6, 1909.

P. 145.

† Several instances of canker at Wisley could be traced to the scars left on the branches by the removal of figs.

sites for incipient canker that will ultimately involve the death of the branch, if not that of the whole tree.

The appearance of disease of some kind or other being almost inevitable under present conditions, however careful the cultivator, it is important to record the presence of a malady the instant it appears in a nursery or house. Quite recently I was able to bring to the notice of the Scientific Committee* a case of the introduction of black spot into a garden on the 'Lyon' Rose, where neglect to deal with the trouble at once led to its appearance on more than a dozen varieties in the second season. An outbreak of Carnation rust was averted at Wisley in 1915 by removing an infected plant which had been recently added to the collection from the Carnation house and placing it in quarantine. After suitable treatment the plant and six cuttings taken from it were restored to the house and proved absolutely rust-free. Both rust and black spot are caused by parasitic fungi, and needless to say much trouble would have been saved if they had not been introduced. The greater the precaution taken on the part of the consignor and consignee the less the chances of undesirable intrusions of this kind. One of the chief difficulties lies in the lack of trained observers to detect fungal pests in their different forms at an early enough time. Action is almost universally delayed until the symptoms are plainly manifest. In the case of the American Gooseberry mildew, an outbreak was detected at Wisley by a trained observer within a few days of the initial infection, but imperfectly trained observers did not detect the outbreak for at least another week after the first observation. Now the control of the whole epidemic might depend on the treatment of the mildew within this single week.

An outbreak of disease in a garden is of course not necessarily due to the actual introduction of a pest in imported plants. The germs of disease may lurk among samples of seed—in this way the winter fruits of the Delphinium mildew † may be distributed if the seed be collected from mildewed plants and sent out contaminated—in packing material, sacking, boxes, straw, &c., wherever the winter or resting forms of fungi (sclerotia, sclerotial mycelium, resistant spores, &c.) can remain concealed. Cases and receptacles used for collecting apples, pears, &c., would be especially liable, and soil from infected areas containing the spores of *Plasmodiophora*, the spore-balls of *Spongospora*, or the sporangia of *Chrysophlyctis*. Special attention to cleanliness will meet these cases—clean stock, clean handling, and clean packing.

A source of disease frequently overlooked is the infection of a cultivated variety from its wild congener. A notable example is the occurrence of finger-and-toe in common hedge crucifers. The incidence

* See "Proc. Sci. Com. Roy. Hort. Soc." in *Jour. Roy. Hort. Soc.* xli. p. cxcviii.

† The winter fruits (perithecia) are frequently formed in very large quantities on the stems, leaves, flowers, and fruit of susceptible varieties, and it is difficult to collect the seed without obtaining the small black perithecia as well unless special precautions are taken.

of Rose mildew in a collection may be due to the presence of infective briars in a neighbouring hedge; it may also be introduced by the use of susceptible briar stocks; in such cases suckers* which appear early in the season and are not removed may become mildewed and provide the fungus with a first hold in the garden.† Black spot of Roses, which is frequently stated to have been introduced on the Austrian briars, also occurs on our hedge Roses, and I have also found it on certain stocks at present in commerce. These evils may be ameliorated to a certain extent by careful choice of sites for a rosary where there is any latitude for choice, by judicious grouping of varieties, and by selecting disease-free and if possible immune stocks for grafting purposes.

Some pests are difficult to control from their habit of passing phases of existence in more than one host. I will give as an example a case sent to Wisley for diagnosis last year that will prove of exceptional interest, for the self-same disease was under discussion before this Society just over a century ago. The fungus concerned, which belongs to the rusts, was known in those days as *Lycoperdon cancellatum*, and was recorded from Downton and localities in the vicinity of London by THOMAS ANDREW KNIGHT as destroying the leaves and branches of the Pear tree. Pear leaves with this *Lycoperdon*, now styled *Gymnosporangium*, which bore the pycnidia of one species—*G. Sabinae*, (fig. 3)—and leaves of the Quince from the same source were infected with the aecidia of a second and rarer species—*G. confusum* (fig. 4). Both fungi pass the winter on the Juniper, and the Pear and Quince are liable to re-infection each season from this tree.

Within the last decade we have been led to hope, especially from the brilliant work of BIFFIN, that our destiny with regard to the control of fungal disease rests with the breeders of new forms of plants, for much has been accomplished towards raising disease-resistant races of our most valued economic species of wheat, cotton, sugar, &c. It is an effort that should spread far, and it could not obtain happier application than when designed to produce immune or semi-immune races of plants resistant to the annual visitation of mildew. Considering Roses, we should picture a Utopian landscape where the flowers retain the properties we cherish—those subtle perfumes, those blended colours of sunset or sunrise, their exquisite form—invested with the mantle of immunity; for even though we may not enter the promised garden the foundations may be laid of future creations leading to successes that will excel the hard-won triumphs of to-day.

Now, mildew in Roses is of multiple origin. Undoubtedly two sources of influx and spread are through the Hybrid Perpetual Roses

* This actually occurred in a garden in Surrey in 1915; the mildew appeared on a sucker from a standard stock in April.

† With regard to Roses under glass, there seems no insuperable difficulty in keeping them free if we could start with a mildew-free house.

on the one hand and on the other from the 'Crimson Rambler,' derived from *Rosa multiflora* Thunb., a bad mildewer, introduced originally from Japan. A number of varieties known or suspected to be of 'Crimson Rambler' parentage are highly susceptible to mildew, such as 'Purple East' and 'The Lion,' derived from 'Crimson Rambler' and 'Beauté Inconstante'; and 'Leuchtstern' and 'Flower of Fairfield,' in which 'Crimson Rambler' blood is suspected. There is, on the other hand, an important class of Roses having as a parent *R. Wichuraiana*, an immune Japanese single Rose and possessing a higher degree of immunity than the *R. multiflora* derivatives. Can we not aim then at obtaining all the characters we value in the *multiflora* group from the less susceptible Wichuraianas? Again, the Hybrid Perpetuals, derived largely from the susceptible Damask and Gallica Roses, are paralleled by a relatively less susceptible series—the Hybrid Teas—descended from forms exhibiting strong likeness to the more immune China Roses. Can we not raise from Hybrid Tea parentage forms equal to the finest among Hybrid Perpetuals?

Some of the difficulties * to be met with in the attainment of our ideal may be gathered from the case of Peaches and Nectarines. Here the question of immunity from disease is exceedingly complicated, not only because we cannot yet distinguish all the symptoms due to *Exoascus deformans* from other troubles to which these trees are liable, but *Exoascus* itself varies in virulence to a remarkable extent according to weather, soil, and cultural conditions. It is not so easy to distinguish such distinct types as exemplified by the *multiflora* and *Wichuraiana* Roses. Some varieties appear to attain an almost cosmopolitan susceptibility, such as, for example, the variety 'Elberta,' which is recorded susceptible for the United States, Britain, and Australia, although, curiously enough, the variety 'Kia-Ora,' a seedling raised from 'Elberta' (on a Peach stock) in New South Wales, is recorded as free from disease. For other varieties the record varies; thus 'Briggs' Red May' is resistant in Australia, susceptible in the United States and Tiflis. A short time ago, by the courtesy of the Imperial Bureau of Entomology, I received some valuable information from Professor JACHEWSKY on the subject of varieties immune to *Exoascus* in Asiatic Russia. Professor JACHEWSKY writes that the 'Early Alexander' and the American varieties, such as 'Amsden' (susceptible at Tiflis), are recorded immune by BANDARTJEV for the Black Sea district, where *Exoascus* is a veritable scourge; the variety 'Markwallia gauri' is recorded immune in the government of Kutais by KWARATSCHCHA; the varieties 'Daghestan' and 'Queen of the Gardens' were noticed to be immune by NEMADOWSKI in the botanical garden of Tiflis, whilst the European varieties obtained from seeds are reported immune in Kachetia, where the local species are badly attacked.

* See also difficulties of another kind experienced in the case of the sugarcane described by BARBER in *Ann. Appl. Biol.* i. Jan. 1915.

In some cases we have an unexplained reversal of symptoms in a given locality. Thus certain varieties of Aster, notably *dumosus*, were recorded badly mildewed at Wisley in 1911, but in 1914 and 1915 these were practically unaffected, whilst *salicifolia*, slightly affected in 1911, was mildewed very much in 1914 and much in 1915.

INCIDENCE OF MILDEW (*Erysiphe Cichoriacearum*) ON ASTERS (Michaelmas Daisies) AT WISLEY.

Variety.	Degree of Mildew.		
	1911.	1914.	1915.
Pink Daisy	v. bad	some	little
Porcelain	slight	much	some
Moonstone	slight	much	little
Snowdrift	little	much	some
Daisy Peters	v. bad	little	some
White of the Dwarfs	v. bad	little	some
<i>salicifolia</i>	slight	v. much	much
Janus	slight	much	slight
Thirza	slight	much	slight
<i>dumosus</i>	bad	none	none
Grace	unrecorded	none	much
Ariadne	v. bad	v. much	some
Apollo	bad	v. much	much
Berence	v. bad	much	some
<i>canus</i>	v. bad	v. much	much

A similar happening was observed amongst Pears affected with scab caused by *Venturia pirina* from observations made at Wisley in 1914 and 1915. The significance of phenomena akin to these occurring among plants propagated vegetatively, such as the sugar-cane, has been ably discussed by BARBER and by BUTLER in India, and by HARRISON, STOCKDALE, and WARD in the West Indies.

There seems no prospect that the use of preventive and curative remedies can be to any extent abandoned, and especially since susceptible varieties of fruit, vegetables, &c., are commercially prized through possessing some favourite quality of colour, flavour, fragrance, and form. We can, however, abandon their improper use and direct our efforts to improve their utility. Some discredit has been thrown on the practice of spraying and the use of bouillies, owing to the conflicting results obtained; such results will inevitably accrue from an insufficient knowledge of the nature and origin of the diseases or epidemics treated, and furnish another cogent argument for increased investigational activity. I will give a case from past experience which exemplifies the kind of misconception responsible for error in many more widely planned experiments. Several rows of potatoes in a large potato field in England were sprayed with the object of impressing the farmer with the beneficial effect of spraying against potato blight (*Phytophthora infestans*). At the time of lifting, however, it was found that although the foliage was healthy the tubers formed by the sprayed plants were badly diseased, and to the same extent as those of the unsprayed plants (foliage also healthy). The

agricultural expert attributed his failure to spraying somewhat late in the season. According to him, the spray was not applied in time to prevent the fungus passing down the haulm. The farmer was convinced that spraying was useless to prevent disease, and in this case he was right, for no *Phytophthora* had appeared in the foliage of the sprayed plants and none was observed in the foliage of the unsprayed rows; the infection came from the soil, but whence it came and how it reached the soil we do not know. None of these things had been anticipated or considered at all. Much labour could be saved in experimental spraying against mildew, whether using a fluid or a powder, by a few hours' study of the effect of the remedy on the fungus in the open. Is the fungus killed? If so, to what extent and by what strength and under what conditions? It would not be surprising to find that some recorded successes were really due to physical influences—the epidemic may have received a natural check; on the other hand, failure may be due, amongst other things, to using a spray at an unsuitable time, an experience more than once recorded in the Bulletins of various Experimental Stations in the United States.

A great many compounds are noxious to cryptogamic life, of which some are noxious to all plant life in strengths suitable for use against Cryptogams; in general many are of mediocre value and a few invaluable; the latter we must harness to suit our needs. Copper sulphate and the polysulphides of potassium are amongst the few compounds that have proved of great value in the past, and it seems very probable that perseverance with these may produce better results than trials with other newer and perhaps relatively more expensive remedies.

It needs little thought to decide on what lines improvements must trend. When the text-book formula for applying liver of sulphur is used, we have a watery liquid which possesses poor wetting power; it either rolls off the leaves or collects in globules, often failing to reach or cover the mildew; new mixtures can be devised and are in use at Wisley that confer the power of adhesion on the liver of sulphur fluid; moreover, the strength of the chemical can be much reduced in these bouillies without sacrificing efficiency.

The cost of the chemicals used in spraying the Roses at Wisley against mildew in 1914 worked out at about four shillings a thousand Roses, of which 10 per cent. are climbers and ramblers; the chief sprayings were made on August 4 and August 20 respectively, and a minor operation on August 12, and as a result two-thirds of the amount of mildew present was absolutely destroyed. If the old method had been adopted, using liver of sulphur as the sole ingredient dissolved in water, the cost would have been halved with the same expenditure of time and labour, but without attaining any definite result. In 1915, by modifying the composition of the mixture used in 1914 and by adopting a different plan of action, not only was the cost of the ingredients used reduced to about one shilling

a thousand Roses, but a saving in time and labour was effected as well.*

Again, with regard to Aster mildew, adopting the same method, two ounces of liver of sulphur sufficed in 1915 for the Wisley collection of Asters, which comprises 130 plants, a very considerable reduction on the quantity used in 1914. This effective use of liver of sulphur when employed much more dilute than usually recommended is important, for it renders a great range of varieties, whether of Roses, Gooseberries, Asters, &c., amenable to treatment without risk of damage to the foliage by the fluid. (Fig. 5.)

Burgundy mixture, consisting of sulphate of copper and sodium carbonate, which possesses, when properly mixed, remarkable natural adhesive features, is as invaluable for preventive as liver of sulphur mixtures are indispensable for curative purposes. One application of Burgundy mixture without any additional ingredient was sufficient to prevent almost entirely the occurrence of *Exoascus* leaf blister in Peaches and Nectarines at Wisley in 1915, and a still more remarkable case occurred at Brentford in a garden where a score of Peach trees, including both young and old neglected specimens, which had every leaf blistered and produced no fruit in 1914, were completely free and bore fruit in 1915 after receiving similar treatment. Burgundy mixture was also successfully used by squirting down the haulm to check the potato collar-rot fungus, *Hypochnus Solani*, and against *Septoria Petroselini* var. *Apii*, the cause of celery leaf-spot. In some cases the plant we desire to treat possesses some peculiarities: it may be coated with hairs, a waxy film, &c. The mixture has then to be adapted to the special conditions. Thus Burgundy mixture rolls off the foliage of Carnations in droplets; here a modification has been devised to bring the Burgundy to adhere to the plant's waxy surface, and by coating the whole Carnation plant with an exceedingly fine film of the preparation it can be effectively protected from infection by Carnation rust (*Uromyces Caryophyllinus*). This modified Burgundy was employed on Delphiniums against Delphinium mildew (*Erysiphe Polygoni*) in greatly reduced strength without losing efficiency; and here again, owing to the degree of dilution, the whole collection could be treated without damage to the foliage.

Among newer remedies, formalin is sometimes advocated as a cure for mildew. Using the strength generally recommended for Rose mildew, on Gooseberries at Wisley, it proved of little value. Recently M. A. BLAKE and C. H. CONNORS † find that strengths really noxious to Rose mildew are harmful to certain varieties of Roses—for example,

* The following is the formula of the wash used successfully in 1915:—

Liver of sulphur	1/8 oz.
Soap powder	1 oz.
Water	1 gallon.

† M. A. BLAKE and C. H. CONNORS in *New Jersey Stn. Rep.* 1914, pp. 38, 39. These authors used strengths varying from 1/100–1/300 on 'American Beauty' successfully, but found 1/250 disastrous to 'Killarney.'

the variety 'Killarney.' Formalin may, of course, have other valuable uses, for instance as a fumigant or sterilizing agent. Another compound, hycol, proved by Miss DOIDGE to be virulently poisonous to the germ causing Mango disease in South Africa, failed in practice to control the malady. Miss DOIDGE states that hycol possesses about one-tenth the poisoning power of mercuric chloride with respect to the Mango bacterium; formalin and cyllin approach it closely in poisonous effect, whilst lysol is less effective. Tetrachlor-ethylene may be found helpful as an ingredient of spraying mixtures, but this and other suggested chemicals need careful trial to discover their most useful application.

Trichlorethylene may prove a valuable agent in the aseptic treatment of leaves apart from the cleansing effect obtained, for I find that weak strengths of certain commercial products which contain this chemical can be used on Odontoglossum leaves without causing the slightest injury. Spraying and washing are, of course, not the only operations that need activity towards improvement. Devices are needed in connexion with freeing soil from pathogenic fungi in their various forms; cleaning seed from fungal contamination; aseptic pruning against canker &c.; prevention of the spread of incipient rot in Melons &c., and sterilization of the fruit-room or store.

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ON AN EARLY MENTION OF THE DOUBLE WALLFLOWER
(*CHEIRANTHUS CHEIRI*).By EDITH R. SAUNDERS, Lecturer, late Fellow, Newnham College,
Cambridge.

IN the course of an account dealing in the earlier part with the history of the double Stock (*Matthiola incana*),* I gave a list, arranged in chronological order, of certain botanical works which appeared between 1530 and 1600, for the purpose of showing at what dates we find mention of the double form in this genus, and also in two other plants—the Wallflower (*Cheiranthus*) and the Violet (*Viola*), both of which in early times were grouped with the Stock under the common name of *Leucoium* or *Viola* owing to their common characteristic of possessing a sweet scent. In this list the earliest date at which mention appears of the double Stock and the double Wallflower is 1568, the work in which both references occur being one by the Belgian botanist Dodoens entitled “*Florum et coronariarum odoratarumque nonnullarum herbarum historia.*”

Since the appearance of the account referred to above I have received a letter from Dr. TRABUT, Director of the *Service botanique* of Algeria, bringing to my notice the following sentence from a French translation † of “*The Book of Agriculture*” written in Arabic by IBN AL AWAM in the latter half of the twelfth century: “*La giroflée jaune est plus double que les autres, et l'on dit qu'elle ne donne point de graine*” (the yellow *giroflée* is more double than the others, and is said not to yield seed).

This extract from CLÉMENT-MULLET'S translation leads to the extremely interesting supposition that the double Wallflower was known and cultivated at least four, and, as we shall see later, perhaps five centuries before the date given in my list (1568). It further raises at once the question, “What is intended by ‘the others’ (*les autres*)?” Does this expression cover merely forms of the Wallflower (*Cheiranthus*) other than the yellow, or are Stocks (*Matthiola*) included under it as well? The French term *giroflée*, by which the Arabic is rendered, as we know, is used to-day in French horticulture to include both genera. Were both intended by IBN AL AWAM? The result of my endeavour to verify the first point and to answer the second gives occasion for the present note.

* See vol. xl., p. 450, of this *Journal*.

† Presumably that by J. J. Clément-Mullet, Paris, 1864-67. An earlier translation into Spanish by J. A. Banqueri appeared in 1802.

I have examined various other passages in CLÉMENT-MULLET'S book which contain references to the *giroflée*, both those noted by Dr. TRABUT, to whom I am much indebted for calling my attention to this work, and others, and have compared them with the corresponding passages in the earlier Spanish translation by BANQUERI, who prints the Arabic text side by side with the Spanish rendering.* Those of interest in regard to the present inquiry occur in chapters xv. and xxvii. The sentence relating to doubleness quoted above appears in the course of the later chapter (T. II. p. 257), and is rendered somewhat differently in the Spanish (P. II. p. 267), which states that the yellow form is very weak, and that [? in consequence] some, so they say, do not set fruit. ("El amarillo es muy endeble; y segun se dice, alguno no fructifica.") The first statement, however, scarcely appears consistent with the facts or with later portions of the text. In the article, e.g., which deals with the violet (as to the rendering of which both translators agree) we find the following statement: "There is an analogy between the *giroflée* (Sp. *alhelí*) and the violet as regards treatment and method of cultivation, with this difference, however, that the *giroflée* † is more vigorous and better able to survive any accidents which may befall it." Then follow the remark that the yellow *giroflée* is a triennial, and a reiteration of the statement that every proceeding followed in the case of the violet is applicable also to the *giroflée* (Fr. tr. p. 259, Sp. tr. p. 269). If, however, the usual duration of the life of the yellow *giroflée* were three years, one would hardly expect to find it described as "very weak." Moreover, as the *giroflées* in general are here mentioned as being particularly vigorous, and the yellow form is individually referred to in the sentence immediately following, it is hardly likely that no reference would have been made to its being an exception to the general statement regarding vigour if this were actually the case. Furthermore, the statement that it is said to yield no seed is precisely the comment which we should expect if CLÉMENT-MULLET'S view, that the characteristic to which IBN AL AWAM here alludes is really doubleness, is correct. In the works of the medieval writers who make mention of the double form of the Wallflower it is usual to find superadded the remark that this form is so double that it produces no seed. (See Dodoens, Dalechamps, J. Camerarius jun., Tabernaemontanus, Parkinson, J. Bauhin, and others.) To these early writers this fact evidently appeared somewhat out of the common and one which called for some remark; and the Arab authority quoted by IBN AL AWAM, having heard of this double form—it would appear that he had not himself seen it—may well have had the same feeling regarding such an anomaly, and have

* The only known manuscript copies of the original Arabic work appear to be the one in the Library of the Escorial, the one at Leyden, and one, of the first part only, in the National Library in Paris. (See the preface to Clément-Mullet's work, p. 18.)

† To avoid unnecessary repetition I give the name in one language only, using the French word as being more familiar.

wished to bring it to the notice of his readers. As between the French and Spanish rendering, therefore, there is no doubt that, so far as the *nature* of the characteristic referred to is concerned, CLÉMENT-MULLET'S view is more consonant with the facts and with other passages in the original than that of BANQUERI. We may then fairly confidently carry our date for the double Wallflower back as far as the latter half of the twelfth century, and perhaps even a century earlier still.* For there is a general consensus of opinion that the plant referred to here and elsewhere in Arabic writings as *al Kheiri* † is the plant named by Linnaeus *Cheiranthus Cheiri*—our Wallflower. So far we may feel on safe ground. We now come to the question as to whether IBN AL AWAM'S statement also has reference to the Stock. The Spanish rendering makes a definite assertion concerning the Wallflower *and the Wallflower alone* (“*El amarillo es muy endeble*”—the yellow kind is very weak), without making or implying a comparison with any other form. For although the word used in the title of the article and understood after the word *amarillo*, viz. *alhelí*, like the French *giroflée*, covers both Wallflower and Stock, the introduction of the descriptive term *amarillo* (yellow) in the present context definitely excludes the Stock in this case. CLÉMENT-MULLET, on the other hand, renders the Arabic word translated by him as “double” in the comparative (“*plus double que les autres*”—more double than the others). We may put the position briefly thus:—If the author intended a statement in the absolute form as BANQUERI has it, then we have no case for the double Stock; but if the French version is correct the case for the Stock needs further investigation. It will therefore be well to see what else IBN AL AWAM has to say about *al Kheiri*.

We find a passing reference to the plant in an earlier chapter (chap. xv.) devoted to the consideration of some curious practices, among which is included a method for obtaining variegated flowers. Under the heading “Process applicable to the *giroflée* according to the book of properties of Madainy” (Sp. Madianita) appears the following instruction: When one wishes the flowers of the *giroflée* to be variegated one takes a slender shoot of the red *giroflée*, another like it of the white *giroflée*, or two young shoots of both colours; one twists them as one would a string, one plants and waters with care, and the flowers which result come variegated, very beautiful and pleasing in appearance (Fr. tr. T. I. p. 615, Sp. tr. P. I. p. 655). CLÉMENT-MULLET evidently takes the view that this article has reference solely to the Wallflower, and to leave no doubt on the point he adds in brackets the Linnean name *Cheiranthus Cheiri*. But the mention of white as one of the two colours to be selected in the operation described presents a certain difficulty in the way of accepting this interpretation. The mention of red, if Wallflowers were intended, would cause us no surprise, for red or “bloody” is commonly given by English writers as one of the colours characteristic of the Wall-

* See later, p. 33.

† Also spelt *Kheyri* and *Keyri*.

flower (see, e.g., William Hanbury 1770,* John Rea, 1665.†) ROBINSON ‡ describes a dark crimson as an old form with flowers nearly black which has now become almost extinct. But a pure white form, as distinct from cream or pale yellow, is not known in *Cheiranthus* to-day. It is true that the mention of a white form occurs persistently in the writings of various botanists from CAMERARIUS § (1588) onwards.¶ Even as late as 1824 GREEN ¶¶ mentions a white type in the list of principal varieties of *Cheiranthus Cheiri*, all of which he says occur both as singles and doubles. But it is to be noted that nearly all these authors emphasize the greenness of the leaves of this white-flowered plant, and notwithstanding the statement of REA that there is a true white Wallflower as well as a white Stock-Gilliflower and that the two can be distinguished by their scent, we are led to infer that this white plant to which reference is so frequently made was in fact a Stock. The evidence of REA himself that the leaves of this plant are as green or greener than those of the yellow Wallflower, and of C. BAUHIN that the leaves are glabrous, shining, and thick, point almost certainly to this conclusion—a view which is confirmed by the further statement of the last-named author that the smell is somewhat sweet in the evening. We may, I think, safely regard these statements as all having reference to a white-flowered Stock of the wallflower-leaved class.** The wallflower-leaved form is generally believed to have been introduced into Western Europe from the Grecian Archipelago, though at what date is unknown. On this view we arrive at the further conclusion that there being no clear evidence as to the existence, either now or in the past, of a pure white Wallflower, the plants referred to by IBN AL AWAM in the article in question are probably neither of them Wallflowers, as supposed by CLÉMENT-MULLET, but Stocks,†† since we are told of no difference

* *A Complete Body of Planting and Gardening*, vol. i.

† *Flora, Ceres, et Pomona*.

‡ *The English Flower Garden*, 3rd edition, 1893.

§ *Hortus Medicus* in which is mentioned another (kind) more rare with leaf quite green, flowers white, somewhat fragrant, &c.

¶ See C. Bauhin (*Phytopinax*, 1598), who says that he is led to place this form which smells at night with the Wallflower rather than with the Stock on account of the greenness of the leaves; Parkinson, *Paradisus terrestris*, 1629, who mentions a sort with flowers of a very white colour, having a faint or weak scent; Gerarde (*The Herbal*, 2nd edit. 1636), who speaks of a kind with very green leaves and pure white well-smelling flowers; J. Bauhin (*Historia Plantarum*, 1651), who quotes from Camerarius and adds that the leaves are of a shining green; John Rea, *Flora, Ceres, et Pomona*, 1665, who lists both single and double white Wallflowers, the leaves of which are as green or greener than those of the yellow form, and the flowers of a fair white colour; he adds that there is also a sort of double white Stock-Gilliflower raised from seeds which on account of its green leaves is called by some the white Wallflower, but that any who are familiar with the different scents of the Wall- and Stock-Gilliflower will be able thereby to distinguish the one from the other.

See also Ray, *Historia Plantarum*, 1686, *loc. cit.* p. 781: Hanbury, *loc. cit.* p. 437: Miller, *Gardening Dictionary*, vol. i. 1797.

¶¶ *The Universal Herbal*, 2nd edition.

** The whole plant in this case is glabrous, and the leaves of a bright shining green (hence the name) instead of greyish white as in the hoary type.

†† It needs scarcely to be mentioned that variegation is a common phenomenon among Stocks normally self-coloured, even if the plants are not subjected to any such treatment as that recommended by the writer quoted by Ibn al Awam. Its occurrence, which with us is most common at the beginning and end of

between them except that of colour. But if the reference here is to Stocks it *may* be that the statements to be found in other parts of the "Book of Agriculture" in regard to the *kheiri* were intended to apply to the Stock as well as the Wallflower.

We find a good deal of further information in chapter xxvii., the subject of which is "The Culture of Aromatic and Sweet-smelling Plants, such as the *Kheiri*, the Lily, the Water-lily, the Bupthalmum, the Narcissus, the Chrysanthemum or Matricaria, the *Althaea*,* the Sweet Basil, and other plants of the kind." Article 1 deals with the culture of the *kheiri* (Fr. tr. T. II. p. 256, Sp. tr. P. II. p. 266). Clément-Mullet appends a note here to the effect that the Arabic name *kheiri* is synonymous with *Cheiranthus* in general,† i.e. *giroflée* in all its colours. He then proceeds to ask the question—"Are we to take it that *giroflées* are intended by the *Leucoion* of DIOSCORIDES (lib. 3, cap. 138), the *Viola* of PLINY (xxi. 14), and the *Ion* of the Geoponics (xi. 22)?"—and answers it with the remark that M. FÉE doubts it, and that he himself shares that view. In my earlier account I ventured to express the contrary opinion that both the Wallflower and the Stock are intended by DIOSCORIDES in his description of *Leucoion*.‡ This question, however, is not vital to our present purpose.

The above-mentioned article on the *kheiri* proceeds to state that according to a certain Arab writer, ABOU'L KHAÏR, there are eight kinds in cultivation, viz.:

(1) The *kheiri* of gardens, which is well known, the flower of which is purple (Fr. tr. *purpurine*, Sp. tr. *purpúreo*).

(2) The *kheiri* of gardens with flowers white.

(3) The *kheiri* with yellow flowers.

(4) The *kheiri* with flowers variegated red and white.

(5) The *kheiri* with flowers of a violet (? = purple) tint (Fr. tr. *violacée*, Sp. tr. *turquesada*).

(6) The *kheiri* with flowers of a very deep red.

(7) The *kheiri* with flowers dingy (tawny) yellow.

(8) The *kheiri* with sky-blue flowers.

In addition to these eight forms there is, he adds, a wild *kheiri* the flower of which is purplish and small, and also the one known more particularly under the name of the water *kheiri* with purple

the flowering season, is usually attributed to unfavourable conditions such as damp and cold, conditions less prevalent in the Mediterranean region, where possibly the greater rarity of the phenomenon may have been the reason why efforts were made to induce it artificially.

* I have rendered the *rose de Chine* of Clément-Mullet (*rosa chinensis* of Banqueri) simply by the genus. As to the species here intended see discussion of the subject in another work by Clément-Mullet, "Études sur les noms Arabes de diverses familles de végétaux."—*Journal Asiatique*, 1870, p. 45.

† It may be mentioned in passing that Stocks and Wallflowers were included together under the Linnean name *Cheiranthus* until as late as 1812, when Robert Brown divided the genus and gave the name of *Matthiola* to the Stock. In Linnæus' *Species Plantarum* the garden Stock appears as *Cheiranthus incanus*.

‡ The work of Dioscorides here referred to is his *Materia Medica*, supposed to have been written in the first century of the Christian era, a manuscript copy of which is preserved at Vienna. A facsimile reproduction of this manuscript, which is illustrated by drawings, published in 1906, now renders this work more accessible.

flowers. The method of cultivation, he remarks, is the same for all. There follow instructions quoted from two other writers, IBN HEDJADJ and IBN AL FAÇEL (referred to by BANQUERI under his other name, ABU ABDALAH), as to the time of year at which the seeds of the different forms should be sown, and then the remark, also on the authority of IBN AL FAÇEL, which has been differently rendered by IBN AL AWAM'S two translators, and which forms the subject of the present discussion. In the preface to his work (p. 77) CLÉMENT-MULLET mentions that we have no precise information as to the time at which IBN AL FAÇEL lived, but that ERN. MEYER ("Geschichte der Botanik") concludes that he must have lived before the year 1074, since Ibn Hedjadj, by whom he is quoted, lived about this period and composed his work on Agriculture in the year 1073 or 1074. Further on (Fr. tr. p. 258, Sp. tr. p. 268) IBN AL AWAM quotes from another writer, the Greek KASTOS, who mentions seven different kinds of *kheiri*, of which six, he says, are well known, but the seventh, of foreign origin, is little known. Of this seventh form Kastos remarks that it is like the others, though it differs from them in colour and perfume. It is black (very deep red) in that half of the petals which is exposed to view; the other half, which ends in the claw, is white. It is overspread with a yellow tint. Its scent has a strong and more agreeable aroma than that of the other kinds except the red *kheiri*. It is indeed more perfumed and more vigorous, supporting better want of water and other accidents which may attend it. Oil is obtained from this form. On the next page we find the statement that the *kheiri* lends itself to being grafted, and the flower is then at once affected by the colour and the nature of the form grafted. But, adds IBN AL AWAM, this graft is difficult and the operation demands great skill. He makes the further interesting comment that the five kinds which are not yellow can be grafted on the yellow form. The graft shoots and one obtains a hybrid. That Wallflowers of different colours are referred to by each of these writers under the name *kheiri* seems certain. All mention one or more forms as being yellow in colour, and we have the further evidence of Kastos in regard to the preparation of an oil.* The point which remains in doubt is whether there is ground for supposing that Stocks are also referred to here.

As regards the list of different coloured forms quoted from ABOU'L KHAÏR, we may clearly leave out of account No. 8, described as sky-blue. Many of the early writers included under the name *Leucoion* (*Viola*) a bulbous Monocotyledon which is presumed to have been *Leucojum aestivum*. This is perhaps the plant referred to here. No. 3 is undoubtedly a Wallflower, and very probably Nos. 6 and 7 are also. For although as regards No. 6 the colour (red) might indicate

* In this connexion see GERARDE (*The Herball*, p. 371 (1597)), who, quoting from Dioscorides' account of *Leucoion*, says of the Wallflower that the juice was used "mixed with some unctuous or oilie thing, and boiled to the forme of a lymiment." Parkinson (*loc. cit.*) also notes that the plant is generally called *Kheiri* or *Cheiri* by apothecaries because they make therefrom an oil—cheirinum.



FIG. 6.—ONE OF THE LATERAL GORGES ON THE EAST FLANK OF THE TALI RANGE, LOOKING WEST AT AN ALTITUDE OF 9,000 FEET. THE BACKBONE OF THE RANGE IN THE BACKGROUND IS 14,000 FEET.

[To face p. 32.]



FIG. 7.—PLEIONE DELAVAYI Rolfe.



FIG. 8.—*BUDDLEIA FORRESTII* Diels.

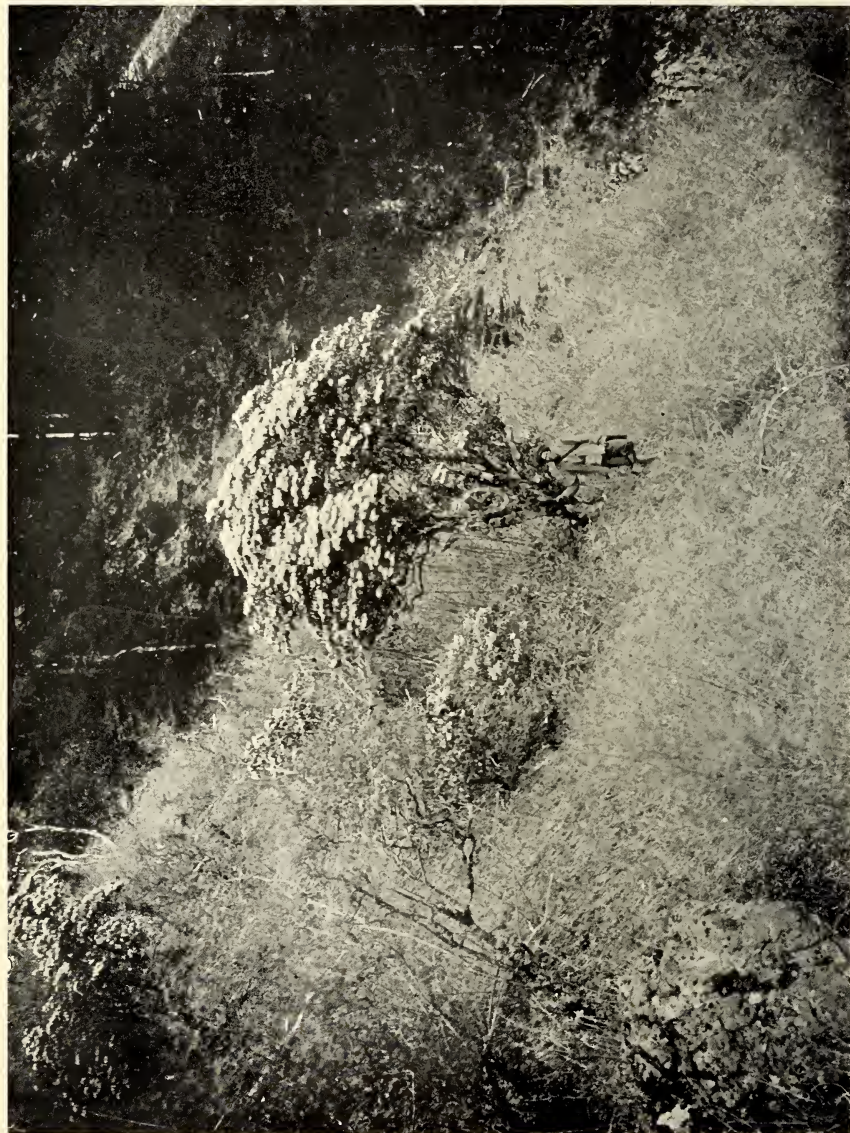


FIG. 9.—RHODODENDRON OREOTREPHES W. W. Smith.

either a Wallflower or a Stock (see the article in chap. xv. discussed above), the description "very deep red" (Fr. tr. *rouge foncée*, Sp. tr. *bermejo muy subido*) points rather to the old blood-red strain of Wallflower (see above, p. 30). Nos. 1, 2, and 4, one may well believe, refer to the purple, white, and red varieties of *Matthiola incana*. In both coloured forms we are familiar with the phenomenon of *fleurs panachées*—flowers variegated owing to the appearance of white streaks or patches. No. 5 is perhaps another shade of purple Stock, as several are known to-day among the garden strains. If then we accept the view, and we can hardly do otherwise, that Stocks as well as Wallflowers are included in ABOU'L KHAÏR'S list, and hence that the statement of IBN AL AWAM in regard to grafting the non-yellow on the yellow form possibly indicates that attempts were made to graft one genus on the other, we can well understand the statement of the latter author that the operation was a difficult one to carry out successfully.

As to grafting, we have evidence that the operation was practised in very early times. IBN AL AWAM devotes a whole chapter (chap. viii.) to this subject. Grafting of Stocks appears to have been a common custom until comparatively recently. BLAKE,* for example, writing of Stock-Gilliflowers [i.e. *Matthiola incana*] says "there are subtle wayes of grafting them, the effect of it is to have two severall colours of one stock [i.e. stem], it is done in manner as I told you of the Cornation-Gilliflowers [i.e. Carnations], so of these, and with a great deal more ease you may obtain your desire." We see the same motive at this later date as in the time of IBN AL AWAM—the desire to produce a curiosity. But in none of the statements of these Arabic writers concerning grafting and the number of different colour forms do we find any remark which sheds further light on the question at issue, viz. whether the double Stock as well as the double Wallflower was known and in cultivation at this early date. It only remains, therefore, to summarize the conclusions to be drawn from the arguments here set forth.

Conclusions :—

1. It seems fairly clear that, as was the case up to little more than a century ago, Stocks and Wallflowers were not distinguished from one another in the Arab writings under consideration, but were both grouped together under a common name (*kheiri*).

2. Our view as to whether the double form of either genus is referred to in the "Book of Agriculture," a work in Arabic written by Ibn al Awam in the twelfth century, depends upon the view which we take of a particular passage which has been rendered differently by the two writers J. C. Banqueri and J. J. Clément-Mullet, who have translated the Arabic into Spanish and French respectively.

3. It appears beyond doubt that the statement contained in the passage in question has reference to the yellow Wallflower (*Cheiranthus Cheiri*).

* *The Compleat Gardener's Practice*, p. 64, 1664.

4. Banqueri's rendering describes the yellow *kheiri* as "very weak." Clément-Mullet's version is that it is "more double than the others." There is thus a difference of opinion on two points: (1) whether the *character* alluded to in the original is weakness or doubleness, and (2) whether the *form* of the statement in regard to this character implies a comparison of one plant with another. Both writers interpret the concluding half of the sentence as stating that (owing presumably to the condition described) seed is said not to be set.

5. With regard to the first point of difference mentioned under (4), Banqueri's view that the allusion here is to "weakness" accords ill both with our knowledge of the character of the Wallflower as we are familiar with it to-day, and also with various other statements occurring later in the book.

6. Clément-Mullet's interpretation of the passage as having reference to "doubleness," not "weakness," on the other hand, receives great support from the fact that the original old-fashioned double Wallflower was so fully double as to be incapable of producing seed, and the succeeding comment of the writer in regard to seedlessness is therefore entirely in accord with the facts, and is precisely the statement which we might expect to follow any reference to this form. This very remark appears repeatedly in the descriptions of the double Wallflower in sixteenth and seventeenth century Herbals.

7. We may then conclude with some certainty that the double Wallflower was known and in cultivation not only as far back as the twelfth century, which is the date assigned to Ibn al Awam's work, but even before the end of the eleventh century, since the statements in Ibn al Awam's book on which our evidence rests are based on the authority of another writer whose work is supposed to have been written about 1073.

8. There is only very questionable ground for supposing that we also have here a reference to the double Stock. If in regard to the *form* though not the *substance* of the passage under discussion Banqueri's version is correct, then clearly we have no evidence for the existence of the double Stock at this date. Furthermore, even if Clément-Mullet's rendering is accepted *both* in form *and* substance, there is still the uncertainty whether a comparison is intended between one form of double Wallflower and another, or between the double Wallflower and the double Stock, since both genera are included under the same name, and more than one form, if our identifications are correct, is mentioned in each case. The original text, on any interpretation therefore, leaves us without decisive evidence on this point.

9. On the view here advanced we have a reference to the double Wallflower earlier by some five hundred years than that quoted in my previous paper. We therefore need to reverse the chronological order in which the double Wallflower and the double Violet stand in the list there given, and thus give first place to the double Wallflower.

A CENTURY OF CERTIFICATED PLANTS INTRODUCED FROM CHINA BY ERNEST H. WILSON, V.M.H.

[THE following list of one hundred plants which have received certificates, with the corrections of the names which research has shown to be necessary, has been compiled by Mr. E. H. WILSON, V.M.H., now of the Arnold Arboretum, Boston, U.S.A., through whom they were introduced to cultivation. It reflects credit alike upon the enterprise and prescience of those who organized the expeditions and upon the energy and perspicacity of the collector.—ED.]

Date.	Name exhibited under.	Award.	Authentic Name.
Oct. 18, 1904	<i>Aconitum Wilsonii</i>	A.M.	<i>Aconitum Wilsonii</i> Stapf
May 28, 1907	<i>Actinidia chinensis</i>	A.M.	<i>Actinidia chinensis</i> Planch.
Aug. 5, 1902	<i>Astilbe chinensis</i> var. <i>Davidii</i>	F.C.C.	<i>Astilbe Davidii</i> Henry
July 18, 1905	<i>Astilbe grandis</i>	A.M.	<i>Astilbe grandis</i> Stapf
Sept. 23, 1913	<i>Berberis aggregata</i>	A.M.	<i>Berberis aggregata</i> Schneid.
Aug. 31, 1915	<i>Berberis Sargentiana</i>	A.M.	<i>Berberis Sargentiana</i> Sch.
Oct. 8, 1912	<i>Berberis Stapfiana</i>	A.M.	<i>Berberis Stapfiana</i> Schneid.
Oct. 24, 1911	<i>Berberis verruculosa</i>	A.M.	<i>Berberis verruculosa</i> Hemsl. and Wils.
Oct. 15, 1907	<i>Berberis Wilsonae</i>	F.C.C.	<i>Berberis Wilsonae</i> Hemsl.
Jan. 23, 1906	<i>Buddleia asiatica</i>	F.C.C.	<i>Buddleia asiatica</i> Lour.
Dec. 19, 1911	<i>Buddleia officinalis</i>	A.M.	<i>Buddleia officinalis</i> Maxim.
Aug. 30, 1910	<i>Buddleia variabilis gigantea</i>	A.M.	<i>Buddleia Davidii</i> var. <i>gigantea</i> Wils.
Aug. 15, 1905	<i>Buddleia variabilis</i> var. <i>magnifica</i>	F.C.C.	<i>Buddleia Davidii</i> var. <i>magnifica</i> Rehd. and Wils.
Aug. 19, 1902	<i>Buddleia variabilis</i> var. <i>Veitchiana</i>	F.C.C.	<i>Buddleia Davidii</i> var. <i>Veitchiana</i> Rehd. and Wils.
April 2, 1912	<i>Camellia cuspidata</i>	A.M.	<i>Thea cuspidata</i> Kochs
April 7, 1914	<i>Clematis Armandi</i>	F.C.C.	<i>Clematis Armandi</i> Franch.
May 23, 1905	<i>Clematis montana</i> var. <i>rubens</i>	F.C.C.	<i>Clematis montana</i> var. <i>rubens</i> Wils.
Oct. 24, 1911	<i>Clerodendron Fargesii</i>	A.M.	<i>Clerodendron trichotomum</i> var. <i>Fargesii</i> Rehder
Aug. 1, 1911	<i>Cornus paucinervis</i>	A.M.	<i>Cornus paucinervis</i> Hance
Mar. 5, 1912	<i>Corylopsis warleyensis</i>	A.M.	<i>Corylopsis Willmottiae</i> Rehd. and Wils.
Mar. 19, 1912	<i>Corylopsis Veitchiana</i>	A.M.	<i>Corylopsis Veitchiana</i> Bean
June 10, 1902	<i>Corydalis thalictrifolia</i>	F.C.C.	<i>Corydalis thalictrifolia</i> Franch.
April 11, 1905	<i>Corydalis Wilsonii</i>	A.M.	<i>Corydalis Wilsonii</i> N.E.Br.
Oct. 1, 1907	<i>Cotoneaster appplanata</i>	A.M.	<i>Cotoneaster Dielsiana</i> Pritzel
Oct. 8, 1912	<i>Cotoneaster bullata</i> var.	A.M.	<i>Cotoneaster bullata</i> var. <i>macrophylla</i> Rehd. and Wils.

Date.	Name exhibited under.	Award.	Authentic Name.
Aug. 27, 1912	<i>Cotoneaster divaricata</i>	F.C.C.	<i>Cotoneaster divaricata</i> Rehd. and Wils.
Jan. 12, 1916	<i>Cotoneaster horizontalis</i> var. <i>perpusilla</i>	A.M.	<i>Cotoneaster horizontalis</i> var. <i>perpusilla</i> Schneid.
Jan. 24, 1905	<i>Cotoneaster pannosa</i>	A.M.	<i>Cotoneaster Harroviana</i> Wils.
Oct. 8, 1912	<i>Cotoneaster salicifolia</i> var. <i>rugosa</i>	A.M.	<i>Cotoneaster salicifolia</i> var. <i>rugosa</i> Rehd. and Wils.
Oct. 8, 1912	<i>Cotoneaster Zabelii</i>	A.M.	<i>Cotoneaster Zabelii</i> Schneid.
Aug. 31, 1915	<i>Cydonia Mallardii</i>	A.M.	<i>Chaenomeles lagenaria</i> var. <i>Wilsonii</i> Rehd.
May 28, 1907	<i>Cypripedium tibeticum</i>	F.C.C.	<i>Cypripedium tibeticum</i> King
May 23, 1911	<i>Davidia involucreta</i>	F.C.C.	<i>Davidia involucreta</i> var. <i>Vil-</i> <i>moriniana</i> Hemsl.
Apr. 30, 1912	<i>Deutzia longifolia</i>	A.M.	<i>Deutzia longifolia</i> Franch.
May 22, 1912	<i>Deutzia Veitchii</i>	A.M.	<i>Deutzia longifolia</i> var. <i>Veitchii</i> Rehd.
June 9, 1908	<i>Deutzia Wilsonii</i>	A.M.	<i>Deutzia Wilsonii</i> Duthie
Aug. 31, 1909	<i>Gentiana ornata</i>	A.M.	<i>Gentiana Veitchiorum</i> Hemsl.
May 22, 1912	<i>Hydrangea Sargentii</i>	A.M.	<i>Hydrangea Sargentiana</i> Rehd.
Sept. 1, 1908	<i>Ilex Peryni</i>	F.C.C.	<i>Ilex Peryni</i> Franch.
June 3, 1914	<i>Iris chrysographes</i>	A.M.	<i>Iris chrysographes</i> Dykes
Aug. 1, 1911	<i>Itea ilicifolia</i>	A.M.	<i>Itea ilicifolia</i> Oliver
Mar. 10, 1903	<i>Jasminum primulinum</i>	F.C.C.	<i>Jasminum primulinum</i> Hemsl.
Aug. 5, 1902	<i>Libocedrus macrolepis</i>	F.C.C.	<i>Libocedrus macrolepis</i> Benth.
Oct. 11, 1910	<i>Ligustrum Henryi</i>	A.M.	<i>Ligustrum Henryi</i> Hemsl.
Sept. 23, 1902	<i>Lilium Brownii</i> var. <i>chloraster</i>	A.M.	<i>Lilium chloraster</i> Wils.
Aug. 29, 1905	<i>Lilium leucanthum</i>	F.C.C.	<i>Lilium Sargentiae</i> Wils.
May 22, 1912	<i>Lilium myriophyllum</i>	A.M.	<i>Lilium regale</i> Wils.
July 6, 1915	<i>Lilium regale</i>	F.C.C.	<i>Lilium regale</i> Wils.
July 18, 1905	<i>Lilium sutchuenense</i>	A.M.	<i>Lilium Thayerae</i> Wils.
July 2, 1912	<i>Lilium warleyense</i>	F.C.C.	<i>Lilium sutchuenense</i> Franch.
June 11, 1907	<i>Lonicera Maackii</i>	A.M.	<i>Lonicera Maackii</i> var. <i>pod-</i> <i>carpa</i> Franch.
Oct. 24, 1911	<i>Lonicera nitida</i>	A.M.	<i>Lonicera nitida</i> Wils.
Apr. 5, 1910	<i>Lonicera pileata</i>	A.M.	<i>Lonicera pileata</i> Oliver
May 20, 1913	<i>Lonicera tragophylla</i>	A.M.	<i>Lonicera tragophylla</i> Hemsl.
July 30, 1912	<i>Lysimachia Henryi</i>	A.M.	<i>Lysimachia Henryi</i> Hemsl.
Aug. 12, 1913	<i>Lysionotus warleyensis</i>	A.M.	<i>Lysionotus pauciflorus</i> Maxim.
July 1, 1913	<i>Magnolia Delavayi</i>	F.C.C.	<i>Magnolia Delavayi</i> Franch.
Apr. 25, 1905	<i>Meconopsis integrifolia</i>	F.C.C.	<i>Meconopsis integrifolia</i> Franch.
May 9, 1905	<i>Meconopsis punicea</i>	F.C.C.	<i>Meconopsis punicea</i> Maxim.
June 8, 1915	<i>Micromeles Folgneri</i>	A.M.	<i>Sorbus Folgneri</i> Rehder
Oct. 7, 1913	<i>Paulownia tomentosa</i> var. <i>lanata</i>	A.M.	<i>Paulownia tomentosa</i> var. <i>lanata</i> Schneid.
Sept. 22, 1914	<i>Pilostegia viburnoides</i>	A.M.	<i>Pilostegia viburnoides</i> Hook. f. and Thoms.
Sept. 15, 1908	<i>Populus lasiocarpa</i>	F.C.C.	<i>Populus lasiocarpa</i> Oliver
Apr. 16, 1907	<i>Primula Cockburniana</i>	A.M.	<i>Primula Cockburniana</i> Hemsl.
May 9, 1905	<i>Primula japonica</i> var. <i>pulverulenta</i>	A.M.	<i>Primula pulverulenta</i> Duthie
May 9, 1905	<i>Primula Veitchii</i>	A.M.	<i>Primula Veitchii</i> Duthie
May 23, 1905	<i>Primula vittata</i>	A.M.	<i>Primula vittata</i> Bur. and Franch.

Date.	Name exhibited under.	Award.	Authentic Name.
Apr. 2, 1912	<i>Primula warleyensis</i>	A.M.	<i>Primula warleyensis</i> Willmott
Jan. 5, 1915	<i>Pyracantha crenulata</i>	A.M.	<i>Pyracantha crenulata</i> Roemer
Oct. 8, 1912	<i>Pyrus Veitchiana</i>	A.M.	<i>Malus yunnanensis</i> Schneid.
Apr. 21, 1903	<i>Rehmannia angulata</i>	A.M.	<i>Rehmannia angulata</i> Hemsl.
Feb. 10, 1914	<i>Rhododendron moupinense</i>	A.M.	<i>Rhododendron moupinense</i> Franch.
Apr. 3, 1907	<i>Rhododendron intricatum</i>	F.C.C.	<i>Rhododendron intricatum</i> Franch.
Mar. 22, 1910	<i>Rhododendron primulinum</i>	A.M.	<i>Rhododendron flavidum</i> Franch.
May 18, 1909	<i>Rhododendron Souliei</i>	F.C.C.	<i>Rhododendron Souliei</i> Franch.
Feb. 20, 1912	<i>Ribes laurifolium</i>	A.M.	<i>Ribes laurifolium</i> Jancz.
June 20, 1905	<i>Rodgersia pinnata alba</i>	A.M.	<i>Rodgersia pinnata</i> var. <i>alba</i> Duthie
June 9, 1908	<i>Rosa Moyesii</i>	A.M.	<i>Rosa Moyesii</i> Hemsl. and Wils.
Oct. 15, 1915	<i>Rubus Veitchii</i>	A.M.	<i>Rubus thibetanus</i> Franch.
June 3, 1913	<i>Salix magnifica</i>	A.M.	<i>Salix magnifica</i> Hemsl.
Aug. 19, 1902	<i>Senecio clivorum</i>	A.M.	<i>Senecio clivorum</i> Maxim.
July 18, 1905	<i>Senecio Ligularia</i> var. <i>speciosa</i>	A.M.	<i>Senecio Veitchianus</i> Hemsl.
Sept. 15, 1903	<i>Senecio tanguticus</i>	A.M.	<i>Senecio tanguticus</i> Maxim.
July 29, 1913	<i>Sorbaria arborea</i> var. <i>grandis</i>	A.M.	<i>Sorbaria arborea</i> var. <i>subtomentosa</i> Rehd.
June 17, 1913	<i>Spiraea Sargentiana</i>	A.M.	<i>Spiraea Sargentiana</i> Rehd.
July 20, 1909	<i>Spiraea Veitchii</i>	A.M.	<i>Spiraea Veitchii</i> Hemsl.
May 20, 1913	<i>Styrax Wilsonii</i>	A.M.	<i>Styrax Wilsonii</i> Rehd.
May 5, 1914	<i>Syringa reflexa</i>	A.M.	<i>Syringa reflexa</i> Schneid.
Aug. 18, 1908	<i>Thalictrum diptero- carpum</i>	A.M.	<i>Thalictrum diptero- carpum</i> Franch.
Mar. 26, 1912	<i>Viburnum Davidii</i>	A.M.	<i>Viburnum Davidii</i> Franch.
Sept. 27, 1910	<i>Viburnum Henryi</i>	F.C.C.	<i>Viburnum Henryi</i> Hemsl.
Sept. 17, 1907	<i>Viburnum rhytidophyllum</i>	F.C.C.	<i>Viburnum rhytidophyllum</i> Hemsl.
Sept. 1, 1903	<i>Vitis armata</i>	A.M.	<i>Vitis Davidii</i> Foëx
Oct. 23, 1906	<i>Vitis armata Veitchii</i>	A.M.	<i>Vitis Davidii</i> var. <i>cyano- carpa</i> Sargent
Sept. 1, 1903	<i>Vitis flexuosa Wilsonii</i>	A.M.	<i>Vitis flexuosa</i> var. <i>parvi- folia</i> Gagn.
May 29, 1906	<i>Vitis Henryana</i>	A.M.	<i>Parthenocissus Henryana</i> Diels and Gilg.
Oct. 1, 1907	<i>Vitis leeoides</i>	A.M.	<i>Ampelopsis Watsoniana</i> Wils.
Sept. 1, 1903	<i>Vitis megalophylla</i>	A.M.	<i>Ampelopsis megalophylla</i> Diels and Gilg.
Sept. 1, 1903	<i>Vitis sinensis</i>	A.M.	<i>Vitis Piasezkii</i> Maxim.
Sept. 1, 1903	<i>Vitis Thomsonii</i>	F.C.C.	<i>Parthenocissus Thomsonii</i> Planch.
Sept. 28, 1909	<i>Vitis Wilsonae</i>	A.M.	<i>Vitis reticulata</i> Gagn.

A brief analysis of this list may be of interest. It shows that fifty-three genera belonging to twenty-nine families are represented, and that they include herbs, shrubs, climbers, and trees of value for their flowers, their ornamental fruits, or for their foliage. All are hardy in some part or other of the British Isles, and the great majority are perfectly hardy everywhere in Great Britain and Ireland. There

are twenty-seven herbs, of which six are best treated as biennials. Of the woody plants forty-six are deciduous and twenty-seven are evergreen, and of these fifty-two are shrubs, fourteen are climbers, and seven are trees. All the plants exhibited were raised from material which I collected in China, but it is known that eleven of them were or had been introduced to cultivation independently. The percentage of one **F.C.C.** to three **A.M.** is a high average, and it will readily be conceded that with scarcely an exception the plants are of permanent value to our gardens. In addition to those enumerated several other plants have been awarded the **B.C.**, and in the hands of the hybridist the *Astilbes* and *Primulas* have yielded results which have received awards.

NOTES ON THE FLORA OF NORTH-WESTERN
YUNNAN.

By GEORGE FORREST.

THE flora of North-west Yunnan is so rich and varied, the area so extensive, the mountain and river systems so complicated, that it is a matter of no small difficulty to select one portion in illustration of the whole. The region includes the watersheds of the mid-Salwin, Mekong, and Yangtze; those watersheds are broken into an indescribable chaos of subsidiary ranges and spurs, many of them bearing species which are purely local. Much of the area is still unknown, or at least unmapped.

It is a marvellous country, planned on Nature's grandest scale, prodigal in flora and fauna, rich in minerals; for gold, silver, galena, copper, iron, and coal are found on every side. Numerous tribes, nearly all of Tibetan origin, people it, settled in the valleys and on the ridges as far south as lat. 25° N., the diversity of whose customs, languages, and religions is truly remarkable. Like the slopes of the Caucasus, the region might be called the country of the hundred nations, and is worthy of the most thorough exploration by competent ethnologists.

All of the principal ranges, which fall away from the Tibetan plateau and enclose those three great rivers, run due south as far as mid-Yunnan, at which point the divergence eastwards of the Yangtze causes a break in the regular contour of the country.

As is now generally known, the formation of those ranges is purely limestone, a hard grey magnesian limestone, and that possibly accounts in great measure for the exceptional richness and high development of the vegetation. Only in the principal and deepest valleys—the Salwin, Mekong, and Yangtze—are other strata exposed in places, and in descending to those one immediately leaves the most interesting flora behind.

In the higher valleys, above 6,000 feet, and the still higher plateaux, the soils consist of heavy reddish clay marls, gritty limy clays and loams, and lime silts and cements. Quite a number of those valleys, even at an altitude of 9,000 feet, show signs of having been at some period the sites of extensive lakes; evidence, in the shape of deep, extremely durable, and barren lacustrine deposits, being abundant.

On the rolling downs, which are characteristic of the country in the centre, east, and south-east of the province, the clay marls and heavy loams are general; in the opposite direction, north-westwards, the farther one travels the more evident is the limestone, till, north of lat. 26° , it becomes dominant.

From the Burmese frontier in the south-west, and running across the province in a north-easterly direction into Szechwan, is a narrow volcanic belt, easily defined by numerous boiling springs and local seismic disturbances. The water of the springs is heavily charged with sulphur and other minerals, has certain medicinal properties, and is largely utilized by the local Chinese in the cure of many ailments. This volcanic belt can also be traced by many species peculiar to it, such as *Ilex Pernyi*, *Eremurus chinensis*, forms of *Lilium Brownii*, giant Lobelias, *Primula malacoides*, and many lovely species of the families Liliaceae, Scitamineae, and Orchidaceae.

The Tali range, in the Mekong basin and within this volcanic area, is one of the most prolific of the west. For forty miles it forms the western bulwark of the Tali valley, enclosing the beautiful lake called Erh-hai. Owing to its great bulk acting as a rain-screen, the rainfall on the western flank is greatly in excess of that on the eastern side. As a result the vegetation on the west is much more luxuriant and of quite a different character. Though on both flanks there is a decided pine belt from about 10,000 to 12,000 feet, the spurs and ridges on the east, from their bases to the higher alps, are mostly of a pastoral character, with the arborescent vegetation confined to the gullies and lateral valleys (fig. 6). On the west the vegetation is principally arborescent, so dense in places as to be almost impenetrable; it attains a much greater altitude, and is carried right to the base. That part of the range has never been explored to any extent, and, judging by the results of two short and hasty journeys in 1906, and one in recent years, the collections of which are so far undetermined, it carries many interesting and new species. During these journeys were found the following: *Buddleia myriantha*, a shrub of 10 feet, allied to *B. variabilis*, but with deeper-coloured blooms; a new *Berberis*, named *B. centifolia*, an excellent rock shrub of 2-5 feet, with charming yellow blooms, and an interesting new species of *Diapensia*, *D. Bulleyana*, also a rock shrub, and peculiar in having bright yellow flowers instead of the normal purple-red. *Leptodermis glauca*, a dwarf shrub 2 feet in height with beautiful lavender flowers, was also rediscovered. There also, in moist open situations amongst scrub, was found the beautiful *Pieris Forrestii* with its pure waxy-white fragrant blooms. On the cliffs the dominant shrub was *Rhododendron crassum*, its large white fragrant blossoms showing most freely. Many fine herbaceous plants were secured; in the shady gorges the damp moss-covered boulders and cliffs bore many terrestrial Orchids, such as *Pleione Delavayi* (fig. 7), with purplish-rose flowers marked a deep crimson; *P. grandiflora*, with snow-white blooms blotched a deep crimson-lake; and a remarkably fine new species, *P. Forrestii*, having orange-yellow blooms laced and marked deep brown. The colouring of the last is unique, the precocious flowers arising from the deep green moss having all the appearance of our yellow Crocus at first sight. A new genus of Orchidaceae was also discovered, typified by *Bulleyia yunnanensis*.



FIG. 10.—RHODODENDRON TALIENSE Fr.

[To face p. 40.]



FIG. 11.—RHODODENDRON FICTO-LACTEUM Balf. fil.
45 feet in height.



FIG. 12.—*HEMEROCALLIS NANA* sp. nov. W. W. Smith et G. Forrest.
3-6 in. Flowers, interior deep orange, exterior brown orange.
Moist pastures, 13,000 ft.



FIG. 13.—OPEN CONIFER FOREST WITH FORMS OF RHODODENDRON FORTUNEI AT 11,000 TO 12,000 FT.
[To face p. 41.]

On both flanks of the range, in common with all the mountains of north-west Yunnan, above the pine belt there is a distinct zone of *Rhododendron* forest, commencing first as isolated specimens among the outlying groups of conifers, and then as dense thickets 20 to 40 feet in height, composed of such species as *Rhododendron taliense* (fig. 10), *R. ficto-lacteum* (fig. 11), *R. anthosphaerum*, *R. Beesianum*, *R. rubiginosum*, *R. irroratum*, and the true *R. lacteum*, with its huge trusses of beautiful canary-yellow blooms. Again this belt gradually gives way to dwarf species and forms of the *R. intricatum* group which carpet the upland pasture with their fragrant foliage and purple flowers, dominating large stretches of the alps to the exclusion of all other vegetation.

Most species of *Rhododendron* are in greatest luxuriance and perfection of bloom in April and May, and are seen to best advantage in some of the lower and more sheltered passes; one such col, named the Sungkwei Pass, is on the divide between the Lang-kong and Hoching valleys, three days' journey north of Tali-fu. Of 11,000 to 12,000 feet altitude, it is a comparatively shallow depression, a broad cleft running almost east and west on the summit of the divide, two miles in extent by half a mile in breadth. The centre is occupied by a small lake, with open pasture on both sides for a short distance up the slopes. From the margins of this pasture to the tops of the low hills, about 1,000 feet higher, which enclose the pass on the south, is *Rhododendron* forest. The foreground is occupied extensively by matted masses of innumerable colour forms of *R. intricatum*, in habit resembling the *Calluna* of our own moors. Behind are thickets of *R. chartophyllum*, in a variety of shades, forming a colour belt from deepest lavender to almost white. From there to the verge of the pasture on the summit of the pass is an impenetrable forest of tree *Rhododendrons*, 20 to 45 feet in height, of such species as *R. lacteum*, *R. Bureavii*, *R. irroratum*, *R. vernicosum*, *R. ficto-lacteum* &c., with a dense undergrowth of dwarf bamboo. On the hills forming the northern side of the pass is open forest of lichen-clad evergreen oak trees 50 to 90 feet in height, and, interspersed with them, numerous superb specimens of *R. ficto-lacteum* and others. Some measured were found to be almost 50 feet high.

As one travels north of Tali the scenery increases in grandeur, many peaks of the higher ranges being capped with perpetual snow, especially those of the Lichiang system. This range, north of the Yangtze, is more contracted and rugged, forming the eastern boundary of the Chungtien plateau. The peak of Lichiang is some 20,000 feet in height, but in the Haba range, the name of the extension north of the Yangtze, there are peaks exceeding that, flanked by enormous glaciers. In 1913-14 I collected there, and amongst other things secured fully forty new species and forms of *Rhododendron*, the majority rock and cliff shrubs of dwarf form.

The contour of the Lichiang peak is, however, quite distinct from all others in the region. Rising gradually from a southern base of

8,500 feet, at the foot of which is a large lake called Lake La-hsi, in an air-line of some twenty miles is the summit. This is formed by a series of jagged-edged peaks several miles in extent, trending north-westwards. Just south of the highest point the range is cleft in two for fully half its breadth by a stupendous gorge, the upper end of which is formed by a series of precipices falling from the extreme height of the main peak to 10,000 or 11,000 feet. The entrance to the gorge, about a mile and a half in breadth, is flanked by cliffs 3,000 to 4,000 feet sheer, gradually rising towards the upper end. In length it is about six miles. From the main peaks several glaciers fall into it, huge moraines almost dam it at several points, and along the base of the flanking cliffs are continuous and extensive scree fed by the débris from the limestone cliffs above. The centre of the gorge is occupied by a snow-fed torrent, of milky whiteness from the lime carried in solution. The floor of the valley is clothed by forests of Conifers, principally *Picea yunnanensis* and others of the same genus, and *Tsuga yunnanensis*, whilst higher up the cliffs, wherever a sufficiently broad ledge gives footing, are clumps and solitary specimens of *Abies Delavayi*. Much of this forest is gradually being engulfed by the scree débris; in some places I noted quite an appreciable difference in three years.

In the forest and by the stream are a multitude of fine shrubs. Of *Lonicera* one fine new species was found, *L. xerocalyx*; others were *L. Maackii* f. *podocarpa*, *L. Henryi*, and the beautiful dwarf form of *L. ligustrina*, named *yunnanensis*. The last is not an imposing shrub in flower, but produces, in abundance, beautiful purple-blue fruits, and the small *Buxus*-like foliage has a charming appearance and is persistent. The best form of *Rosa sericea*, viz. *pteracantha*, is plentiful, striking alike in its large crimson armature and orange and red fruits. Of *Tilia*, *Acer*, *Prunus*, *Pyrus*, and *Sorbus* there are many species, *Sorbus Wilsoniana* and *Pyrus yunnanensis* being two of the finest. The latter forms a shapely tree or shrub of 20 to 50 feet, handsome in flower and fruit, and showing wonderful coloration in the foliage as autumn approaches. Following the first frosts, I know of nothing to equal the tints seen in the foliage of *Sorbus Wilsoniana*. Each tree stands out like a crimson plume, visible at quite a distance against the dark background of pines. It is a most graceful shrub, 20 to 40 feet high, with delicately-cut foliage and pinkish-white fruits. Another excellent shrub with even finer foliage and larger pure white fruits, but of stiffer and more inelegant form, is *Sorbus Vilmorinii*. *Ligustrum ionandrum* is another new species of fine compact form and small, slightly coriaceous foliage. Of *Berberis* there are many species, and the same of such genera as *Deutzia*, *Cotoneaster*, *Philadelphus*, *Hydrangea*, *Helwingia*, *Lespedeza*, *Leptodermis* (*L. Forrestii* is a new species with beautiful lavender flowers, very large for the genus), and many *Gaultherias* and *Vacciniums*. The dwarf *Vaccinium fragile* is in abundance on the forest margins, its beautiful foliage and pink flowers showing to great advantage. It fruits freely, and the purple-

black berries are the principal food, during the season, of the common pheasant of Yunnan, *Phasianus elegans*.

Caragana Franchetiana is also plentiful, especially by the stream-side, where it blooms most profusely and forms quite a handsome shrub. Another new species worthy of mention is *Euonymus porphyrea*, with graceful foliage, dark maroon flowers, and brilliant scarlet fruits. It attains a height of 20 feet and is a shade plant. In contrast to it, another handsome species, *Meliosma cuneifolia*, revels in the sunshine and is one of the freest-flowering shrubs of the region. Normal specimens are fully 20 feet in height.

Curiously enough, though on all other parts of the range Rhododendrons are very numerous, few are to be found in that gorge; only a few stunted specimens of a form of *R. Fortunei* (fig. 13) and *R. vernicosum* are seen, whilst on the cliffs are forms of *R. intricatum*.

The screes proved exceptionally rich: many fine species of Delphinium, as *D. yunnanense*, *D. ceratophorum*, *D. mosoyense*, *D. likiangense*, and two fine new species, *D. Beesianum* and *D. calcicolum*. The last three are dwarfs, *D. likiangense* the finest. It is a beautiful plant of 10 to 16 inches, with stout scapes arising from a cluster of finely cut foliage, each bearing from two to five extremely large flowers of a fine shade of deep purplish-blue, whilst, to add to its attractiveness, the blooms are sweetly fragrant.

Several species of Meconopsis are there, notably *M. Delavayi*, *M. Forrestii*, and *M. rudis* (fig. 14), the last the most abundant, with flowers of every conceivable shade of purplish-blue. Other scree plants of note are *Dipoma iberideum*, a semi-prostrate crucifer of 6 to 9 inches, with white fragrant flowers and ruddy foliage; *Dracocephalum bullatum*, with deep purple flowers; *Codonopsis Bulleyana*, with pale blue blooms marbled milky-white; and *C. Meleagris*, which has large dull yellow corollas netted maroon. *Campanula Delavayi*, also a scree plant, of 9 to 15 inches, has large pale blue flowers. Several splendid species of *Corydalis* are in abundance; Saussureas are everywhere, their brilliant tints classing not a few of them as worthy of cultivation. On the screes several dwarf species of *Caragana* have their home. Their large yellow or cream-coloured flowers, flushed brown or rose, their bright foliage and neat habit, commend them as subjects for the rock garden. *C. tibetica* is one; two others are as yet unnamed.

On the cliffs above the screes are many fine rock plants, most of the best growing in shady northern exposures. Of those *Isopyrum grandiflorum* (fig. 15) takes first place, seen growing to perfection there. It is the ideal cushion rock plant, and, as with most of the others, in the tints of its foliage shows the character of its surroundings. Saxifrages abound, many of them new, the finest being *S. pulchra*, with fleshy, silvery-grey foliage and rose-pink flowers. *Androsace alchemilloides*, with its clear white blooms, and many forms of *A. Chamaejasme* and *A. mucronifolia*, with flowers of every shade of rose and pink, adorn each ledge; whilst in moister situations are seen huge compact cushions of the beautiful *Androsace Delavayi*, with large sessile blooms,

ranging in colour from the deepest rose to the purest white. Yet another species deserving of mention is *Parrya Forrestii*, a fine crucifer having the foliage of a *Cheiranthus* and spikes of brilliant orange blooms.

Daphne aurantiaca, in sheets of orange bloom, and a fine dwarf procumbent form of *Buxus*, also occupied the ledges.

On the higher alpine meadows, from the summits of the cliffs to the verge of the snows, is an indescribable wealth of bloom, the colour scheme changing from month to month as the seasons advance. Most of the species being gregarious, absolute sheets and carpets of colour are the result. *Trollius*, *Anemone*, *Primula*, *Gentiana*, *Cremanthodium*, *Cyananthus*, blue and yellow, *Corydalis*, *Meconopsis*, *Pedicularis*, *Phlomis*, *Aster*, *Parnassia*, *Saxifraga*, *Orchis*, *Roscoea*, *Delphinium*, *Oxygraphis*, *Plectranthus*, *Salvia*, *Cerastium*, *Incarvillea*, *Morina*—these are only a few of the many genera represented. Two of the finest, seeds of which were secured in 1913, are the magnificent *Draccephalum Isabellae* and the equally beautiful *Anemone glaucifolia*. The former is a new species, 14 to 18 inches high, with foliage resembling that of *D. tanguticum*, but with very much larger blooms. Those are 2½ inches in length, of a rich shade of velvety bluish-purple, and freely produced. *Anemone glaucifolia* is a plant of 18 to 24 or even 30 inches, and was first collected by DELAVAY many years ago and described by FRANCHET. The leaves, which are pinnate, form a dense basal rosette, and, as with all other parts of the plant, are densely coated with a silvery down. The flowers are 2 to 2½ inches in diameter, and range in colour from the clearest blue to shades of purple. It is a glorious plant!

But even to enumerate the best of the species seen would require much time. Of *Primulas* alone over forty find their homes there! In two seasons I collected seeds of fully eighty species on that and the neighbouring ranges. Any attempt at more than a mere superficial description of the beauty of the scene must necessarily fail. Even the photographs, characteristic as they may be, lacking the charm of colour, come far short of the reality.

As already mentioned, the Haba Mountains, farther north-west, attain even a greater altitude, and form part of the system culminating in the north of the Chungtien plateau. On the way to Atuntze those mountains are crossed by one of the highest passes in the province, called the Bei-ma-shan, fully 16,000 feet high. For eight months of the year, from October to May, it is closed by snow. The summer is therefore very short, but, despite that, the flora is wonderfully rich and quite distinct. It was explored by me to some extent in 1913, and again in 1914, with excellent results, but as yet only a few of the new species have been dealt with. On that range *Rhododendron Wardii*, a grand species 14 to 20 feet in height, with bright yellow flowers, was first found in July 1913, as well as many others equally beautiful, such as *R. wvarifolium*, *R. Roxieana*, with rose-pink blooms, and *R. Clementinae*, with white and rose flowers. Several new *Buddleias* were added

notably *B. caryopteridifolia*, two species of *Betula*, and the interesting little *Vaccinium modestum*, a pretty dwarf species with the habit of a *Pyrola*. Another fine shrub is *Euonymus ilicifolius*, an evergreen with broad, dark-green, prickly foliage, identical with that of an ordinary holly, with inconspicuous flowers, but striking white and red fruits. One especially fine new species secured is *Ostryopsis nobilis*, a shrub of 6 to 12 feet, a most interesting addition to a genus hitherto monotypic. As a foliage plant it should take first rank amongst cultivated shrubs. It is of compact habit, the leaves are large, very broadly ovoid with base cordate, deeply bullate, dark glossy green above, the under surface heavily felted with a dark cinnamon-brown tomentum, with which the petioles and young shoots are also clothed. Several other new species of *Berberis* were collected, the three principal being *B. leptoclada*, a densely foliate rock species, of compact habit, 2 to 4 feet high, with pretty glaucous leaves, pale yellow flowers, and coralline fruits. *B. leucocarpa* is taller, 5 to 8 feet, but of good habit and a free flowerer, and distinguished by having pure waxy-white fruits. *B. Jamesiana* is of somewhat similar habit and has red fruits.

Herbaceous plants were legion, many old friends being seen, and a large number of novelties added. As on other ranges, Primulas rank first in numbers and beauty, such lovely plants as *P. szechuanica*, with yellow flowers, *P. Wardii*, with blooms in many shades of rose-lavender, and *P. Franchetiana*, with its large trumpet-shaped purple and yellow corollas, forming masses on every moist meadow. The well-known *P. Poissonii*, common to every range in the province, I never saw in such perfect beauty as there. Of new species were secured:—*P. aemula*, a fine plant with stout scapes of 2 to 2½ feet, bearing many whorls of bright yellow blooms. The corollas have reflexed lobes, are fleshy, with an enamelled sheen on the exterior. *P. chionantha*, a noble species of the Nivales section, with fleshy foliage, numerous scapes 14 to 30 inches high, producing many whorls of large, pure white, fragrant flowers. *P. florida*, a charming small species of 6 to 14 inches, with blue or rose flowers, dark green, finely-cut leaves, the under surface of which as well as other parts of the plant are densely coated with silvery farina; a beautiful species of the capitata class, *P. sphaerocephala*; and others as yet unpublished.

Several new *Meconopsis* were also found: *M. concinna*, *M. venusta*, *M. speciosa*, *M. impedita*, and *M. eximia*.

The lovely *Lilium apertum* var. *tibetica*, with deep maroon-coloured, fragrant, pendulous blooms, and the equally beautiful *Nomocharis pardanithina*, with widely-spread, satiny-white, purple-spotted perianths, are there on every meadow; by the side of every stream and marsh Pedicularis, of the Siphonantha section, with their long tubular corollas of brilliant red and orange-yellow, form masses of the richest colouring. Every step one takes treads a beautiful or interesting plant to earth! On the stony meadows and screes are innumerable species of *Saussurea*, many of them real gems, close cushion plants with silvery-coated foliage and flowers of the most lovely shades of rose,

purple-blue, and magenta. Gentians bulk largely in the autumn flora, the finest of all *Gentiana heptaphylla*.

This huge range acts as a rain-screen, consequently the ranges eastwards towards Mili are more or less barren in comparison.

Again, far to the west is another wonderfully prolific region, the Mekong-Salwin divide south of Dokerla, one in which I spent some time in 1905, and which I hope yet to explore more thoroughly. All the collections of that year were lost completely through the upheaval caused by a local rebellion of the lamas of the Upper Mekong. From what I saw then and collected, I should say it is by far the richest area of any yet known. Specimens of a few new species were saved from the wreck, such as *Rhododendron gymnanthum*, *R. Stewartianum*, *R. chasmanthum*, and the beautiful and curious *R. Forrestii*. This last is a most interesting shrub, with large fleshy flowers of a deep blood-crimson shade. It has the habit of ivy; attached by roots on the under surface of its stems it covers almost perpendicular cliffs and boulders with its bullate glossy foliage. The leaves are very small, broadly ovate and highly coloured; the blooms pendulous, produced singly in the axils. On those mountains was first discovered *Meconopsis speciosa*, one of the finest of the genus. Somewhere north-west of there, north of lat. 29° and west of long. 98°, will probably be found the greatest concentration of the genus *Rhododendron*, and possibly the same might be said of *Primula*, for my experience during eight years spent in the region is that as one goes farther north-west the number of species is continually added to.

REPORT OF WORK IN 1914 IN KANSU AND TIBET.

By REGINALD FARRER.

[The following notes were written by Mr. FARRER in China in 1914, but did not reach us until April 1916; hence this somewhat belated appearance. Mr. FARRER has added a few comments to his original notes and these are inserted in square brackets in the body of the report. We are greatly indebted to Prof. I. BAYLEY BALFOUR for looking through the proofs and revising the nomenclature so far as is possible at present.—ED.]

In spite of all the perils and tragedies with which the Kansu-Tibet border seethed in the earlier part of 1914, neither the "White Wolf" nor local insurrections succeeded in frustrating the Expedition. It now becomes necessary to give its course in detail. On April 13 we left Tsin Chow, a bygone imperial city of S. Kansu, and struck almost due south for Kiai Chow. The way ran through loess country, largely cultivated, and over high open downs. The two most important finds were *Farreria* sp. (*novum genus*) Balf. fil. twice occurring on the barren fells, and—yet more important if possible—the first (as I believe) record of *Viburnum fragrans* as a wild plant, scantily appearing in the hilly cotes south of Shi-ho. At Kiai Chow we entered upon the arid country of the Hei Shui Jang, or Blackwater River, a justly-named voluminous tide of filth, which, in all its course between Siku and Bi-gû, where it joins the Whitewater (the Pei Shui Jang), runs through a series of loess and sandstone ravines, hedged in on both sides by vast arid and Saharan crags of loess. The climate here is African in heat and drought. I have made a point of sending samples of all good seeds from this region to Professor BERGER, secure that at least at Mortola they will do well, whatever be their fate in the damps of England. Kiai Chow, during our short stay, yielded only the lovely little *Iris Henryi* and *Paeonia Moutan*.

Leaving Kiai Chow (pronounced in every province differently, but usually Jié-Jo*) on April 25, we continued southward down the grilling ravines of the Blackwater towards Wen Hsien, crossing the Feng S'an Ling Pass the day before our arrival, and there making acquaintance with two treasures in *Pleione* F 4 and *Primula* F 300. This pass separates the Blackwater from the Whitewater, which flows beneath the acacia'd walls of sunny Wen Hsien in unsullied purity, to join the Blackwater a little further east, at Bi-gû. On May 3 we rode out of Wen Hsien, striking due westwards up towards Tibet. Ere long the Whitewater deserted us, and our way continued up the East

* I often diverge from the official Romanized spelling of Chinese names, which in all cases seems nicely calculated to give them as they are *not* pronounced.

Road River to Di-er-Kan, the first Tibetan village. Hence, on May 6, we turned sharp to the right, and up over the huge forested and grassy flank of Chago-ling, the pass over the great limestone range that had now for two days past been peering at us above the bare loess hills on our right. Here, of course, the climate is cool and alpine, and enormous virgin woodlands clothe the mountains—a strange sight, after many weeks of naked arid loess. This range is one of the enormous ripples in which the Kwun Lün dies away eastwards into China. It runs roughly parallel to the Min S'an further north, and between them intervenes a ridge of some 10,000 feet, cutting off the Blackwater from the Satanee River. From the heights of the pass at last the great snows came into sight, the Satanee range, on whose final vertebræ we stood, towering away to the left in magnificent peaks and wildernesses of white, while in front, over the intervening mountains, rose the overwhelming mass of Thundercrown, sheer above Siku, last outbreak of the Min S'an splendours which, to match those of the Satanee, unfolded themselves westward in ever-increasing magnitude far away into the wild heart of Tibet.

All this gorgeous country, being alpine, is despised by the practical-minded Chinese, who abandon it wholly to the savagery of unkempt Border-tribes. We had trouble accordingly at Chago, left it hurriedly on May 8, and by May 13 were ensconced comfortably in a small temple at Satanee, in a friendly village under Chinese sway. From this, however, when we had just begun to get our teeth into the riches of the snowy range, now just opposite, we were driven by a general Jihad organized from Chago by the monks, under the conviction that our investigations were annoying the mountain spirits. The White Wolf was now raging in Kansu, and our position was critical. However, we decided on the least of the many threatened evils, and made straight over the intervening range to Siku, on chance of finding the rumour false that declared the Wolf in full possession and the town sacked.

On May 22 we entered the storm-tossed little city of Siku, sitting so snug beside the Blackwater, embosomed in groves of willow and Persimmon, with gaunt and sunburnt hills of loess all around, and behind, overhead, the colossal impending mass of Thundercrown and the huge ridge in which, after Thundercrown, the Min S'an dies away eastwards as the Satanee range dies away eastwards from Chagola. Reference to the map will show that we were now once more quite near Kiai Chow, having rejoined the Blackwater a little further north-west, and thus described a long and irregular narrow rectangle down through the last descending tip of Kansu. BEREZOWSKI, it will be remembered, had visited both the Siku and Satanee districts in 1886, spending the winter zoölogizing at Satanee, while at Siku they vividly remember him to this day as having stolen a moon of theirs that lived in a stone and was never seen after his departure. Even the Herbarium yield, however, of the POTANIN Expeditions is still for the most part a *rudis indigestaque moles*. These districts have



FIG. 14.—MECONOPSIS RUDIS Prain.

[To face p. 48.



FIG. 15.—*ISOPYRUM GRANDIFLORUM* Fisch.



FIG. 16.—*PRIMULA SECUNDIFLORA* Fr.
A single plant 20 to 24 inches in height.



FIG. 17.—CHINESE CHAIN SUSPENSION-BRIDGE ON THE MEKONG.
SPAN 75 YARDS. LOW WATER (SPRING) LEVEL.

[To face p. 49.]

proved very fertile of interesting and beautiful plants, many of which are probably new to Herbaria, and yet more of them to cultivation.

Siku, Shi-ho, and Wen Hsien were the only three towns of south Kansu left untouched and unvisited by the White Wolf. All the early summer Siku sat in utter isolation, cut off from all intercourse with the ravaged outside world, and sufficiently occupied on its own account with repelling invasions from wild Tibetans, who seized the chance of the general anarchy to come up against it from the mountains a few miles west, which, though (like all this Border) called "China" and "Szechwan" on maps, are in reality pure Tibet, owing allegiance only to uncontrolled Tibetan princelings, or to the august remoteness of Lhasa. In the intervals of repelling these alarms then, we were able to spend a happy six weeks exploring the fastnesses of Thundercrown and the great Ridge. Thundercrown runs up to some 15,000 feet, and the Ridge is little more than a thousand feet lower. Though the conditions are alpine here, and every cloudless day for weeks in succession breeds a thunderstorm in the afternoon (hence the name Lei-Go-S'an—Thundercrown), yet the high alps feel the influence of the loess barrens far below, and the Ridge is dry for its altitude—much drier than corresponding elevations in the Satanee range to the south, or the main Min S'an to the north-west, towering as they do over cool woodlands and quite uncultivated alpine valleys. On the Siku ridge woodland and luxuriance are only found in the huge ravines that disembowel the flanks of the mountain, and finally debouch all together in the wide shingle-flat of dead rivers that sweep down to Siku, where the lost waters of the range all come bubbling up again in springs like diamonds, amid the dappled shade of willow and poplar.

On July 6 we left Siku, rode east some 20 miles down the Blackwater, and then struck straight away north, up through the gorges of the South River (the Nan Ho), which here joins the Hei Shui Jang, cutting itself a way down through the last fading battlements of the Min S'an Ridge overhead.

On July 10 we reached Minchow, on the northern side of the Min S'an barrier, in a country now quite changed—of vast and rolling green dish-covery grass downs, with a curious feeling of being in a saucer on the roof of the world. Whereas Siku, home of fig and palm and pomegranate and Persimmon, sits sunning itself at 4,500, Minchow stands 2,000 feet higher, in a cold, damper, and less kindly climate, where palm and pomegranate are strangers. So now we moved westwards, along the Tao River, up to the dilapidated little Tibetan city of Jô-ni, where for some time we fixed, exploring the foothills of the main Min S'an mass, which lies across the river, some 60 miles south, approachable only by long, open, wooded valleys, river-channels from the endless undulatory downs of lush hay above on either hand. Here the moist, chill summer is much the same as our own, but the winter, of course, is of a far more adamant hardness. Loess still lingers on either side of the Tao, but is no longer in evidence in the

landscape, which is here, more especially in its upper reaches, of a quite special character, owing to grass growing only on the south side of the folded downs, and forest only on the northern, with a perfectly definite line of cleavage, diversifying the emerald sea of waves, from one aspect, with stripes and rims of darkness, while from another a dark world of forest alone appears.

On August 21 I returned alone to Siku for the seed harvest while PURDOM worked in the Tibetan valleys and highlands. He rejoined me at last on September 16, and after our headman had successfully returned from Wen Hsien with *Primula* and *Pleione*, we all adventured back again over the hills to Gahoba and Satanee, pleasantly and placidly exploring the Satanee Alps till at last the alpine winter came crashing finally down on October 18, and the snow-fall drove us back again to sunny, torrid Siku, the change being equivalent to that of Torbole or Garda from the Stelvio. From Siku we made our final ascent of Thundercrown in quest of *Delphinium tanguticum*, and then PURDOM hurried north again for odd jobs in the Tibetan Alps, while I remained to finish a few final collections at Siku. On October 30 I also bade a last sad farewell to this delicious little corner of sunshine, and rode northward to join PURDOM at a small village nearly opposite Jô-ni, whence on November 13, the country and the green hills being now all gone brown and sere and dead in winter, we all moved up northward over Lotus Mountain towards Lanchow, there to spend the dead months, after a well-rounded season, in which, after all its storms and stresses, there have been only two downright failures to regret—*Iris Henryi* and *Farreria* sp., neither of which was it possible to attempt.

The following list is intended to give notice of all the plants of which seed has been sent home and distributed. It will include a few specially interesting subjects which have not been sent, as well as some others which, though sent, have not yet been distributed. It is my intention, of course, that all such should in time be shared in due proportion; I had originally hoped that this could have been done immediately with all things collected. However, I now find that matters often are not so simple as they seem in England. For one thing, seed-collecting is an exceedingly gambling game, and often a week's hard journey will only yield you perhaps half a dozen seeds of some quite common treasure, by the hazard of men or beasts or weather-gods scattered already or destroyed. In such cases it is obviously best that one practised raiser should deal with these two or three priceless vegetable diamonds, and then in due course distribute their propagated offspring. Otherwise my friends might each have to receive a fraction of a seed! There are other cases in which I am so far reluctant to send out shares of my harvest. For in that harvest are bound to be stray, odd, or uncertain things, such as I do not wish to burden people with, until myself reassured as to their value and distinctness. In especial, late autumn is a season for grabbing all one sees; in such a gleaning there are bound to be

dulnesses, repetitions, and obscurities—to say nothing of the miscellaneous collections made by one's retainers, and ultimately undecipherable. Now Chinese collecting has suffered in the past from an over-catholicity which flooded the grounds of the enthusiastic with weeds so dowdy and invasive that their luckless victims soon ceased to be enthusiastic at all. This indiscriminate zeal I am anxious to avoid ; and therefore, in the case of a plant suspected to be worthless or indistinct, I prefer to pause awhile until it has justified its importation, before helping it claim a general welcome that it may not prove to deserve. With regard to things that I know to be good, these, whenever possible, have been at once issued ; in the cases where this has not been possible, they will duly be issued as soon as the quantity is sufficient.

As I have said, the main mass of uncertain or indistinct plants results from late autumn collecting, when no adequate diagnosis can be made. The bulk of numbers after F 280 are of this nature ; and as I cannot guarantee their bearers I cannot, obviously, describe them fully. I recommend, moreover, that even such names as I can give should be accepted as makeshifts, not as final certainties. Without a whole library to assist examination, it is not always possible to be scientifically *certain* that even apparent *Kerria japonica* or *Meconopsis quintuplinervia* may not be in reality different species, however overwhelming the probability that they are not. Where I believe a name to be sound, I shall duly give it, but without dogmatic insistence on its validity. Generics, as a rule, are pretty safe, when given ; specifics I only venture on with the above caution, and where I give names of my own to certain finds (e.g. in *Iris* and *Primula*) such names, I need hardly say, imply no sort of claim for specific rank in their bearers, but are merely labels of convenience applied to certain specialities so charming that I should feel it frigid to think of them only as numbers. Professor BALFOUR* meanwhile will, I hope ere this, have received specimens of all my last finds, and to him may safely be left the task of unravelling their uncertainties, and separating the white sheep of new species from the goats of old ones already collected by POTANIN. I give here no diagnosis of even such treasures as I believe to be genuine novelties ; the aim of these notes is merely to offer my friends, now that the season is done, a convenient and compendious running account of what they may expect from its results, with cultural suggestions, and such other hints as may occur. Much already has been said on all these matters, in occasional articles in the *Gardeners' Chronicle* ; I hope a certain amount of inevitable repetition may be found pardonable, in view of the great advantage that a connected account must always have over disjointed fragments of journalism, or occasional MS. notes accompanying each lot of seeds

* Since this paragraph was written (in January 1915) Professor BALFOUR, with his usual untiring kindness, has completely revised the list of names and species, which now, therefore, has the authority and value that it necessarily lacked when I wrote.

as it was despatched. It may occasionally happen, too, that I may include as distributed a plant or seed which my friends will find they have not yet received. This will merely mean that the tubers or the seed-envelopes have arrived in such a state that my manager has found it impossible to send out the rotted tuber, or imprudent to distribute seed which may have leaked out and got mixed with that of other plants beyond present possibility of sifting or deciphering.

As for such cultural hints as I give, these, of course, are purely conjectural, and based on my local observations. The foregoing itinerary is meant to suggest the various climates of the districts I have this year explored, and the stations given for various plants will serve to identify each with its own conditions. Generally speaking, these northerly ranges should give no such legacy of tenderness as is bequeathed by the warm, wet atmospheres of Yunnan and Szechwan that have bred us so many disappointments. The Satanee range has a climate close akin to our own north country conditions, with a very hard winter. Yet harder is the winter and damper the conditions in the vast grass-lands of the Min S'an Alps. Between the two lies the hot loess region of Siku, and it is from there alone that we may expect its plants to want favouring circumstances of drought, heat, sunshine, and a hard, stony soil. The Thundercrown Ridge, however, with its daily shower, stands far above the circumstances of the hot loess at its feet; and its children will take the culture of the general high-alpine flora of the Min S'an, to which indeed they belong, though cut off from their kindred upon a remote and insulated mass of limestone. And this last word reminds me of a last caution.

For whatever the information may be worth, both the Min S'an and the Satanee ranges are essentially calcareous, so that, except where a special caution is entered, it may be taken that all the following plants are calcicole in Nature.

MR. FARRER'S 1914 JOURNEY.

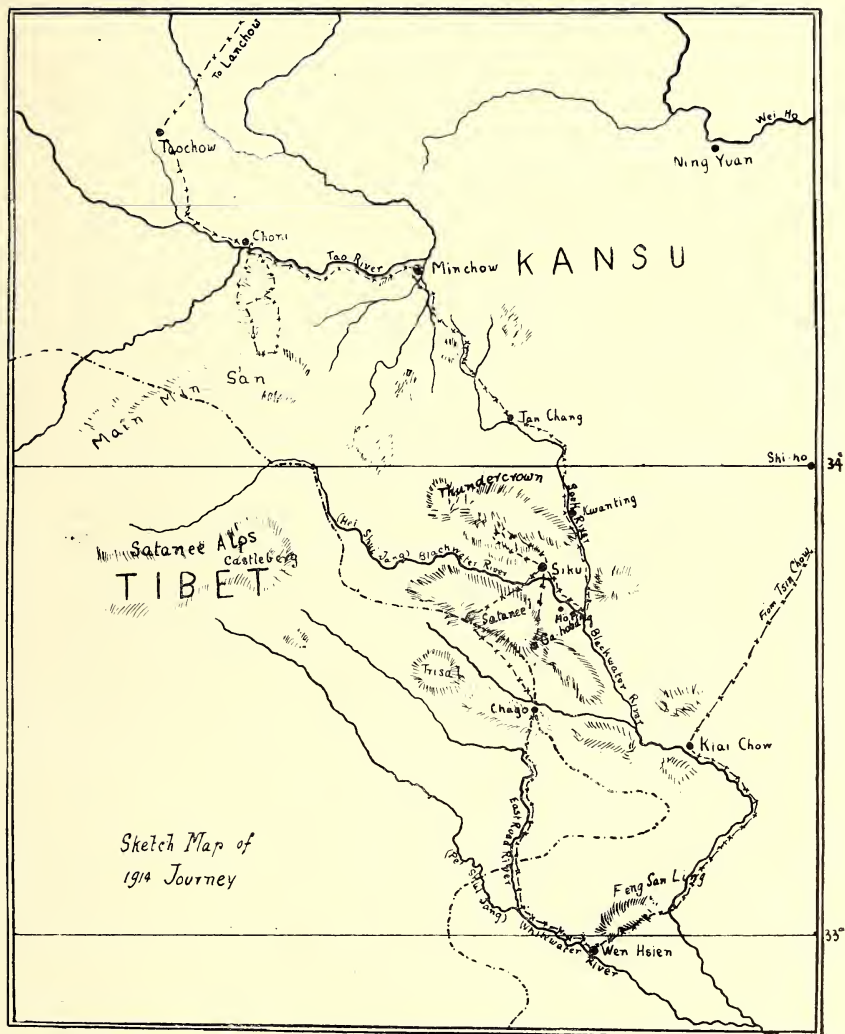


FIG. 18.—Sketch Map of the Kansu-Tibet border, showing roughly the district explored, the main route being marked by lines and crosses.

[To face p. 52.]

COLLECTIONS OF 1914.

Abelia biflora (F 101).*—A pretty slight shrubling with pinky tubes of blossom, only seen in the subalpine coppice above Mō-Ping, and not generally distributed yet, as the seed was of untrustworthy quality, and Abelias are so notoriously troublesome about germination.

Acanthopanax quinquefolia (F 394) and *A. trifolia* (F 395), two handsome, thorny-stemmed, Virginia-creeper-leaved Aralias, of some 6–8 feet, live in the subalpine coppice of the Satanee range. The former is the handsomer, with five folioles and very noble glistening dome-clusters of black berries. The latter is not quite so tall, as a rule, with only three folioles and poorer clusters of fruit. F 394 really makes a superb effect of glossy black amid the dying coppice in October, so exactly like the dying coppice of an English pheasant-drive on some sad and silent day of autumn, filled with the quiet haunting smell of the year's decay.

Acer sp. (F 349).—A gloriously-coloured small straggling tree with five-lobed leaves, met on the very crest of the Mō-Ping pass over the intervening ridge between the Satanee River and the Blackwater, at some 10,000 feet.

Acer sp. (F 348).—A smaller tree of larger leaf and lobing, about 12 feet high, neat and rounded, and of gorgeous scarlet. Foothills of the Satanee Alps.

Acer sp. (F 351).—Seed collected from a cut-back bush of 10 feet; will probably be a tree of 18–20 feet. Large and almost entire foliage of richly suffused amber-vermilion. Same region as the last.

Actinidia? sp. (F 351).—A very rank and voluminous frightful ramper from subalpine coppice and hedgerows, which redeems itself a little in autumn with profuse clusters of golden berries that open to reveal transparent scarlet pulp. (? *Celastrus articulatus*.)

Adenophora.—These beautiful Campanulas take the place of their august cousins in the alpine grass-lands of Tibet, having all, more or less, the habit of *Campanula rhomboidalis*, though with longer and stiffer displays of bells. One common species has showers of poor little, almost globular flowers, with far-protruding style; a second is an improvement, leading on to F 235 (? *A. Potaninii*), a really lovely thing which should be of the easiest

* The number in parentheses, e.g. (F 74), is that under which the plant was collected, and sent home by Mr. Farrer.

cultivation in any healthy, open place. It has crisped, deeply dentate, incanescens foliage, and noble branching panicles of big blue bells, far better furnished and more elegant than in *C. rhomboidalis*. It abounds in the grass-lands of the Tao-River district, colouring the hillsides in August. F 354 is very similar, but appears shorter and stiffer in the spike. It hails from a different district, from the alpine herbage in the valley opposite to Satanee, and I have not seen it in flower. Finally, F 492 will probably not yet be distributed, as I think it may prove identical with F 235, being from the same region, a pinch of winter seed collected from the dried capsules on the crest of Monk Mountain.

Allium.—In no race are the Alps of Kansu and Tibet more prolific. Of the commoner and cruder sorts I have taken little note, and, even among such as I have considered beautiful, the seed may sometimes yield confusion. F 165 is a narrow-leaved species with spraying heads of pink stars on stems of about 5 inches in high summer. It abounds in South Kansu, and in the sub-alpine turf above Siku, though it is possible that two species are concealed under one number here. Still more possible is it that even more species may be concealed under F 222, the most important of the lot.

Allium cyaneum macrostemon.—I greatly suspect that this name embraces several of the lovely bluebell-blue Garlics that so abound all over the Alps of South Kansu and Tibet, dotted freely in the hot alpine herbage (with close heads of colour), or forming mats on the ledges of cool limestone cliffs (with spraying heads of celestial stars), but always and everywhere, even on the highest ridges to which they ascend, objects of greatest charm and elegance and delight in August. It should not be easy to fail at home with *A. cyaneum*, already introduced by POTANIN through Petrograd, but never yet fully realized in English gardens. F 258 occurs rather higher than typical *A. cyaneum*, in the alpine turf of the Min S'an. It is not a match for its blue rival, being a Garlic of 5 or 6 inches, with a tight round head of yellow blossoms in July and August. F 304 is not yet capable of distribution; a bulb or two were sent home, but this pretty thing blooms so late in October that I was not able to get more than two or three doubtfully ripe seeds. It is a delightful little species, making a pair to the cliff-haunting form of *A. cyaneum*; for it grows only on cool shady ledges of the limestone, where it forms mats, and sends up numbers of 3- or 4-inch stems, each carrying a loose, radiant head of a few soft pink stars. This is found about Siku, and about Siku too, the last, and perhaps the best, of this year's Garlics. F 305 is a high-alpine, only seen at some 12,000–12,500 feet, growing in the upper slopes of the great limestone screes on Thundercrown, in very hard caky loam, overlaid with small chips. It may prove only a development of *A. cyaneum* [but

I am now (1916) quite resolved that it is a distinct species]. It grows in tight little colonies, has long, reddish, deep-set bulbs, and rather nodding heads of the loveliest Puschkinia-blue blossoms on stems of 4 inches in mid-August, of colour much paler and softer than in any form of *A. cyaneum* (unless it was a frost which had bitten them into that beauteous pallor). And the last of our blue Garlics is *A. Purdomii*, F 321—a most dainty little grassy thing of 4 inches, the whole tuft breaking into a shower of rather dark-blue heads. This was collected by PURDOM from shallow shelves of soil in the limestone rocks of Lotus Mountain; blooming in August-September no seed could be got, but its discoverer, ascending the mountain in the snows of February, hacked out three or four tufts from 3 feet of ice, so that it cannot be as yet distributed.

Amphiraphis albescens (F 146).—This well-known thing, which I consider rather ugly, I have only sent for fear its friends might otherwise complain of its omission. It is very general in the limestone river-shingles of South Kansu and Tibet, at subalpine elevations.

Antennaria sp.—A universal moorland wayside weed all over Kansu, with umbels of white everlastings on 8-inch stems, only really silvery and attractive when the seed-fluffs are gone, leaving the naked receptacle a glistening flat star. I feel it too much a rubbish to be yet distributed.

Androsace longifolia (F 94).—I give this wonderful plant a very exalted rank among my possibilities of this last year. In appearance the most delicate and glorious of high-alpines, it is so far from being alpine at all that it is only found at low elevations in the loess district, affecting particularly steep and torrid banks of iron-hard loam, or loamy shingle, where it forms wide carpets of splayed-out dark-green rosettes, snowed under in early May with a profusion of stemless big white flowers that give it the look of an albino *A. alpina* glorified beyond recognition. It is always found by itself, on cliffs and scarps and banks uninhabitable to most other plants, and it never ascends much above 6,000 feet, luxuriating on the burning slopes about the Blackwater round Siku at 4,500. *A. longifolia* gave hope, in fact, of being a high-alpine-looking *Androsace* of the very best, but easily attainable by any sunny garden that can give it a hard, hot, and stony slope. It is of extraordinary beauty, and though technically a *Chamaejasme*, because it sometimes has two flowers or more to its microscopic stems, usually has much more the effect of an *Aretia*, specially lavish in its carpets of flat snow. [Alas, it is not easy, seeming to be as exacting in the way of hot, dry treatment as its kindred are in the way of alpine (1916).]

Androsace mucronifolia (F 319) returns to the tradition of the family, and is a very-high-alpine, never found except in the last fine turf on the crests and ridges at 13,000–14,000 feet, along the

Min S'an. Here it makes fine clumpy masses of wee rosette-balls, from almost every one of which in August springs a half-inch scape unfolding a domed round head of some three to four milk-white flowers with a golden eye, piling each mound of rosettes with snow, and showing the wild sheep of Tibet exactly how hawthorn smells in England. Now that *A. longifolia* has preferred so successful a claim to queen it in gardens over all the Aretias, a place is left vacant for *A. mucronifolia* to take sovereignty over all the villosa-Chamaejasme group. For indeed it is a supreme loveliness, wholly different in effect from the last. It bloomed unfortunately too late for seed to be got, and a pinch of last year's germs collected on Thundercrown in June were too untrustworthy and few to be distributed; our hopes at present rest on dormant masses sent home in the winter.

Androsace tibetica (F 246).—This only doubtfully occurred to me in the Siku district, but becomes abundant as soon as you get north, and up the valley of the Tao River—a lowland species like *A. longifolia*, never ascending but delighting to grow on the precipitous lip of loam-banks along the waysides. It is always happy, but does not affect shady aspects, while in the sunny ones that it prefers it likes best to flop in a cushion from the overhanging loam-cliff, while above it sprout forth a few fine sprays of *Aster* or *Artemisia* that keep off the full fury of the sun. I was too late to see it in flower, but it appears to vary between white and pink by all accounts (possibly containing two forms or species). From its clumpy, hearty habit of pointed-leaved rosettelets, and their generous profusion of well-furnished 3-inch scapes, as glorious a future in gardens might be foretold for *A. tibetica* as for *A. longifolia*, from exactly the same ordinary and commonplace conditions (and so far suggesting a flattened-out mass of *A. tibetica* as almost to justify its ancient name of *A. sempervivoides tibetica exscapa*). Figured English specimens seem to me to give no idea of the real beauty and elegance of *A. tibetica*—at least it was long before I could believe that they represented the same species, as I saw it abounding in 1914, neat and graceful in habit, and presumably brilliant as its cousins in flower [and in 1915 over all the flat lowland lawns of the Da-Tung Alps].

Androsace sp. (F 328).—May be only a form of the last (*A. tibetica*). It was found growing beneath the cliff of F 143, in a huge coppiced slope of lime and gravel and limestone débris. It has all the habit and inflorescence (apparently) of *A. tibetica*, but as I never saw its flower I cannot say more, and, as I only got some three seeds, all I should say would as yet be unprofitable.

Androsace Chamaejasme (F 142).—A tiny high-alpine form, from the topmost grassy ridges along the Min S'an. It is a thing so fragile and microscopic that neither plants nor seeds have been collected. It is a very old friend.

Androsace sp. (F 143).—This is a puzzling problem. Only two specimens have I ever seen, growing, the one on a quite, the other on a nearly impregnable cliff, high up in a sunny aspect of the biggest gorge behind Siku. Here they seemed to be running about in dust-dry soil, held together by springy mats of a dried-up *Selaginella*. They suggested small, poor, white-flowered *Sarmentosas*, but really have a more *tibetica*-habit, but with looser masses of larger, more oval-leaved, incanescens, irregular rosettes, from which sprang scapes of 4 inches or so, with lax heads of white in June. I succeeded at last in securing seven seeds, which may perhaps some day help us all to know whether this is a distinct *Androsace*, or merely *A. tibetica* magnified and relaxed by its conditions—which, however, were almost precisely those of *A. tibetica*-type further north, while at its feet, in the shingle-slope, another *Androsace* was growing that almost exactly copied *A. tibetica*—if, indeed, it was anything else (F 328).

Androsace Tapete (F 128).—Has not yet been collected, as it so exactly mimics *A. helvetica* that no one would be thankful for yet another wool-dowered miff of the *Aretia* group. *A. Tapete*, however, grows into far larger masses than *A. helvetica*, and is so closely clad in silver grey as almost to have the argent hoar of *A. hirtella*. It is universal in the high limestones above 12,000 feet, hugging the sheer precipices and flawed rock-walls exactly after the style of *A. helvetica*.

Anemone narcissiflora (F 91).—This is a most magnificent *Anemone*, but perhaps a mere development of *A. narcissiflora*. It is, however, a far grander plant, forming many-yard-wide masses on the open ledges of the bare limestone cliffs at 9,000–11,000 feet, always out of reach, and often impregnable. Here, amid colonies of soft leaves, it emits 8 inch stems, carrying sometimes only one flower (in this case as large as in *A. sylvestris*), but usually three or four. These are of a clear snow-white, shining from afar like arrested flakes of snow, all up and down the enormous precipices of Thundercrown. It is, as I say, no joke to get at, and it seems to have an eccentric way of dropping its carpels green; in any case, despite many efforts, the store of its seed has not proved large enough yet to be freely distributed. F 91 I have only noted on Thundercrown; it is purely (and very oddly, for its size and lush, soft habit) a high-alpine of the exposed cliffs, ascending in wizen form to the topmost crests, but never coming lower than some 8,500 feet. Its full glory is from the end of May to the end of June.

Anemone japonica var. (F 436).—It is a fashion nowadays to give specific names (such as *hupehensis*, *moupinensis*, &c.) to all these local developments of universal *A. japonica*. For the typical form of Kansu-Tibet I will as yet make no such claim. It is a tall-growing and very luxuriant plant, with a profuse display

of rather fat-faced flowers of pale pink, abounding in all hard, hot, and stony places at low elevations throughout South Kansu and up the Tibetan border. It loves river-shingles and sun-baked stony fields, but never affects the woodland.

Anemone sp. (F 481).—This is sent on the chance of its being a *Narcissiflora*-*Anemone* which was seen in abundance, just emerging on the southern face of Chago-ling on May 6, in the alpine turf of the pass, near its crest. This seed was collected from specimens of evidently kindred blood, in similar situations high up in the Alps of the Min S'an; the only lingering flower, however, in August, looked poor and ugly. But this may merely have been that it had hung on for so long, declining to drop.

Aquilegia sp. (F 280).—Quite different from *A. ecalcarata* as we grow it from Japanese seed, this should be no other species. It abounds in the subalpine river-shingles and coppice of the Kansu-Tibet mountain regions—a dim little quaint dangler of rarest and most elfin charm, with showers of small plum-coloured Columbines in June.

Arisaema.—Of these great Aroids, two abound in the rich or stony woodland places of the Siku-Satane Alps. F 283 has three big leaflets, and makes an impressive sight in deep and sheltered woodland places, while F 420 has a more elaborate leaf-frill, and the spathe of scarlet fruit is dazzling in the October woodland. Neither, of course, is really choice or specially attractive, but impressive in the right place.

Aruncus sp. (F 386).—This is a superb thing, precisely replacing *Spiraea Aruncus* in the alpine copse-fringes, dingles, and hedgerows in the Satane Alps. It is, however, of much slenderer growth, developing only two or three stems from the crown, and the blossom panicles, opulent and arching, leave all efforts of *S. Aruncus* far behind, attaining often to a generous yard in length and even more.

Asparagus.—There is a little thorny, starry mass from the hot, dry hills about Siku &c.; and there is another, like small sprigs of *A. officinalis* stuck into the ground. Only the former can as yet be distributed, and neither is important; the latter I only once saw, understudding the scant coppice on the rough banks above the South River (the Nan Ho).

Aster kansuensis (F 131).—A small single-flowered high-alpine Aster, which runs happily about in the topmost scree of Thundercrown, with stems of 2-3 inches and gold-eyed purple daisies. The first lot sent under this number covers the far more beautiful and important F 226—a treasure of the same habits and tastes, but with much larger blossoms, occurring on the highest shingle-crests of the main Min S'an.

Aster oreophilus (F 156) occurs on level and very stony lawns of scant turf just above Siku, in the débouchure of the gorges (and ascending to about 8,000 feet in crevices of hot rock-slopes).

It forms carpets of smooth-looking, almost glaucous foliage in rosettes, from which spring 6-inch stems in June, carrying a scattered flight of some four to five large flowers of a very tender pale lavender, so faint as to be almost of a soft grey in effect, as the flowers sheet the distance. In the rock-garden it would make the most delightful association with *Papaver rhaeticum* across a hot moraine [but proves none too generally hardy yet (1915)].

Aster limitaneus (F 173) exactly copies *A. diplostephioides*, but differs in having its 7–8-inch stems beset more liberally with quite narrow pointed leaflets inclining to expand at the base. The large marguerites of rich lavender unfold in July–August, and the upper grass-ridges of Tibet, imperialized in a rippling ocean of these glorious, golden-twinkling Asters, while among them flare the furious flopping scarlet flags of *Meconopsis punicea*, offer a sight that not even the Col de Lautaret can easily efface. F 173 is general on the high grassy lands of the Tibetan border, between 8,500–11,000 feet, stunting into a very concise, neat, large-Astered form on the uppermost turfey summits, where it has a far-off look of *A. alpinus* on far-off hills.

Aster Farreri sp. n. (F 174) is more local than the last; I have seen it rarely in the Tibetan valley of Mirgo, here and there among the grass; and very abundant in the alpine hay of the Bao-u-go Valley, at some 10,500 feet [and as universal in the lower Alps of the Da-Tung chain far up in the north (1915)], never seeming to ascend to the wind-ruffled heights of the great ridges above, where F 173 is no less happy. It is a superb beauty, recalling *A. Falconeri* in the profusion of its especially long and narrow rays of deeper violet-blue than in the broad-rayed lavender face of F 173. The leaves are rather long and narrow, too—soft, and rather pointed; leaflets sit alternately up the stout 12–15-inch stem, and the whole plant is green and hairy. The single flower is enormous, with an eye of intense vermilion-orange, clouded round by a Saturn's ring of chaffy fluff. Its fringy ragged grace is after a very different carelessly regal style of magnificence from the rather smug and fat-faced complacency of lovely F 173.

Aster sp. (F 131), a sufficiently dear and dainty little alpine Aster, occupies the upper screes of Thundercrown, but further north-west, in the heart of the range, its place is taken by *A. limitaneus* F 226, a jewel pre-eminent among the best, with much larger golden-eyed purple Marguerites piercing everywhere on their 3-inch stems, from the gaunt shingle-slopes of the upmost Min S'an. This little plant is hairier (especially at the base) with a grey pubescence, and the basal leaves in F 131 are usually more spatulate and clearly-stalked. None the less, and allowing for the floral supereminence of F 226, I fancy that they might both prove forms or developments of one species. Standing to each other as I once thought *Primula* No. 22, from the main range, did

to *Primula* No. 10, an outlying type from the isolated and outlying mass of Thundercrown, which has also bred *Aster kansuensis*. [Note that seed distributed about the New Year under the No. F 131 in reality consists of, or includes, F 226—I at first having been sceptical as to the distinctness of the two spp. until I again compared the dried specimens, when the distinct and glorious supremacy of F 226 leapt clearly to view.]

Aster Thunbergi (F 246).—We now move into the group of *A. acris*.

All the warm bare loess banks, hedge-cliffs, and city embankments from Choni away down the South River Valley (not extending to Siku) are coloured in early July with this *Aster*, which forms a tight, neat, domed bush of many stiff and sturdy stems about a foot or 18 inches high and twice as much across, solid all over with domed heads of little lilac-lavender stars, making a rare effect of rich colour and concise, almost artificial tidiness. For hot dry slopes of the garden this charming pudding-bowl bushlet of blossom should have especial value. [Alas, it hardly seems hardy. 1915.]

Aster hispidus (F 200) abounds on the hottest, barest loess hills and stony, torrid slopes about Siku. It is woody at the base, intricate and very fine and wiry in leaf and habit, forming low, filmy, heath-like masses, beset with little lavender *Asters* of great charm in August and September. Whether F 200 includes two spp. or not I cannot be certain, as the plant's true character is hard to decipher, owing to its always being so pitilessly cropped by goats on those Saharan hills. It is not, as thus seen, brilliant, but may prove much more so in goatless gardens, and anyhow, even at its most hard-bitten, has the fine and feathery charm of *Felicia abyssinica*. Seed has been collected from the best forms only. [It is clearly not hardy (1915).]

Aster sp. (F 455).—Seems like a much glorified version of the last, from similar hot situations further down the Blackwater. It is probably nearer, however, to *A. turbinellus*, forming low, wiry, half-decumbent masses, with profusion of large and brilliant flowers in October, on very long, stiff pedicels. Seed from the finest forms only.

Aster sikuensis sp. n. (F 456) replaces F 246 in the Siku district, blooming six weeks later, at the beginning of September. It is notably Galatelloid, with fewer stems than in F 246, forming no bush, and set with broader foliage of glaucous tinge. The flower-heads are lax; the flowers comely and of a thick and chalky lavender. Its height is from 6 to 8 inches, and its beauty conspicuous and serene. Treatment &c. as for F 246.

Aster sp. (F 458).—A rather weedy wayside *Aster* about Gahoba, whose very brilliant flowers, however, may look much better when the mass grows, under good cultivation, to a thick clump of soft greyish stems of 10–14 inches. I find some of these “back-end” Chinese *Asters* intensely puzzling; each district seems to

have its own form of what is, probably, one pervasive species. There is a straggling Michaelmas Daisy with the habit of a poor *A. Thomsoni*, from cool, damp groves and rill-sides about Siku, which may have affinities with F 458, as indeed may also F 455; though this is less likely, as the affinities of F 455 are rather with F 290.

Chinese Asters of 1914:—

Alpine group	{ F 131 F 226	Acris group	{ F 246 F 456
Diplostephioid group	{ F 173 F 174	Turbinelloid group	{ F 200 F 455

Astilbe sp. (F 385) is possibly only *A. Davidi*. It was abundant in a small limit in the cool stony bottom of the great Siku gorge. The only flower-spike, however, that I saw opening (and a mutilated one at that) seemed to be of a pale, soft pink. F 384 abounded in the alpine open turf above the Da-hai-go in the Satanee range, and is perhaps the same, though its habit seemed a trifle larger, and its spike (all I saw of it) longer and heavier.

Atragene sp. (F 315) (or *Clematis* sp.), a handsome blue-flowered slight trailer, occurring very rarely in the Minchow district, by me neither collected nor seen, and the seed so scant and imperfect as not to have seemed distributable when first sent. (Coll. W. PURDOM.)

Bauhinia Faberi (F 134) lives on very hot rocky slopes about the Blackwater round about Siku. It is a low flopping shrub, with very pretty, graceful foliage, tiny white flowers (not at all papilionaceous-looking), and very large rusty-coloured pods in autumn.

Berberis sp. (F 80).—A big bush of 8–10 feet, its stately boughs well set with close pendent tails of pale-yellow blossom, with the heavy scent of *Lilium auratum*, and a succession of scarlet berries in drooping racemes. Subalpine coppice about Satanee.

Berberis sp. (F 355).—A small-growing plant, abundant in the open upper alpine turf of the Siku-Satanee ranges, where it forms a densely spinous jungle about 12–24 inches high, and every spray becomes in autumn a voluminous unbroken spout of pure blood-scarlet with its tight-bunched berries. It is a marvellous sight in fruit, and eminent as affecting the rather hotter, drier region of the Alps, about Siku. For open sun-baked downs it should make admirable covert.

Berberis sp. (F 356) is the one Barberry of low and hot places. I know it only in the Siku district, occurring here and there in the torrid pebbly slopes and grilling little graveyards about the Blackwater. It is a gracious bush of small, holly-like foliage, about 5–6 feet high, each spray being bowed beneath a burden of close-clustered oval berries of luscious bloomy vermilion, glowing like living lamps of colour. (? *B. Potanini*.)

Berberis sp. (F 357) is near the last, and, being a late autumn find, *en route*, I cannot yet say more about it, especially as I myself have never seen it. (Coll. W. PURDOM.)

Berberis sp. (F 358).—A rather gawky, angular, and mangy bush of 3–4 feet, occurring in the higher alpine coppice of Thunder-crown, with clustered oval berries.

Berberis sp. (F 359).—Possibly a form of the last; from Yang-sa. (Coll. W. PURDOM.)

Berberis sp. (F 360).—A beautiful, elegant, and aspiring slight bush of 5–6 feet, with its tall *élançé* arches copiously set with “dropping wells” of blood and fire. From the alpine coppice ascending to Lotus Mountain.

Berberis sp. (F 361).—Another alpine ugliness from Thundercrown, about 2–3 feet high, leggy and sparse and stiff, with paired fruits, and long pale thorns of a quite especial vindictiveness and venom.

Betula Bhojpattra, if F 298 be *B. Bhojpattra* indeed, is a most noble forest tree, rigidly confined to an 8,000–9,000-foot limit in the cool alpine woods of the great mountain ranges, where it constitutes, in its clearly-marked zone, the chief of the timber. It is of stiff, gnarled habit, growing into a wide, dome-headed tree of 30–40 feet, with the bark all ravelling away in tabs of dull diaphanous scarlet, till in spring its forests are a haze of lilac and rose before the young emerald of the foliage breaks, and never again loses its first, fine, careless rapture of spring green until the latest winds of autumn have swept it whirling. Yet, even so, this wonderful tree is almost more beautiful still in its wintry nakedness, when it is all a bloomy mist of lavender-blueness faintly shot with rose, making a unique effect of arrested fog amid the sombre columns of the spruces. *B. Bhojpattra* appears to insist on damp and cool air; on the desiccated ridge above Siku it lingers only here and there on the flanks of the gorges, but in all the big main ranges of E. Tibet it abounds, and its boughs provide the peasants with cartwheels, while its folios of torn red bark come in for water-buckets, hats, and butter-wrappings. It should be a superb acquisition for Northern England and Scotland, though perhaps too insistent on alpine coolness of conditions for the drier South.

Betula sp. (F 333) is probably only *B. alba*. It is common in lower alpine woods, not competing with *B. Bhojpattra*. There is also F 470, another kindred Birch, not yet differentiated. (Coll. Chinese headman.)

Bosa hygrometrica (F 261) is very general throughout the hotter, lower loess region of South Kansu, haunting the cooler vertical faces of black primary rock (or hollows round the feet of boulders) all up the course of the Blackwater, always in a strictly horizontal position, and there making a precise copy of *Jankaea Heldreichii* in the flat and shaggy silver-haired rosette, until in July up spring a number of naked 4-inch scapes, each expanding into a loose

flight of pendent little narrow Streptocarpus-flowers, of Streptocarpus lavender, most beautifully contrasting with the shining silver rosette below. It is a thing of the greatest charm and daintiness, and ought to prove a treasure for our gardens in typical Ramondia-places and attitudes, in the cooler walls of the rock-garden, not exposed to excessive rain, and apparently preferring non-calcareous rock. There is a wee relation of this, not collected, with rare scapes of an inch from rosettes of an inch wide, which I have only once seen, forming enormous flat masses and curtains on certain cliffs just beyond Wen Hsien above the Whitewater, where it grows all curled and wizzled with the drought.

Buddleia Farreri sp. nov. (F 44).—This is a luxuriant bush of 4-5 feet, confined to the very hottest and driest cliffs and walls and banks of the hot dry Blackwater region. In March unfold on the still naked stems, beset with white wool, great compound panicles of lilac, scented deliciously of raspberry ice, and making the bush like a glorified *Veronica Hulkeana*. Subsequently develops the lush and voluminous leafage of soft grey flannel, in shoots uprising on either side of the submerged seed-spikes. For long I despaired either of the plant's seed or its powers of growing in England, so intensely arid and tropical are its inclinations. However, we fortunately remembered a strayed outlier, occurring, and seeming happy, beside the track above the Satanee river in cool and subalpine conditions; PURDOM undertook the difficult and dangerous adventure, and seed was found to be lingering in the capsules. This specimen's acquiescence in so strange a station gives me my sole but cherished ground for hoping it may prove amenable in England to conditions less roasting than its own. At Mortola it should be at home [and even with us much more thriving hitherto than I dared hope (1916)].

Buddleia alternifolia (F 100) has much less stringent views on drought. 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.

Buddleia Purdomii sp. nov. (F 14) has not been collected. It haunts the hottest and steepest cliffs and banks down the Blackwater from Kiai Chow to Wen Hsien, not ascending to Siku. It is a hoary-grey-leaved little shrub, with wax-pink Verbenoid flowers in heads in early April.

Buddleia variabilis (F 424).—This is usually very poor in these parts, where it occupies the river-shingles in special profusion. However, about Kwanting, in the Nan Ho Valley, it seems to have longer spikes and smaller leaves and better colours than elsewhere. Accordingly, on the faint chance of such remaining constant, I have collected seed from the biggest-tailed bushes. Above Naindzai I saw one specimen which I believe to be a hybrid of *B. variabilis* × *B. F 100*. But *B. variabilis* does indeed earn its name, growing especially neat and small and dainty-leaved and brilliant in pure river silt (it would be well worth while to try to preserve such forms by similar cultivation at home), and then developing in hedgerows &c. volumes of limp and flopping leafage, terminating in wretched drooping rat-tails of absurdly disproportionate, small, dull blossoms. In all this region it blooms in July–August.

Callianthemum Farreri sp. nov. (F 73).—This, as collected in May from damp, cool ledges in the Satanee Alps, had low outspreading foliage, very glaucous and beautiful, with outlying stems of 2–3 inches, and very large flowers of a most melting China-blue, suggesting a discarnate *Anemone blanda*. The seed sent out under this number was collected from a plant of precisely similar habit, abounding in the earthier parts of the big limestone scree on Thundercrown; I have none but a philosophic doubt that they should prove identical. Seed is very hard to get; the carpels fall while yet green, and you have to quest around each clump to detect the green nutlings lurking here and there in the chinks of the shingle; and then the catching them becomes an agitating business, for if not caught at the first pounce they dive deeper and deeper among the pebbles every moment, and are soon completely buried from view. So hard are these wee nuts, and so evident their purpose in dropping prematurely, in order that the husk may wilt and rot below ground, and give the nucleus full time to sprout, that in the artificial conditions of the garden it would be well, I think, cautiously to split open the nut and extract the kernel to be sown.

Caryopteris sp. (F 350).—This is a speciality of the Jô-ni district, extending down the Nan Ho Valley, but on all the hot bare open loess hills about Jô-ni making clouds of azure haze in August, and even flaunting its blue films from the crumbling walls of the dilapidated little city itself. It is a most lovely thing, and, as Jô-ni stands at 8,000 feet, should be very happy in dry aspects in England; it is always a low flopping mass of some 15 inches high, and I can by no means believe it not to be quite distinct from *C. Mastacanthus*.

Celtis sp. (F 335).—This, I think, is the most beautiful deciduous tree I know, when well developed, having the look of a great many-trunked, smooth, grey beech, with the bark minutely parqueted with cracks and tiny peelings that bring a note of

russet into the bole's silver. The foliage is that of a wee elm, borne in clouds of lacy filminess most exquisite to see, especially in the emerald freshness of spring or the clear amber of autumn. It is a well-known beauty in Oriental art, but I rather doubt its being wild in South-West Kansu, where I have only noticed it in warm grave-coppices, or about little temples or pleasure-houses beneath the sunny flanks of the hills, in places rather chosen-looking and deliberate.

Celtis? sp. (F 317) may not be a *Celtis* at all. It has the same smooth grey bole as the last, but is a smaller and very scanty branching tree, with bay-like foliage and little stalked fruits like myrtles. From the grave-coppice outside Kwanting; not yet distributed.

Cimicifuga sp. (F 445).—This superb thing lives luxuriant in the alp-meadows about Jô-ni, and far up into the Tibetan highlands, extending south-east to the Thundercrown gorges, where it is rare and poorer in the drier circumstances. The basal volume of foliage is ample, sumptuous, glossy and splendid; from this arise in August the stately stems of 6-7 feet, deploying a great foaming spout of cream-white blossom in a broken panicle, suggesting *Spiraea Aruncus* on a quadrupled scale of glory. This will clearly repay the very richest conditions of cultivation in a moist but sunny spot. (Can it be *C. racemosa*?)

Clematis sp. (F 211) is a magnificent floppet from the upper reaches of the wooded alpine valleys opposite Jô-ni in Tibet, where it sprawls upon the bushes, and in August sends up in pairs, on very long pedicels, a profusion of enormous snow-white flowers of six amply rounded segments, and a general resemblance to some small *Jackmannii* hybrid.

Clematis aethusifolia (F 301) is a rather uncommon occurrence on steep wayside banks of loess in the Jô-ni district—a very frail, slight weakling of a foot or so, with a quantity of urceolate little straw-coloured flowers, so campanuloid in effect that one thinks at once of a yellow *Campanula Bellardii* growing in lax tangle.

Clematis tangutica obtusiuscula (F 307, 342) unfurls a coil almost as long as its name over the river-shingles of all the streams about Jô-ni, ascending to about 10,000 feet on the fringes of the alpine coppice. In August it is all a dancing carillon of big, yellow bells like gay golden Fritillaries, succeeded in November by the most voluminous fluffs of soft silver that I know among these Clematids.

Clematis nannophylla (F 321) belongs to the Sikü district, and ceases north of Tan Ch'ang in the Nan Ho Valley (though reappearing far away up country on the downs below Lanchow). It loves very hot, steep, bare, and stony places of loess or shingle, over the torrid hills about the Blackwater and the Nan Ho. It makes a thick stiff-stemmed bush of curled parsley-like foliage, usually about 18 inches high and 2 feet through, lavishly set in August with

a profusion of bright golden Maltese crosses with a darker eye, slightly pendulous, widely open, and of the most conspicuous charm. When well treated and not nibbled down, it can become a mass at least 4 feet through and about 2 feet high.

Clematis sp. (F 343) is doubtfully distinct, and not distributed.

Clematis sp. (F 344) is perhaps only *C. montana*, but a fine, large-flowered type from hedgerows and coppice in the Gahoba district.

Clematis sp. (F 345) is closely akin, if not the same. Lotus Mountain. Not distributed.

Clematis sp. (F 346) (Coll. W. PURDOM), from Lotus Mountain, is doubtful and not distributed.

Clematis sp. (F 347) is also not to be distributed. It is a hideous Vitalba thing, typical of so many sent out in recent years. Only under protest have I sent home even a little sample, while the equally numerous uglinesses near *C. orientalis* I have wholly refused to notice.

Convolvulus tragacanthoides (F 99).—Such a very lovely little mound of silver-grey horns this is, starred in June with inset blossoms of the softest, hot, clear pink, perfectly clean and pure. It is a dense hedgehog, usually of about 4 inches high and 8–10 across, but where safe from goats occasionally doubling its dimensions and developing quite a woody trunk. No Levantine could be lovelier; it lives on the hottest, driest slopes of the hot, dry loess hills about the Blackwater, from Naindzai and all round Siku, up to Lodanee [and proves a most miserable moribund miff accordingly].

Corydalis sp. (F 113).—This is one of the Chinese Corydalids much boomed of late years—a lush rank mass of blue adiantoid foliage, with tall spikes of pallid yellow flowers and a noxious stink. I cannot admire it; it especially affects the slag-dump-like avalanches of filth that here and there descend in cataracts of unpleasant slimy chaos from the hills about Siku.

Corydalis curviflora (F 37) is general all up the Border, in beck-shingles and alpine turf and scrub-edges. It is a weakly, gracious thing of annual look, about 6 inches high, with scant fine leafage, and flower-spires of the most dazzling pure azure, occasionally varying to straw-colour. Unfortunately, seed of *Corydalis* is often hard to catch on the hop, and I have not yet succeeded in getting any of this beauty.

Corydalis melanochlora Bat. (= *C. Purdomi*) (F 254) lives only in the topmost scree of the great mountains, huddling close with fat and lovely leafage of glaucous-blue, emerging from which unfold large heads of very large flowers of pure white, but lipped and helmed with sky-blue, and with a black eye. It smells most deliciously, too, of Lily of the Valley, and its tuffets of sky and snow make a wonderful effect as they dot those gaunt arêtes of the Min S'an in August, amid the hovering velvet butterflies of *Delphinium tan-*

guticum [and extending to the northern chain of the Da-Tung]. Seed was unluckily not procurable ; our hope depends on dormant tubers sent home in the winter, and ere long to be distributed, if all goes well. [Alas ! they all died in due course.]

Corydalis sp. (F 418) is a version of F 113, living on the loess cliffs round Minchow, and differing for the better in having larger flowers of a clear decisive yellow. There is not yet enough seed to distribute, as almost all the pods were discharged by the time I got back to Minchow. (I take no count here of various other spp. seen—gawky dull weeds, lush and ephemeral, of no value except for the herbarium.)

Cotoneaster sp. (F 111, 402a) lives in the cliffs about Siku and Mō-Ping. It is perhaps *C. Dielsiana* (*C. applanata*)—a very graceful, applanate, sprayed, rounded-leaved shrub, with berries of bright opaque scarlet.

Cotoneaster Dammeri var. *radicans* (F 148).—This is perhaps the most important of all. I have seen it only at one point, in the limestone bottom of the great Siku gorge where, growing and resting and re-rooting as it goes, in almost pure limestone silt, it ramps perfectly tight and flat along the floor, moulding each boulder in its embrace, and developing a carpet many yards across, of refulgently glossy and apparently evergreen rounded foliage, among which glows in September–October a richly scattered profusion of brilliant scarlet fruits like holly-berries peppered over a lucent ground-willow, with here and there the amber leaves of autumn enhancing the sombre gloss of the carpet's green, and the flashing wealth of its bejewelment of berries. These were red and ripe on August 28 ; they were yet larger, redder, and more brilliant still at the latest back-end of October. It is certainly new to my experience, and should prove a prize of most special preciousness, whether for its own beauty, sheeting a slope, or as covert for Daffodil and Crocus.

Cotoneaster sp. (F 401a) is a magnificent tall and rather gawky bush of 6–8 feet from the lower alpine coppice about Satanee. It looks close to *C. bacillaris*, but the foliage is not smooth, and the glossy ebony berries are looser in their cluster and more pendulous on their footstalks.

Cotoneaster sp. (F 401b) is a rather smaller and inferior form (?) from the pass above Mō-Ping.

Cotoneaster sp. (F 402b) occurred to me once or twice in the Nan Ho Valley, and seemed to me to differ in being a smaller bush of much neater habit, with much smaller and more close-set leaves, and a much richer profusion of berries. The applanate sprays, however, though condensed, remain the same.

Cotoneaster sp. (F 403) I saw only once—several bushes round about a farm on the ascent out of Gahoba towards Satanee. This stands near *C. multiflora* ; it is a tall shrub or low tree, with long spreading branches abundantly set with lax clusters

of very large and rather oval maroon berries on long pedicels, looking like a burden of small purple cherries along the graceful sprays in October.

Cotoneaster sp. (F 404) has exactly the habit and foliage of *C. congesta*, but that the innumerable little fruits are black. It occurred on the coppiced pass above Mō-Ping.

Cotoneaster sp. (F 405a) is an obscure species collected by PURDOM about Chago, and pre-eminent in the remarkable size of its black oval fruit. It seemed a stiff and gawky bush of about 8 feet. (*C. perpusilla* abounds all over the lower Alps of Siku, but somehow I never arrived at getting any seed of it, it being so universal and profuse that one was always putting off collecting it till the "next time" that never comes.)

Crataegus crenulata (F 329) is a most brilliant addition to the group of *Cotoneaster angustifolia*-*Francheti*. It makes a very stiff, angular bush of 5-6 feet, in foliage and habit exactly recalling *Hippophae rhamnoides*, a resemblance heightened by the stark stiffness with which the spur-like thorny laterals stand off from the few main shoots. All along the sprays and all along the laterals are borne profuse, well-furnished, and well-spaced bunches of the most blazing vermilion fruits in late October, far surpassing any effort of *C. angustifolia*, and making a wonderful effect against the sombre gloss of the narrow, dark leaves. I first sighted this as one solitary stunted specimen above Ban S'an at a field-side on the last summit of the loess before one breasts the mass of Thundercrown; but subsequently we came upon it at home at one point in the cooler yet still dryish region of the Nan Ho, where, between Kwanting and Tan Ch'ang, it rose here and there in spouts of scarlet amid the scant scrub that clothes the rather arid hills beside the river, just below the great level where the stream diffuses in a hundred channels. It was never seen again; nor can I promise much for its flower, seeing that, on our summer traverses of the valley, the shrub completely eluded our notice. [It also abounds through central S. Kansu and far down into Szechwan (1915).]

Crataegus sp. (F 396) is a hawthorn of stately habit, either a stalwart bush, or quite a good straggling tree, with gnarled bark. The oxyacanthoid foliage goes of a burning deep blood-crimson in autumn, amid which the deeper crimson of the berries is almost lost. These, however, hang on very late into the autumn, long after the foliage is gone and the tree left naked. It begins in the high copses above Mō-Ping, and abounds in fine form in the old sacred forest that overhangs Satanee.

? *Cremanthodium* sp. (F 10) has pretty little kidney-shaped leaves, and single golden Senecio-stars on stems of 4-5 inches in March-April. It abounds in all cool and mossy places of the subalpine woodland throughout South Kansu. The seed, however, eluded our notice.

- ? *Cremanthodium* sp. (F 212) lives in cool, moist ledges under limestone cliffs (such as cry aloud for *Soldanella*) at great elevations in the Min S'an. Its glossy foliage is beautifully crenulate, and it carried several bell-shaped yellow flowers to a 6-inch stem (thereby making its name yet more doubtful) in August.
- ? *Cremanthodium* sp. (F 239) is, I believe, merely the last, repeated under a new number—unless it be a different and divergent form with more flowers. This cannot yet be distributed.
- Cypripedium* sp. (F 58 and 85).—This is the great Red Slipper of the subalpine slopes and copses all up the Border, peculiarly magnificent near Satanee, on loose soil of a coppice, burnt out some two seasons ago. These Slippers in the relationship of *C. ventricosum-speciosum* are still very obscure and tangled; whether this be *C. Francheti* or *C. fasciolatum*, or neither, or both, I cannot yet pretend to discern. It is a plant of stout and leafy stem, from the upper foliage of which escapes the voluminous baggy blossom, densely lined in rose-crimson on a dead-white ground, and with a pouch of deeper flush. Striking as is this bloom, there is a *Cypripedium*, form or species, occurring rarely in the Siku gorges (where the common leafy stalwart does not appear), which yet surpasses it—a thing of smaller, slighter growth, with few leaves, and those near the base of the 8-inch stem, leaving free play to a long and rather woolly peduncle supporting an enormous bulge-bagged blossom of very much deeper colour, especially in the uniform maroon crimson of the inflated round lip (? *C. fasciolatum*). This is represented only by specimens and a painting; of the others I have sent home pods to an Orchidist to raise. [F 85 is *C. tibeticum*.]
- Cypripedium luteum* (F 138) is a most glorious plant, precisely, copying *C. hirsutum* (*C. spectabile*) in all points of stature, amplitude, and habit, but that the comely round flowers are of a clear yellow, with a waxen sulphur lip. The segments are sometimes mottled with a few fleshy stains, the lip is freckled within, and the staminode in some forms, but not all, is, or goes, of a rich chocolate which gives Proud Margaret her especial look of well-fed intelligence. The Red Slippers haunt the scrub and copse edges up to about 8,000 feet, and there begins *C. luteum*, occasionally joining them, but beginning thus at the top of their distribution, and ascending for nearly 1,000 feet higher. We saw it in bud amid the overblown Red Slippers opposite Satanee in the end of May, and peasants, seeing us pick the red ones (which are powerful magic), told us also of the yellow; in the Siku gorges the plant occurs handsomely, and PURDOM has a record of it from a wood beyond Minchow. It grows behind Siku in sudden outbursts, here a great patch or an abundant colony, and then no more. Usually it likes a half-shady slope, in and out among scant scrub on the edge of a glade; but I have seen it magnificent in shallow moss and mould on the top of a boulder

in dense fir-tree shade, while one of the finest and yellowest drifts of all was growing in hard fibrous loam among coarse turf in fullest sun; and in the loose burnt humus opposite Satanee it was trying to rival *C. californicum* in stature. From all this it should result that Proud Margaret should easily, in any fair conditions, impart an ample share of pride to her possessor, so long as he remembers that, for all her resemblance in style to *C. hirsutum*, she is *not* a bog-plant like the Queen-Slipper, but a haunter of light woodland fringes in the cool, well-watered alps of China. Dormant crowns of this have been copiously sent, and I hope the Sleeping Beauty will ere long satisfactorily awake. [She never did, but rotted en route.]

Cypripedium Bardolphianum sp. nov. (F 139) has not been sent. It is a wee running thing, with pairs of leaves, and stems about 2 inches high, and green-segmented half-open tiny flowers, with a lip of brilliant, waxy gold, whelked and warted and bubukled like Bardolph's nose. It careers about occasionally in mossy grass in opener places of the mountain woodland, in such close association with *C. luteum* as often to run in and out among its stems. It has not only the exotic look of a wee Catasetum, but a Catasetum's heavy and cloying exotic scent of aromatics. I noted it only once, in the Siku gorges.

Cypripedium Farreri sp. nov. (F 155) carries us far away, towards the section of *C. Calceolus*. This is a delicate grower, sending up not more than two stems from a scanty-fibred root-stock. These stems are about 6 inches high, set with only two or perhaps three leaves, and carrying each a solitary large flower, with the greenish segments pointed and tweaked and twirled as in *C. Calceolus*, and broadly banded with dull maroon. The lip is the especial beauty; it is of dense waxy gloss, and very soft buttery cream-colour, through which dimly show the internal stripes of maroon; it is suddenly and strongly pulled in at the mouth, and then frills out into a series of brilliantly gleaming sharp little vandykes. To crown the attractions of this meek but subtle charmer, *Cypripedium* 'Sweetlips' exhales the most intoxicating and far-reaching fragrance of Lily of the Valley. This, I think, is a rare thing; I have seen it only at one or two points high up in the Siku gorges—always growing in the coldest, dankest, moistest sides of the moist dark cañons, loving a fine, cool, silty mould amid scant herbage, at the foot of enormous sunless limestone precipices. (It seems especially to love the base of a cool, shady, moist limestone rock.) Despite its rarity, crowns have duly been sent home, though only their ultimate condition can decide whether their quantity be sufficient yet for general distribution. [They shared the fate of *C. luteum*.]

Daphne sp. (F 11) (? *D. tangutica*).—This is abundant all over South-West Kansu, from Shi-ho away to Siku, in the lowest alpine zone, amid very light scrub, and usually preferring a

slightly shaded cool aspect in soil that may be yellow loam, or mould, or turfy peat, or limestone detritus. It ascends to some 7,500–8,000 feet on the moorland ridges above Gahoba, and above Siku is as finely developed among the calcareous débris at the débouchure of the gorges as is *D. alpina* among that about the Lago di Loppio. It forms a neat, rounded, low bush, about 15–24 inches high and rather more across, with the foliage and after the style of a small *D. indica*; and the masses of lilac-pale blossom appear in April, filling the air with fragrance, especially (as it seemed to me) in the later afternoon, and followed at the end of June by a brilliant clustered show of glowing vermilion fruits.

Daphne sp. (F 271).—This does not grow, like the last, among scrub, but all by itself, dotted here and there, in tiny sturdy blots of darkness, upon the huge grass-slopes of Tibet. Very small and slow of habit, very stiff and dark in foliage, that is all that can at present be said of it, the flower not having been as yet recorded.

Daphne sp. (F 378) lives in grassy open places like the last, on the hills north-east of Minchow. The last is possibly not distinct, but this one we *know* to have a noble display of fairly sweet blossom so densely borne on the shoots that the whole growth becomes a solid ball of lilac-pink in May–June, and at other times is a perfectly dense dome of very dark leathern foliage, to end up with a glowing display of scarlet berries. Coll. W. PURDOM. This should be a remarkable treasure; like all the others, it is calcicole.

Delphinium sp. (F 253).—Referring to “The English Rock-Garden,” I find that *D. tanguticum* stands closely related to *D. caucasicum*; and, from the similarity of their styles and sites, I therefore have to conclude that F 253 is *D. tanguticum* and no other. It is a noble beauty, confined to the limestone and shalstone scree along the upmost gaunt arêtes in the Min S’an, extending down to Thundercrown. Through the shingle it threads and spreads, and over all the grim slope hovers in August a flight, as it seems, of enormous violet-purple butterflies, flitting close over the stones, with wide-fluttering silken wings, and a black eye, and a body furred with white and gold. These single-flowered 2-inch scree Delphiniums are none of them known as yet in cultivation; they make an absolutely new tradition of beauty in their race, and should be at home perennially in the moraine. Of the larger species, so abundant up and down the border, I will not here speak; none, I think, offer any really valuable contribution to the garden. F 243, however, of which one rather doubtful pad was secured on Thundercrown, is another high-alpine species of the scree, with some two to three flowers on a low squatting stem among the foliage, and, though large, of a rather indeterminate lilac-purple, with a rather dulling downiness of pubescence on their parts.

Deutzia sp. (F 109).—Abounds about Mō-Ping, where all the coppiced slopes are a surf of snow at the end of May. It extends, too, up into the gorges of Thundercrown, and is a slight, graceful bush of 4–6 feet, bent down beneath its burden of large and brilliantly pure-white flowers.

Dianthus.—This race is very ill-represented in the Tibetan Alps. *D. squarrosus*, or a species closely akin to it (F 389), abounds in the upper grass-lands, while on Lotus Mountain, low down, occurs a small red-flowered cluster-head (F 352). Neither is yet worth distributing.

Dicranostigma Franchetianum (F 1) is a Great Celandine, abounding on precipitous field-banks and walls of the loess right away from Honan to the Tibetan border. It makes a very handsome basal rosette of richly glaucous-lobed foliage, like a blue Ceterach, from which arises a profusion of stems in April, showering forth golden-yellow poppies over a long period, in sprays of some 8–12 inches high [but not of any trustworthy permanence].

Diospyros sp. (F 425).—Not distributed; the lesser Persimmon—a graceful voluminous tree, like a gigantic Bay, beset with innumerable little fruits of a warm amber, like stewed Mirabelles.

Dipelta floribunda (F 18).—This very lovely and graceful shrub begins to occur some two to three days south of Shi-ho, and thence abounds magnificently westward in all the lower alpine coppice of the Chago-ling extremity of the range, not extending further into the main mass of the chain about Satanee, and dying finally away northward on the Mō-Ping slope of the Gahoba Pass between the two great alpine chains. It is usually a low bush, but on the slopes below Chago-ling develops into a small rounded tree of 12–14 feet; the effect of that woodland wall, when every bough is bent beneath its burden of pearl-pale Diervillas, with laced lip of golden orange-filigree, is one not easily to be imagined, nor ever to be described. *Dipelta* (F 18) is in its zenith in mid-May; a fact which makes me doubtful of identifying it with Potanin's *D. elegans* recorded from the Mō-Ping passes on June 27—a date by which the earlier species should long have passed out of flower. This curious, capri-foliaceous family, so inordinately profuse in flower, has an ineradicable parsimony about seeding. PURDOM, in the autumn, returned at great peril and in disguise into the Chago district and there got a large sackful of seed; that large sackful yielded some fifty-six sound germs alone. So that no one must wonder if the distribution of this beauty has been but scanty. (It should strike well from cuttings from half-ripened wood about August.)

Dipelta elegans (F 157) is yet worse. Of this I got two large sackfuls, yet, having husked so many seeds and found them all bad, I hardly dare distribute the rest, for fear there may not prove a single sound kernel in the lot. It is a taller grower than the last, larger and pinker in the flower, much larger in the chaffy

membranous bracts that enclose the seed. Though lovely, it is not nearly so profuse nor so dazzlingly attractive—a big lax bush of 8–10 feet, rather lank of habit, with abundance of scattered blossoms that have the value of appearing in early-mid-July. I know it only as a thing of rare occurrence, here and there on the coppiced slopes of the great Siku gorge in its uppermost reaches, at some 7,500–8,000 feet. This, rather than F 18, might perhaps be POTANIN'S *D. elegans* of the Mō-Ping ridge.

Diphylleia sp. (F 284) is probably *D. Grayi*. It is common in cool rich places of the alpine woodland up the Border, and its 2–3 feet racemes of big, blue-black berries have a great attraction above the magnificent peltate foliage in autumn.

Diphylleia sp. (F 428) is much more doubtful and much more interesting. Here the spike is more graceful, and the foliage beautifully divided. Its attribution to *Diphylleia* is doubtful, and it has only been seen in one small mountain wood (also illustrated by *Paeonia Veitchii*) above Gahoba, in the last days of autumn.

Disporum pullum (F 60) is a singularly beautiful woodland treasure, first seen on the Feng S'an Ling, and thence abounding sporadically throughout the lower alpine forests of the Satanee-Gahoba district. It has all the branching habit of a *Streptopus*, and grows about 10–12 inches high, hanging out clusters of the most exquisite waxy *Lapageria*-blossoms, with golden anthers. These ring out their chimes in mid-May, and the growth afterwards develops and expands a little, replacing the flowers with bloomy black-blue berries in October. Obviously the treatment of *Streptopus* and *Polygonatum* ought handsomely to satisfy a beauty so nearly related, and delighting in the same rich, cool woodland conditions. Its effect is, indeed, more that of *Uvularia*.

Dracocephalum sp. (F 491) is a pretty, feathery-leaved, fine-growing species of 12–15 inches high, abounding in the hot loess banks about Jō-ni, where it sends up graceful furry plumes of dark sapphire-blue blossoms, long and narrow, in July-August.

Euonymus sp. (F 289).—This is an extraordinarily graceful and exquisite shrub of 18 inches, running up to 6–8 feet, with stiff and very fine long sprays, few in number, and scantily set with very narrow dentate leaves—suggesting in effect a starved and stiffened Willow, but that from each spray's end hang, on thread-like pedicels of 3–4 inches, huge 5-pointed stars of fruit that open in crimson plush, containing at each apex vermilion-glowing seeds of startling richness in the crimson star, which long outlives the fall of the seed. This plant occurs sporadically down the border, in hedgerows and woodland; the best specimen was seen in alpine coppice at Gahoba.

Euonymus sp. (F 297) is of taller, thicker, bushier habit—in all respects a more commonplace bush, though with similar stars of fruit.

Euonymus sp. (F 307) is an arborescent species, with thin, narrow foliage and big scarlet stars. It is probably, like the next, in relation to F 289.

Euonymus sp. (F 308) creeps and straggles in the Jô-ni hedgerows, and is otherwise closely related to F 289, with big, 5-rayed stars of crimson.

Euonymus sp. (F 390) has the habit of F 297, but its fruits, in scarlet stars, are black.

Euonymus sp. (F 391) is a large bush, after the style of F 297, but the brilliant scarlet fruit-stars have only four rays.

Euonymus sp. (F 392) is a stiff, leafy shrub, or a round-headed graceful tree, so heavily laden with clusters of pink coral waxy fruit, filled with vermilion seed, as to look like a Cherry in full bloom. It occurs in subalpine coppice all down the border, and should either be grown on quickly into a tree or kept very hard cut back into a gnarled bush, so that its fruit may have its full effect; as a mere shrub, the shoots are stiff and leafy, and leave the coral-clusters rather in the lurch.

Euonymus sp. (F 447) is another species with black seeds. Perhaps the same as F 390. It is not possible to promise which seeds of *Euonymus* will be distributed, as no one can tell beforehand in what condition the short-lived and very precarious germs will come to hand.

Exochorda racemosa var. *Wilsonii* (F 95).—This was only sighted on a hot and difficult range of cliffs above Siku, where, amid *Pæonies*, it formed slight bushes of 3–4 feet, brilliant with terminal flights of snowy flowers at the end of May. It is smaller and less dazzling than F 6, but this may be owing to the specially torrid aspect to which it is here confined on a dry hill.

Farreria pretiosa (F 19a) (novum genus Balf. fil. et W. W. Sm.) is a singularly lovely little ground *Daphne*, with clusters of bright citron-yellow flowers, twice met with on the high bare loess downs of South Kansu, April 18, April 20. Unfortunately seed could not be got, and roots were unnegotiable. There is another species, F 71, brilliantly golden, but of quite inferior merit, which abounds in rocks and dry coarse alpine turf on the Siku-Sataneë ranges, between 7,500 and 9,000 feet; this also appears so shy in seed that none could be found, though occasionally, as on burnt-out ribs of rock, its evidence was plain, in small, compact, young plants.

Filix sp. (F 446).—This most lovely fern decorates the woodland above Sataneë, and strays out, above Da-hai-go, into the open alpine turf, where it forms dense colonies many yards across, with fronds as fine as *Trichomanes radicans*, yet hard and hardy and wiry as *Asplenium Ruta-muraria*. They are about 8–12 inches high, and in autumn, dying, fade to a clear amber. One plant was seen far above Siku, near Ban-S'an, but its greatest point of luxuriance was in the lower, lighter woodland of the

forest above Satanee, in tight and springy, turfy loam, or vegetable mould.

Forsythia sp. (F 388).—No more of this can be given than its name.

It is a small stocky bush of 3–5 feet, found occurring in seed about the Mō-Ping in the autumn, though previous traverses of the path had not fallen in with its flower.

Fraxinus sp. (F 314) is sent, as Chinese ashes are at present in such a state of confusion and so little known. It is a low tree of some 20 feet, very heavy in fruit, but in no other way obviously remarkable.

Gentiana sp. (F 25) is abundant all over South Kansu and the Tibetan Border, ascending to 8,000 feet, and luxuriating in any open sunny position, wet or dry, but especially profuse in river-shingles and fallow fields. In its second year the seedling forms a glossy crown, like that of some stout *G. verna*, and in the third this becomes from March to November an endless display of bright azure stars on long tubes. The ovary matures at the tip of an exaggeratedly protruded style, as the flower withers; its two lips quickly gape, and the seed is gone. This fashion seems common among the better Gentians of the border.

Gentiana hexaphylla (F 217).—This number covers a most beautiful Gentian, very abundant in the higher alpine turf of the Min S'an, where it literally turns the turf to a sea of blue with the profusion of its pale clear water-blue trumpets, most delicately lined with darkness on their outside, and poising each singly at the end of the whorled-foliaged stems that spring in such masses from the crown. The species either varies or the number includes two spp. Seed sent as F 217 was for the most part collected on Thundercrown; the Min S'an type is to all intents and purposes the same, but differs conspicuously in having a very much larger ovary. This last has also been sent as F 332. Seed is borne as in the last, and the heyday of the bloom is in August.

Gentiana sp. (F 220).—This is quite like *G. frigida*, but taller and in every way better developed, growing about 8 inches tall, with six or eight large, long, straw-coloured trumpets in August. It is general all along the line of the Min S'an, from 11,000–14,000 feet, growing for choice in the cool alpine turf, usually on steeper, barer banks than those affected by the luxuriant, mossy-looking masses of F 217. Seed very doubtful, and not distributed.

Gentiana sp. (F 267).—Unfortunately blooms too late in September for seed to have been got. It grows only on rock towards the highest summits, between 12,000 and 15,000 feet, and there forms wads of foliage like *Melandrium Elizabethae*, close on which lie stemless the enormous trumpets of lavender-blue.

Gentiana sp. (F 303) stands close to *G. Kurroo*. It is, however, rather smaller and more leafy, with flowers much more numerous along the flopping 6–8-inch stems in September, rather smaller, and of an intense rich sapphire velvet. It grows all along by the

waysides, in the banks and little level lawns beside the road in the Jô-ni district, not ascending above 8,000 feet, and hugging always the flatter places of the loess region, in such hard, dry loam, and in such open, sunny places as those preferred by *G. Cruciata*.

Gentiana sp. (F 332) represents the large-ovary species from the Min S'an, of which the Thundercrown development has been sent out as F 217.

Gentiana sp. (F 442) comes from the Min S'an grass-lands, and was harvested by a Chinese collector. No more can be said; it is perhaps one of the hideous Cluster-headed Gentians of the *Macrophylla-mongolica* group that so abound in the Chinese Alps, and are yearly collected in huge bales for "medicine."

Gentiana sp. (F 443) is a pretty annual, from the high alpine turf all along the Min S'an. From its frail crown it sends out a few frail prostrate sprays, supporting at intervals perfectly erect, very long-tubed, 5-pointed stars of clear straw-yellow, of charming effect among the grass in August.

Geranium Pylzowianum (F 201).—There are many field-Geraniums up and down the grass-lands of Tibet, but none of them likely to be of any garden-value—rather weedy herbaceous things for the most part, akin to *G. sylvaticum*. F 201, however, is of quite a different kidney—being a high-alpine species, found only in the topmost screes of shale or limestone at 13,000–15,000 feet, where it abounds in such masses as to cover the whole vast expanse of desolation with the fluttering flights of its innumerable big flowers of palest pink in August crowded on footstalks of 2–3 inches, all over the concise clump of each plant, making mounds of soft pallor all up and down the desolation. In effect it approaches nearest to *G. argenteum*, but is much neater, much more lavishly beblossed, and in colour of an even paler and more evanescent pink. It is the only important Min S'an alpine which does not seem to extend down to Thundercrown; and its season is so awkward that it was only after great difficulty and exertion that two seeds were hacked up out of the ice-locked adamant of the mountain in autumn.

Hedysarum multijugum (F 103) occurs in big stretches down the river-shingles of the Blackwater, between Kiai Chow and Wen Hsien, but its main distribution seems higher up, about Siku, where it luxuriates on the hot, hard, bare and shingly hills of loess about the town, and even wanders north about a day's journey up the Nan Ho. [It abounds also by the mile far away in the North, in the shingle-flats of the Da-Tung River.] It is a most beautiful plant, forming low masses of glaucescent foliage from a woody trunk, from which rise foot-high racemes, very graceful and delicate, beset with large blossoms of rose-purple-crimson in a long and elegant flight. Its bloom is in May, and the prickly rough burrs that hold the seed await the frosts of November before they dry up and fall.

- Ilex Pernyi* (F 16).—This ugly and graceless little dumpy shrub belongs to the woodland of the drier ranges—as about the Feng S'an Ling, and in the arid scrub of the summit ridges opposite Kiai Chow. Not distributed.
- Incarvillea grandiflora* (F 34).—With greatest uncertainty do I thus name this plant, which stands away from *Incarvillea* in having very minute seeds, wadded up in white fluff in long and very narrow pods (? *Amphicome* sp.). It is a most handsome thing, herbaceous from a huge woody stock, with straight 2-foot stems set with voluminous glossy foliage, and ending in big flights of lovely rose-pink little Allamandas, clear and brilliant, in May. This I have only once seen, and only in the hottest of walls and stony banks in the hot and parching region about Wen Hsien, on the banks and embankments of the Whitewater.
- Incarvillea grandiflora* (F 89) lives in the hot limestone ledges of the Thundercrown foothills at 7,000–8,000 feet. It is magnificent in flower. Unfortunately, all seed had fallen by the time our collecting began. [If the same as the Da-Tung plant it is very splendid, but monocarpic.]
- Incarvillea variabilis* var. *fumariaefolia* (F 97) has weakly branches of a foot or so, set with finely-feathered ferny foliage, and bearing, from May to November, a steady flight of lovely citron-yellow Allamandas. Its home is round Siku, on the very walls themselves, and on the hottest and driest and barest exposures on the hot, bare, dry loess hills about the town. [Also in the Da-Tung region, 1915.]
- Incarvillea* sp. (F 268).—This may be the same as F 89, but has quite a different taste in habitats, not haunting ledges of rock, but open broad patches of soil by the track-side ascending over the foothills of Monk Mountain. It is reported a superb rose-red *I. compacta*-cousin, and the seed-scapes are 8–12 inches in height. I can say no more; *ipse non vidi*. Coll. W. PURDOM.
- Indigofera* sp. (F 105).—This abounds all over the alpine and sub-alpine rocks and coppices of Kansu-Tibet, taking forms so many that specific differences may be suspected. This seed came from low shrubs haunting the sunless walls in the mouth of the great Siku gorge, and there flowering gaily in loose flights of lilac-pink in early June.
- Indigofera* sp. (F 266) is but doubtfully *Indigofera* at all. It is a perfectly prostrate trailing plant, sending out from its crown three or four branching naked-looking sprays of 12–36 inches long, hugging the ground, and densely set in late August with very brilliant crimson-purple blossoms that suggest a much improved and flatly prostrate *Cytisus purpureus*. This lovely thing occurs in the Nan Ho Valley, and abounds all over the hot loess hills about Siku, on steep banks, and at the edges of stony fields, paths, &c.
- Indigofera* sp. (F 312) is one of the loveliest. It haunts only the

hottest, barest, driest, stoniest slopes of the torrid downs about the Blackwater, where it forms neat and very dense, intricate, woody bushlets of 6-8 inches high and twice as much through, spinous and stiff, lacy with elegant tiny leafage, and hanging out pairs of little pea-flowers of brilliant rose-pink in June, along the many brief pungent sprays. Goats, despite its spininesses, keep it sedulously cut into shape; it especially loves to have plenty of stone and shingle in its loam, and luxuriates beneath the Akropolis of Siku, where the rude forefathers of the hamlet lie for centuries exposed, each in his collapsing coffin of wood, poised among the *Indigoferas* upon the pebbly slope of the hill.

Indigofera spp. (F 452, 453, 454) have not been distributed. The distinctness of the last two from each other and from F 105 is by no means certain; F 452 has the big habit of F 105, but with the fine foliage of F 312 on tall élançé sprays of 5-6 feet. It occurs about the Nan Ho, and away to Satanee; like all *Indigoferas*, it keeps its seed unripe until the winter frosts have cracked it, and it is therefore hard to secure in a ripe condition.

Iris Henryi (F 19) is a charming little grassy frailty that runs about in the coarse, hot turf, midway on the blazing hills about Kiai Chow, and in April decks their gullies with a galaxy of milky-white (or sometimes palest blue) *Moraea*-flowers, giving the whole effect of *Triteleias*, but with a peacock-eye to the fall. Unfortunately, even if seed is set, it was not possible this year to procure any.

Iris ensata (F 29) is a type of the ensate *Iris*, which forms by mats all over the loess downs and path-sides of China, with thin flowers of blue on 4-inch scapes in April. Several of the later numbers may refer to this species, or to others closely allied in the same group.

Iris goniocarpa alpina (F 124), if it does not include two distinct species, begins first in the rock-ledges of the Feng S'an Ling above Wen Hsien, is seen below the town on hot, bare banks outside the wall, and again on rock-ledges and in and out among scant scrub above Chago—a grassy, lovely *Iris*, suggesting a smaller *I. unguicularis*, with the brindlings and feline mottlings of *I. tectorum* over its broad and crested lavender falls. But it then, if the same, erupts in enormous abundance over the mid-alpine turf of Thundercrown, from 10,500 to 12,000 feet, enamelling all the sward with its delicate flowers. Abundant as it is, however, this plant marks a comparative failure. The summer was torrid, the pods were gone before we guessed, and, instead of millions of seed, we only acquired a dozen or so, not yet distributed. F 270, however, marks an obscure *Iris*, which may or may not be this, collected by Chinese retainers in the main Min S'an, where this species, if it exists, was long over before we got there.

- Iris goniocarpa* var. *pratensis* (F 90) occurs at lower elevations than the last on the same Thundercrown turf, filling the much coarser longer grass on the hot dry slopes at 7,000–8,000 feet, often, in opener places, developing quite a fan of grassy foliage, with dozens of fine 6-inch stems, each balancing a single lovely flower with lavender standard-blade and a fall of waxen pure white, heavily margined and mottled with richest violet velvet. Even worse luck have we so far had with this; arduous and prolonged research yielded only three capsules, and in these only two seeds still preserved a promise of vitality (May–June).
- Iris* sp. (F 177) is a cousin of *I. prismatica* from the highest grass-ridges of Tibet, with rather thin flowers of plum-colour and dark blue in August, from its fine, dark, grassy mats of foliage.
- Iris* sp. (F 276) lives on the hottest bare banks of loess about Siku, and again crops out in the Nan Ho Valley. It is a strange Moraeoid species, with fans of broad *tectorum*-like leafage, and tall, very graceful branching stems of 12–24 inches, displaying erect flowers, rather small and fugacious, of velvety texture and greyish tone, the falls being mottled with hazel-brown on a pale background. It blooms in July–August and is soon ripe in seed.
- Iris* sp. (F 413) is a small species from level loess pans on the Akropolis of Siku. It belongs to the type of F 29, but seems much littler and slighter in every part, with flowers (unknown) springing almost stemless from the crown, two or three often on one welded scape.
- Iris Farreri* sp. nov. (F 414) is a relation of F 29, abounding on the bare loess in the open valley-bottoms of the Tibetan ranges opposite Jô-ni, at some 9,500–10,000 feet. Its lingering flowers in August were blended of blue and white, and offer good hope that the plant may prove as valuable as it is certainly floriferous.
- Iris* sp. (F 415) was collected by our Chinese headman as being the same as F 19, which is no more nor less than *I. tectorum* (abounding in huge masses all over the cool, grassy downs between Shi-ho and Foo-er-gai); but the fat and purpled pods he brought seem to me in many ways so distinct from those of *I. tectorum* that I can but send it out with this caution, though I am unable to suggest what else it might be, especially as it was not collected in the *tectorum* district. [No! it is quite distinct and shares with true *tectorum* the valleys of S. Kansu.]
- Iris* sp. (F 416) is a quite uncertain species from the Tao-chow district, possibly in alliance with F 29 and F 414.
- Isopyrum* sp. nov. (F 96) is so universally abundant in all the cool, high-alpine limestone cliffs as to have been, in the end, but too slackly collected this year—especially as its seeds are so minute and its capacious capsules so capricious. Such seed as is distributed will want most careful raising. The species is very beautiful, with cushions of tiny Columbine foliage, and

big, golden-hearted flowers that are not blue, as often said, but of a dense waxen texture and milk or skim-milk colouring, only rarely deepening to any blue tone. *Isopyrum* sp. (F 293) cannot yet be sent out. It occurs in the Monk Mountain district (flower unknown) and differs from F 96 in greener, rather large foliage, and in a distinctly bigger, rounder seed. *Ipsē non vidi*. Coll. W. PURDOM.

Jasminum sp. (F 383) is a small golden-flowered shrub collected by PURDOM (May) in the copse below Chago, and not seen by myself. It is remarkably free in flower, but scentless, and rather stiff in growth.

Jasminum floridum (F 433) is a small, neat, stiff bush from the same region, with bright green foliage, and berries of brilliant glossy black with juice of intense purple.

Latotis ramalana (F 125) has not been distributed, as only a very few seeds were got. It grows, however, abundantly, in the highest earth-pans and earthy scree on the crests of the Min S'an and Thundercrown at 13,000–14,000 feet, where in June it produces, close to the stones, fluffy, blue wulfenious heads of not very startling flower, to be followed by the expansion of soft, rounded foliage.

Leontopodium alpinum, the common type of the European Alps, is an abundant wayside weed over all the loess lands of South Kansu, but there are at least two subspecies or forms of much greater merit from more alpine stations.

Leontopodium alpinum (F 219) makes very handsome clumps of very large long-pointed foliage, perfectly green and glossy, from which rise graceful 8-inch stems expending voluminous and splendid heads of Edelweiss. This form belongs to the upper alpine turf between 10,000 and 13,000 feet, and the seed was collected on Thundercrown. (? *L. himalayanicum*; in any case, a noble and stately form, the best Edelweiss by far that I know.)

Leontopodium alpinum (F 410).—It is quite inferior to the last, occurring at much greater elevations, where, not in grass but in the finer scree, it forms cushions of blunt and perfectly woolly-grey foliage which is the plant's one beauty—for the flowers, as I have always seen them, are few-rayed dumpy stars of a dirty, iron-grey tone, borne on stems of 2 inches above the mass. [*This Edelweiss has been distributed as F 392 (= F 410).*]

Leptodermis oblonga var. (F 259) makes a neat, stiff little bush, not unlike a rigid Privet or Persian Lilac in effect—a suggestion completed by the thyrses of pink-mauve flowers that open in July, giving quite the idea of long-throated, five-rayed stars of Lilac. This species seems special to the Nan Ho Valley between Tan Ch'ang and Kwanting, where it sporadically occurs on the steepest gravelly banks and scarps amid other light, scant scrubs, but does not descend to the much hotter regions haunted by the next.

Leptodermis virgata (F 260) belongs only to the very hottest and driest shingly banks or sheer cliffs away down the Blackwater, from all the loess downs about Siku at least as far south as Wen Hsien. It is a small shrub of inimitable grace, attaining, when let alone by goats, to 3-4 feet, but with its delicate stems bowed down beneath the long and lilac-like panicles of blossom that open in August, and are yet further enhanced by the microscopically fine, myrtle-like foliage in which the dainty cloudy mass is invested. It does not go far up the Nan Ho Valley, and will hardly be found with the last.

Ligustrum spp. (F 412) are both perfectly doubtful in their names. F 412 has not been distributed, and is a tall 14-foot shrub with black fruits in racemes. It occurred about Kwanting in the Nan Ho Valley.

Lilium sp. (F 183) has so far been sent only in a few non-distributable bulbs. It abounds all up the Tao-ho district, particularly delighting in steep shingly banks of loam amid light coppice, where its cold, bone-white Turk's caps have a glacial beauty amid the greenery in August, though dulled in detail by their freckling of fine crimson dots along the inner margins of the segments.

Lilium sp. (F 316) is perhaps only *L. longiflorum*, but a form of such gigantic stature and vigour that I send it on the chance of its proving a useful new strain. Two plants were seen, both cultivated, in two cottage gardens just outside Siku, each sending up three spikes of 4-5 feet, laden with gigantic flowers and ultimately each rearing aloft a stiff candelabrum of seed-pods. The foliage appeared to be finer and more abundant than in most types of *L. longiflorum*, and approaching more in its whole style to that of *L. regale*. Neither specimen, however, was closely examined. (Could it perhaps be *L. "Brownii" kansuense*?)

Lloydia sp. (F 87) is lovely in all the cold crevices of the higher limestone cliffs, swinging out glassy bubble-bells of pearly white with dark lines, larger and fuller, and much more beautifully borne, than in *L. serotina*. [*L. alpina* was sent out in 1916 from the Da-Tung Alps.]

Lonicera Farreri (F 46).—This is the one *Lonicera* (not of the *Syringantha* group) of which I can vouch for the flower's being beautiful. It is a very small, neat bush, with tiny myrtle-like foliage flattened on the sprays, from which depend great quantities of rose-pink bugles in May, to be followed by glowing rubies in October. This is a subspecies or form closely allied to a larger shrub not uncommon in the Satanee Alps; of this plant only two certain specimens are known, one from above Chago, and another (now mossed up at Lanchow) in the deep gorge behind Gahoba. Neither of these yielded seed; and I have not dared to send out fruit under this number of any shrub of which I am not certain.

- Lonicera syringantha* (F 189) abounds in the hedgerows and copsy valley-bottoms in the Tibetan Alps opposite Jô-ni between 8,000 and 10,000 feet—a large, light-foliaged bush, with clustered lovely stars of waxy and intensely fragrant pink-lilac blossom in early summer, succeeded by dazzling scarlet berries in October.
- Lonicera* sp. (F 249).—A stiff and rather graceless bush of 4–5 feet from the Tibetan coppices, with black fruits like boot-buttons in pairs or fours along the axils of the sprays.
- Lonicera* sp. (F 250).—A bush of 5 feet, growing with the last but much more graceful, with pendent pinkish trumpets, and then richly glowing ruby berries hovering from invisibly fine pedicels.
- Lonicera* sp. (F 252) attains 6–8 feet. It has smallish flowers in compound sprays along the axils, and twin red berries.
- Lonicera* sp. (F 269) is a tall, graceful bush, with orange berries in fours along the axils of the flattened bending sprays.
- Lonicera* sp. (F 270 or F 224) is only an occasional occurrence in the coppiced valley-bottoms opposite Jô-ni. It is a bush of 8–10 feet, not particularly attractive in flower, but remarkable for the delicious quality of the black oval-pointed berries that it bears along the axils of the flattened sprays. It should not be eaten raw; but in stews, jams, and jellies proves one of the most delightful of fruits. The discovery was made (for the Tibetans ignore it) by the American missionaries, who call it Blueberry, after the Whortleberry that it rather resembles in berry. A most important future may be prophesied for this new fruit, which can hardly fail to be a treasure for temperate climates. Already introduced by PURDOM into America, it has not been heard of in England yet.
- Lonicera* sp. (F 277) belongs to the group of *L. syringantha*, and is a most delightful, almost prostrate bushlet, running freely about in the higher alpine turf of Thundercrown and the Min S'an at some 12,000 feet, its grey-leaved flattened sprays bedecked with clusters of large, sweet stars of crystalline lilac-pink flowers, to be followed in August–November by bunches of oval fruit, dazzling scarlet, bigger and less round than in F 189.
- Lonicera* sp. (F 278) is perfectly prostrate, creeping far and wide in mounded flat masses over the highest beck shingles of the Min S'an and Thundercrown, with long sprays of greyish foliage, and orange berries huddled along them in twins or fours. Flower so far unknown.
- Lonicera* sp. (F 313) has not yet been distributed. It is the larger, much dimmer-flowered and commoner bush already talked of as the big original or cousin of F 46. The pretty ruby fruits hang on very fine pedicels, but I am not yet sure enough of the plant's distinctness to send it out.
- Lonicera* sp. (F 371).—Collected near Gahôba, and quite obscure—perhaps with affinities to F 313.

- Lonicera* sp. (F 372).—A stiff little bush of 4 feet, collected in late autumn in the coppice above Mō-Ping, where it was remarkable for the brilliance of its crimson-scarlet berries arranged in twins or fours along the rigid sprays.
- Lonicera* sp. (F 373) is a dim black-fruited species not distributed.
- Lonicera* sp. (F 374) is possibly the same as F 269, which was collected by PURDOM. I got it in the gorges behind Siku—a tall, flat-sprayed, elegant bush, with orange berries in fours along the axils of the applanate foliage.
- Lonicera* sp. (F 375) is a stiff shrub of 5 feet, with pedicelled crimson fruits like wee cherries from beside the Mill-house at Da-hai-go in the Satanee Alps.
- Lonicera* sp. (F 376) is an ugly, graceless bush from Chago.
- Lonicera* sp. (F 379) (label a little uncertain) is probably the *Lonicera* from the grave-copses of Kwanting, which is so close to F 372, but that this is quite a little round-headed tree of 15–20 feet, all aglow with glossy, blood-red berries in the autumn. Perhaps the numbers may have to be transposed.
- Lonicera* sp. (F 380) is quite uncertain, being seed collected by a Chinese in the Tibetan Alps opposite Jô-ni.
- Lychnis* sp. (F 265) abounds in hedgerows and waysides down the Nan Ho Valley and even across the Blackwater, and up to some 7,000 feet in the foothills of Thundercrown. It is like a gigantic Ragged Robin of 2–5 feet, making a lovely haze of rose amid the pale-blue swathes of *Adenophora*, with *Lilium tigrinum* flashing out in blots of orange fire.
- Meconopsis*.—The two following Poppies are both clearly new since FEDDE'S monograph in the "Pflanzenreich," and I cherish hope accordingly that one certainly, and both probably, may prove to be distinct new species. Both are biennial, both belong to the *Primulina* group, both stand at the Delavayi end of that group, and both appear to be of very limited range.
- Meconopsis lepida* sp. nov. (F 123) inhabits the upper alpine banks and ledges on Thundercrown, markedly preferring the cooler westerly aspects. It is not found in the open turf, but often occurs at its fringes round the base and up the gullies of little limestone outcrops in the huge grassy flanks of the mountain at 12,500 feet, not steadily abounding, but appearing in sporadic outbursts. It is a most lovely little biennial of some 4–6 inches, with all the narrow, rather glaucous foliage at the base, and the naked stem carrying from one to six large flowers, made up of some six to eleven rhomboidal petals of lavender-purple silk, arranged in a whirling Catherine-wheel round the creamy, crowded boss of anthers. These flaunt their frail and filmy loveliness in June; unfortunately by the end of August the seed was so unanimously fallen that barely enough could be collected for distribution in even the smallest quantities. However, it should germinate well, and must then be copiously raised again; nothing more

daintily beautiful exists in the race, as you see its great whirling heads poised delicately amid the fine grasses, the golden Gageas, the Fritillaries, and the innumerable purple Irids that enamel the grassy rocky ribs of Thundercrown. [No germinations yet. 1916.]

Meconopsis Pseudonoma (F 255) is a much larger plant, of precisely similar habit, but that here the naked stem of 6–8 inches invariably carries only one very large flower, made up of some 6–7 broadly ovate waved petals of darker lavender-violet, making exactly the effect of big blooms of the purple *Anemone coronaria*. This, solidier and less fairy-like than the last, has a stately and imposing magnificence. It lives in the thick high-alpine hay of one mountain slope only (so far as I could find) in the foothills of the Min S'an above Ardjeri, beginning about the upper limit of *M. punicea* at 11,000 feet, and ascending to the topmost crests at 13,000, where, on the peaty ledges and in and out among tiny sere clumps of Rhododendron, it meets *M. quintuplinervia*, and reduces that dainty beauty to a wizen and anæmic pale cousin, with the voluminous flares of its own imperial splendour. It blooms in August, and seed was collected in quantity; it must be remembered that this, like the last, is biennial. The seed, too, may possibly show a slight admixture of *M. quintuplinervia* and *M. punicea*, having been harvested by Chinese retainers during our own absence in the south.

Meconopsis integrifolia (F 92) is very magnificent and portly in the highest turf of Thundercrown, standing stiffly up in early June with its huge lemon-pale globes in sumptuous but rather graceless and gawky candelabra of colour. Here, as I say, it loves the long high-alpine hay at some 12,000–13,000 feet, and is found in no other situation but over all the great open flanks of the grassy slopes, where its bloom is at its height before the herbage is well up, while still the alps are sere and brown. No meadow, however, is too coarse for it; and at its lower limit, at some 75,000–80,000 feet, it luxuriates amid the coarsest tangle of tall Asters and Berberids—the Asters, in September, enclosing the huge upstanding pods of the Poppy in a lush jungle of leafage and blossom.

Meconopsis quintuplinervia (F 118) is indeed a gracious and lovely thing, with its single bell-shaped flowers of softest lavender-blue swinging high upon their bare stems above the group of pale-haired, greyish foliage crowded in the turf below. The supremely important point about *M. quintuplinervia*, however, is that it is undoubtedly perennial, and thus forms a grand addition to the garden, where there are as yet *few certainly* perennial Meconopsids except *M. grandis* and *M. cambrica*. This beautiful treasure inhabits the finer (as a rule) alpine turf of the Kansu-Tibet border, between 9,000 and 13,000 feet. We first met it, still dormant, amid the snows on Chago-ling; on Thundercrown and all up the Min S'an it

abounds [and in the northerly ranges of the Da-Tung is clearly in the very centre of its home, so abundant over the alps in such unspeakable beauty that one feels quite sick with the ecstasy of the sight]. In the Minchow district it trenches on cultivated land, and there, at the edges of culture-patches on the rounded green hills, it becomes quite unrecognizably splendid in the steep enriched embankments down the slope, waxing into masses of foliage a foot across and almost as deep, with forty or fifty great swaying vases of lavender all hovering at once, on 2-3-foot stems, above the tangle of leaves below—thus making it evident that *M. quintuplinervia*, while it should answer happily to fair alpine cultivation, should also be handsomely responsive to specially generous treatment. It blooms from June to August; on Thunder-crown there was a notable little rocky grot which in June was filled with a rose-scented jungle of rose-pink Pæonies, above and amid which floated the innumerable expended blue butterflies of the Poppy. [Seed of 1914 was shy of germination, but that of the Da-Tung Alps comes up like cress. 1915.]

Meconopsis Pratii (F 136).—Seed was distributed under the name of *M. rudis*. In FEDDE'S key to the race, *M. rudis* has stem-leaves up to the middle of the spire, while *M. racemosa* has neither bracts nor stem-leaves at all. Unfortunately, in the diagnosis of *M. racemosa*, a full description is given of the stem-leaves already declared to be non-existent! On the whole I am driven to the conclusion that my Kansu plant, sent out as *M. rudis*, is probably *M. Pratii*, and *M. Pratii* alone. The specimens and seedlings will, however, repay investigation, as these blue Poppies are not, as yet, of any final and absolute distinctness. *M. Pratii*, at least, takes two clearly-marked forms. So far as I can judge, from Thundercrown up into the foothills of the Min S'an it is a dense and stocky plant forming a close 8-10-inch mass of gorgeous dawn-blue blossoms, woven of silk and opals. In the highest craggy alps above Ardjeri it takes a new character; the stems are taller, darker, barer, the pedicels are very much longer, so that the inflorescence is a loose and irregular broken flight of flowers, instead of a solid huddled mass. (This may, of course, be merely a later stage of blossom, yet had to me the look of a clear varietal, if not specific, difference.) All the seed sent belongs to the stocky Thundercrown form; in every variety this Poppy (or Poppies), it must be noted, stands apart from all its grass-loving kin, in being always and only found in the gaunt screes and stone-slopes and precipices of the highest limestone or shaly ridges from 12,000-14,000 feet. In other words, it is born and made for the moraine,* and there should be sown again and again, that its biennial splendour may annually repeat the glory of light with which its dense spires of amassed azures illuminate the vast and lifeless stone-slopes on the highest

* [It much appreciates a fuller diet, though.]

crests of Tibet. Every part of the growth is virulently prickly, and the fierce hardened thorns of the fruiting stage make its sturdy pyramids of capsules an anguish to collect, unless with a mailed fist and a pair of tongs.

Meconopsis punicea (F 175) far surpasses all English description and all English effort, as you begin to see it, bloodily flaunting in and out of the scantier coppice in the Tibetan valley-bottoms opposite Jô-ni, first appearing at some 10,000 feet, and thence ascending to the great grass ridges, haunting the glade-edges and light bushery of the glen, until in the high open hayfields it rages furiously over all the hill, between 11,000 and 13,000 feet, dappling the distances with blood like any Poppy in an English field, and in the little grassy hollows along the crests, hovering in flapping flags of vermilion above the rippling sea of golden-eyed purple Asters. For in England those dim flags of scarlet flop; on the Tibetan Alps they blaze and flap—huge expanded stiff goblets or wave-winged butterflies of incandescent blood, that compel from me a humble palinode to my previous rather cold description of *M. punicea* as alone I had hitherto known it, showing no trace of its own true sinuous and serpentine magnificence. This glory of the upland open hayfields, and scant cool coppice of the lower region in the cool Tibetan Alps should be sown broadcast at home in moist rich soil amid pleasant neighbours, with loose scrub of *Pinus montana* all about to keep off excessive heat and drought; it is invariably biennial, from a slight weak tap, and does not extend out of Tibet into the warmer, drier alps of Thundercrown, nor southwards (so far as I could find) into those of Satanee, nor northwards above the Hwang-Hor to the Da-Tung.

Morina sp. (F 215).—A doubtful name; in any case it is a pretty Morinoid labiate, with glossy spinous-edged foliage, and stems of a foot or so, with close heads of cream-coloured blossom in August. It haunts the higher grass-lands of the Tibetan Alps at some 11,000 feet; and, though not special, has a meek attraction.

Myosotis sp. (F 245) is very general all over the drier regions of South Kansu and Tibet, the seed having been collected on the walls of Jô-ni. It is a small annual-biennial species, forming little low tangles of perfectly prostrate sprays, beset from March to September with a profusion of light-blue stars of a peculiar soft loveliness like that of *Omphalodes*. Carpeting a sandy patch round the foot of a big boulder it looks really beautiful in its quiet way, and ought, though not of high importance or startlingness, to give a great deal of modest pleasure in suitable poor and gravelly levels, for preference in fullest sun.

Nitraria Schoberi (F 98) is a gracefully arching thing, with white stems and narrow privet-like leaves of dark green, which forms into a tangled mass 4 feet high and 6 feet through, breaking

in May into a furze of minute white flowers in clusters, to be followed in early July by a lavish display of gorgeous and refulgent ruby-scarlet berries. It belongs to the stonier places in the hot region of the Blackwater, up to Siku, where it even grows happily along the hard loess ramp of the city-wall itself. [Far up the deserts of northern Asia, *Nitraria* grows where all other vegetation fails, and for the northern peoples its fruits are the staple hope of sustenance.]

Onosma sp. (F 3) has not been collected. It fills all the torrid banks, in the torrid region of the Blackwater and the Nan Ho, with low clumped masses of narrow grey foliage, from which, in April, unfurl croziers of long pale-blue bugles, very pretty, but not large enough, and with the unfortunate notion of attempting a copy, at all points, of the supreme and inimitable *Lithospermum graminifolium*.

Ophiopogon sp. (F 302) (? *O. kansuensis*) occurs at one point in the Nan Ho Valley, on cool ledges of rock, or at the track-side, or about the roots of light scant scrub—forming evergreen mats of very dark, wiry, grass-fine foliage, from which spring 6-inch spikes in July, unfolding a spire of lovely crystalline and waxen stars, seeming as if carved out of lavender- or rose-flushed ivory, and followed by balls of blue-black fruit in November. I considered it a most lovely, dainty thing. [It abounds in Southern Central Kansu down into Szechwan.]

Oreocharis Henryana (F 262) grows in similar sites to *Boea*, yet not only likes cool ones as markedly, but is much more partial to damp atmosphere, and even to a certain damp in its soil, growing magnificent on dank, mossy limestone rocks in the depths of the Mō-Ping cañon, and often abounding—as in the débouchure of the Siku gorge, and at intervals in the lower reaches of the Nan Ho Valley—on very steep banks of a stony, rather clammy silt, which grows a certain film of earth-moss characteristic of such cloggy, cool surfaces—from which it spreads happily in and out of the lower fringes of scant scrub and herbage, always preferring an aspect steep to the point of being sheer. Here the rosettes are dully green and only hairy, resembling exactly that specially sinuate form of *Ramondia pyrenaica* which is called *quercifolia*. The scapes are slightly shorter and stouter than in the last, with fewer and much larger flowers—little thimble-shaped inverted Gloxinias in a charming blend of shrimp-pink and coppery flesh-tones, borne in a flying panicle in August. It ought to prove even easier than F 261, and at least as delightful, in similar situations; both continue their mimicry of *Ramondia* in having quite microscopic seed, which should be carefully sown accordingly on a silty surface and most tenderly watched.

Osteomeles sp. (F 408) (probably *O. anthyllidifolia*) abounds all over the hottest bare slopes of the hot, dry loess region of the Blackwater, seed having been collected from a grave-copse outside

Nain-dzai on the Blackwater below Siku, where it had been allowed to form good 4-6 feet bushes of stiff boughs beset with fine Anthylloid foliage, and studded with myrtle-like black fruits in November, to replace the long copious sprays of foamy, cream-white blossom which in May had made the whole shrub wear the look of a well-flowered rigid Hawthorn.

Pachysandra sp. (? *Pachysandra procumbens*) (F 441) is an ugly thing with long fat pods, found flopping over one or two cool boulder-tops in the deep limestone gorge of Mō-Ping, with prostrate shoots of evergreen foliage, 6-8 inches in length.

Paeonia Moutan (F 8) has not been collected, but it is interesting to record this most glorious of all flowering shrubs in its most gorgeous snow-white form, as a wild plant from the cool copses above Foo-er-Gai (between Tsin Chow and Kiai Chow, April 19), again on the torrid hill opposite Kiai Chow here and there amid the coarse herbage and scant scrub, April 23; and again sporadically up the cooler course of the East Road river approaching Di-er-kan, on May 5, occasionally waving its huge white faces amid the scantier coppice on the slopes. In all these stations it is a very thin stiff growth of two to three straight stems (5-6 feet high above Foo-er-Gai), each terminating in one vast flower; but further up the Blackwater, in the hot regions about Lodani in Tibet, PURDOM reports it as developing into a better furnished and more voluminous bush.

Paeonia sp. (F 67) (? *P. Beresowskyi*) abounds between 8,000-9,000 feet on the alps of Thundercrown and Satanee—not a woodland plant, but loving grassy, stony dells and glades on the open alp, in a way that carries one back to the pink Pæonies on Baldo. It is in my eyes a species of singular charm and delightfulness; it has voluminous lucent foliage and stems of 12-20 inches, carrying several flowers in all sorts of clear and clean tones of rosy-pink, light or dark, with a golden eye of stamens and so intoxicating a fragrance of roses that all the hill becomes a rose-garden as you go by its generous jungles of large and lovely blossom in May and June.

? *Paris* sp. (F 430) is a woodlander abundant in the alpine forests of the Satanee range, and exactly recalling *Paris quadrifolia* but that it grows in single crowns, is rather taller, and has both leaf-whorl and flower composed of many more parts and consequently wildly spidery in effect. The flower, however, has no show or merit; but it is followed by a dense-packed many-rayed cluster of vermilion-scarlet berries, much more brilliant than in *Iris foetidissima*. This alone gives it attraction.

Pertia sp. (F 340) is a queer little twiggy branching bush from the alpine coppice, of which I can say no more than that it grows like a bunchy Hazel of 4-5 feet and wears in autumn odd fluffets of seed, as if the achenes of a *Prenanthes* had floated off and got stuck on the sprigs of a *Corylus*.

Phaius sp. (F 64) is a handsome Orchid with clumps of voluminous, corrugated foliage, which I have found only in the lighter places and opener grassy glades of the steep forest up behind Satanee. There can thus be no doubt, not only of its perfect hardiness, but of its adaptability to cool and moist north-country conditions. The scape is some 8–10 inches high, in May, unfolding a loose spike of large greenish-yellow flowers with a handsome crumpled velvet lip of light umber-brown. Seed of this has been sent to an Orchid-grower to raise.

Philadelphus sp. (F 369) has not been seen in flower. It is a tall, stiff, dense bush of 8–10 feet on the Mö-Ping pass, and is evidently extremely profuse of blossom on its rigid sprays. F 370 is another *Philadelphus* from Lotus Mountain, which may or may not prove specifically distinct. (Coll. W. PURDOM.)

Physalis Alkekengi (F 429) was sent, I think, by a slip of the pen, as *P. Francheti*. This is the common old Japanese Lantern or Winter Cherry, which I only send as a curiosity, having but once come upon it, wandering like a Nettle, amid the mossy limestone débris and straying Brambles on the cold shady side of the great Siku gorge, not far above its mouth.

Pinus Armandi (F 341) is especially fine and abundant on the smaller drier ranges, amid slight scrub of Rose and Bramble &c. It can be seen here and there in the lower woodlands of the Siku-Satanee ranges, but belongs in finest form to the intermediate chains, abounding on the Mö-Ping pass, and up the shallow hills of the Nan Ho Valley. It is very much cut, and a very quick grower, so that old specimens or groups of it are rare; there is, however, a splendid little forest of it on the summit of the ridges opposite Gahoba, where the tree at last attains to the splendid emerald amplitude of its maturity.

Pleione Roylei var. (F 4) is an Indian Crocus of extraordinary beauty. It was only seen at one point of the Feng S'an Ling, deep down in a profound slaty river-gorge, heavily shaded and perfectly sheltered, so that I dare not yet assert its hardiness. Here it grows in big masses, up and up on the shelving ledges of the dark cliff, in the accumulated leaf-mould fallen from the trees above; on April 28 it was but just opening, yet already, such is its prodigality of blossom, the twilight of the cliff was aglow with countless bright blots of colour from its clumped blossoms of crimson-purple with their great lips crested and ridged with pure vermilion. Several bulb-mats of this have been sent home, and have, I hope, arrived in such condition as to admit ere long of distribution. [No; no such thing. 1916.]

Pleione sp. (F 158) is no less rare, but not so brilliant a thing. I have only once seen it, growing on the cooler face of an inaccessible church-big boulder high up in the mouth of the Siku gorge, where, on the ledges of vegetable mould, it grew in little clusters of two to three bulbils, rooting along in the surface-carpet of a

small, dry *Selaginella* that here covers all the shelves of the cliffs. It has corrugated leaves of bright green, and the flower, so far as I could judge from one glimpse of a lingering bloom in early June, is pretty and spidery and pink, suggesting a gigantic *Bletia*, carried solitary on a stem of 4 inches—not more than one, it seems (and not always that), being produced from each small tuft of foliage. A seed-pod has been sent, and also a few pseudo-bulbs, collected by a coolie striding barefoot along the face of the boulder, as a fly walks lightly along the ceiling. I doubt if it will yet be available for distribution.

Polemonium sp. (F 141) is general up the border, in all characteristic *Polemonium*-places, in river-banks and shingles of the lower alpine region, and in and out of the light alpine glades and woodland. It is probably only the *tanguticum* variety of ubiquitous *P. coeruleum*, but is very much more graceful than the type, with loose and scattered showers of blossom on stems of 12–24 inches, from early summer onwards. Only a small pinch of seed was after all collected, from high in the Siku gorge; so that F 141 will probably not be distributed till the resulting plants of this have next season yielded their abundant crop.

Polygonatum sp. (F 274) (? *P. roseum*) is a dear little fine-leaved whorled Solomon's Seal of 4 inches or so, that freely spreads into carpets of its larch-like shoots, in the opener alpine places and scant turf round the base and ledges of rock-ribs on Thunder-crown &c., beset with starry flowers of mauve-pink in June, which are followed in autumn by berries of brilliant glowing blood-colour.

Potentilla F 188 is *P. davurica* with its *fruticosa-Veitchii* types, of which there are now so many in cultivation. The pure white *P. Veitchii* is abundant all over the foothills of the Siku Alps, &c., and only towards the highest limit, in the turf at 12,000 feet, does it seem to pass into a yellow form. At least, and until closer investigation decides differently, I am inclined to assume that all this large range of white-golden *fruticosa* *Potentillas* belong in reality to one species. As you advance into the Tibetan Alps opposite Jô-ni the type gets better and the bushes larger. The valley-bottoms are filled with masses of deep and brilliant gold, while a little higher up the white form comes into fuller possession, and the grassy folds of the box-pleated upper alps seem as if mounded with masses of snow in August in their couloirs, with banked dark forest on one side, and the emerald open lawn on the other, in which the *Potentillas* are profusely peppered in bushes of 2–3 feet, concealed from sight by their blossom. The deep golden type passes into the pure white by innumerable gradations of cream, amber, citron, and butter-yellow—intermediate colour-forms (or hybrids); seed sent out embraces all these, having been collected not only from the snowy and golden extremities of the type, but from a little bank in the Mirgo Valley where every link between them was in rich abundance and the loveliest

blend of every shade of saffron, sulphur, and cream—it being specially noted that the paler forms were perceptibly paler and greyer in the seed-husk than the rich brown of the yellower forms. All these should make masses of lovely small tight bushes, and deserve to be planted in big sweeps amid grass on the fringes of woodland and shrubbery, where in August they ought to mimic snow and gorse as they do on the cool green mountains of Tibet.

Potentilla biflora (F 214) is a real gem of a very different kidney. It belongs only to the highest-alpine earth-pans and cliffs on the crests of the Min S'an and Thundercrown at 14,000–15,000 feet, where on the bald bare loam it forms tight massive hassocks, often a yard across, of bright lucent-green foliage, so finely divided and curled as to make the effect of some hairless glossy small Saxifrage of the *Ceratophylla* group, amassed into a tight hard dome. So the plant grows, from a thick woody trunk; and in mid-July the whole hump is covered with a galaxy of almost stemless single little golden stars, in shape and size and colour like those of a diminished *P. verna*, with a blotch of orange at the base of each citron-yellow petal. This compact beauty, in fact, makes a golden third in a trinity with pink *P. nitida* and snowy *P. Clusiana*, though even tighter and harder in its masses than *P. nitida*. [It germinated with me, but then all miffed off: kept too warm and moist probably.]

Primula.—In this great race 1914 has been delightfully fertile, the Nivalis-Maximowiczii group being especially well represented. Several most interesting extensions of races or groups have been recorded, and I cannot help suspecting that Nos. 1, 6, 5, 10, 13, 15, 22, 23 may prove to be good new species. So far as I can discern, the season has yielded twenty-five species, new or old, though perhaps one or two of these may fade into others, and certainly there are more than one concealed under No. 19.

Primula hylophila sp. nov. No. 1 (F 38) should certainly belong to the Davidi group, but that it utterly lacks the brown investiture of scales, and in all its habit and habits precisely repeats *P. acaulis*, with clumps of crisp, crinkly, sharp-toothed leaves, with pale veins, a lettuce-like succulency, and a microscopic veneer of green-velvet glands. From this rises a scape of 2–4 inches, bearing a loose Polyanthus head of large and lovely rose-mauve flowers in March, with a ten-rayed eye of green and white from the pale throat. Not only does this plant repeat the tufts of the Primrose, but it also occupies the typical Primrose-sites in all the forests from Chagoling to the gorges of Thundercrown, between 7,000 and 8,000 feet, growing in the opener places of the woodland, by path-sides, on lightly-coppiced banks, or in the wide flat stretches of *Anemone nemorosa*, dappling the ground beneath deciduous trees. It loves the clammy, rich loam of the Primrose, too, but especially luxuriates in rotten timber, forming magnificent crowded colonies in the

moss along aged and decayed windfalls in the forest. The calyx, with its lobes, pedicels, and scape, lengthen and stouten and amplify remarkably in seed. For this, owing to our enforced flight, we had to depend on specimens hurriedly dug up in the woods of Satanee, carried off in boxes, and grown on to ripen in the hot backyard of the Yamên at Siku. On this, accordingly, I build no great hope; but plants have been since sent, which I trust may be enough to introduce so really first-class a *Primula* into cultivation, where it has all the look of thriving robustly and permanently. So far, it is the only general woodland *Primula* exactly taking the place of *P. acaulis* in its limited region. [Specimens of what appears to be this are in the Petrograd Herbarium as *P. membranifolia*, quite a different thing. There is no trace left of either plant or seed now (1916).]

Primula scopulorum sp. nov. No. 2 (F 39) is very hard to place; it is best pictured by imagining a scape of soft-mauve *P. hirsuta* applied close upon a rosette of *P. farinosa* or *P. frondosa*. It is a charming species, and abounds on cool, mossy rocks and cliffs in the woodland zone of the Chago-ling-Satanee Alps, penetrating across to Thundercrown, where it is commonly seen in the boulder-crevices from 8,000 feet to the actual gaunt summits of the Ridge, and there it is still in bloom at the end of June—long after the May-flowering specimens of Satanee have passed into seed. It is purely a saxatile plant of cracks and crannies, and dies away in autumn to a beautiful fat knob of creamy-white, the same soft powder on the reverse of the foliage finely enhancing the blossom in spring. It is only at its best, goodly in form and rosette and freedom and flower, in the dark chines opposite Satanee; about Chago-ling and throughout its strange distribution over the open flanks of Thundercrown it seems to miss the cool and mossy dampness of the woodland cliffs, and is universally thin and starved in growth, with only two to three blooms to a scape, instead of the possible eight that it can attain to in the moist and dark sub-alpine river-glens of Satanee.

Primula riparia sp. nov. No. 3 (F 33). [Specimens of this, in the Petrograd Herbarium, are included under *P. diantha*.] It is a small, dainty clump, with gracious little scant umbels of mauve-crimson blossom; three tufts were first seen on a steep, grassy rill-bank above Chago on May 6, and then a whole bank, cool, and overhung with slight coppice, was seen studded with delicate specimens on the descent from Chago to the Satanee River on May 8. It proved impossible to get either seeds or plants of this—a failure with which I am glad to compound for success with so many more brilliant and important species.

Primula sp. No. 4 (F 40) is interesting, as being almost certainly the plant previously recorded from Kansu, with marks of interrogation, as the Alaskan *P. Loczii*. In my experience it is confined to the district round Gahoba, where, on the high moorland ridges

confronting the huge Satanee Alps, it abounds on all the myriad little willowed hummocks and dimples of the fell, not only in the mossy banks but out upon the fine open turf itself in sheets. Above Gahoba it is sporadic on the higher ridge behind, and its last occurrence was in one big patch just below the crest of the Mö-Ping pass on the further side. It is a charming pretty thing, like a glossy dwarf and perfectly powderless *P. farinosa*, with the curious quality of throwing out a number of rooting stolons from the central crown, and so forming rapidly, where satisfied, into a thick, wide carpet. It blooms in early May, and is a lovely reminder of *P. farinosa*, in *farinosa*'s pet situations, on the cool, grassy fringes of the woodlands and fell coppices about Gahoba. Seed was late and very scant; my chief hope lies in dormant crowns despatched in December.

Primula sp. nov. No. 5 (F 61) belongs to the *Polyneura* group, but is, I think, of special interest as bridging the gulf between this section and that of *P. septemloba* and is perhaps the same as No. 21. Unless I am wrong, *P. septemloba* lives in the cool upper woodland of the Satanee Alps, while across the intervening range abounds something very like *P. lichiangensis* on the warmer, drier slopes and boulder edges of Thundercrown. That intervening range, with the foothills opposite Satanee, is the home of *Primula* No. 5, a most lovely species, far superior in grace and charm (as I think) to *P. Veitchii* and *P. lichiangensis*, of which it has precisely the soft foliage and lush woodland habit (it is singularly small and frail in the crown), but its beautiful big flowers of vinous rose are not flat stars but shallow saucers, and instead of being borne in stiffly upstaring umbels are carried loosely and gracefully in an almost pendulous and one-sided spray, in general effect recalling that notable wide-faced form of *P. viscosa* which yields *P. × Farreriana* to *P. marginata* on the Col de la Croix. (Occasionally, but very rarely, a second tier of blossom unfolds above the first.) Above Satanee, *P.* No. 5 occurs happily, though rather stunted, in the hot crevices of sunny primary rocks from which coppice has evidently been cleared; but its real home is in deep cool places and mossy river-banks of the woodland, and it is particularly fine and lovely in the dense darkness of a little bamboo-brake in the forest zone of the Satanee Alps, growing in very rich clammy loam consisting almost wholly of decayed vegetation. Here it blooms in early May. October seed proved too scanty to distribute as yet, but I hope that dormant crowns may also help to increase the stock.

Primula Viola-grandis sp. nov. No. 6 (F 74) is especially beautiful, important, and interesting. It is a very far northerly and most unexpected extension of the weird *Omphalogramma* group, with solitary flowers like gigantic monstrous violets or *Pinguiculas*

before the full expansion of the leaves.* Hitherto the most northern species of the group has been *P. Engleri*, which is rare in the alps of Szechwan, very far to the south; the nearest relation to *P. Viola-grandis*, *P. Delavayi*, lives yet further to the south, on the flanks of Tsang-S'an, and differs, *inter alia*, in having its stems beset with brown membranaceous bracts. Thus the whole depth of Szechwan intervenes between the older Omphalogrammas of Yunnan and their new cousin of Kansu. *P. Viola-grandis* has already been splendidly figured in the *Gardeners' Chronicle*, so I need not expatiate on its prognathous great blue-purple blossom, with ears laid stiffly back, and lip stuck stiffly out (but the bud opens a regular star of intense violet, lightening to a more lucent tone as it opens out and the segments set to work reflexing and protruding). It only remains to describe the enormous subsequent expansion of the foliage, which develops heart-shaped blades like those of a fat *Viola hirta* or *V. odorata*, but densely thick like flannel, of very dark opaque dusty green with paler veins, lying flopped about on the black soil, too heavy for the elongated fleshy footstalks of glandular pinkness. *P. Viola-grandis* may perhaps prove easier than its cousins; but it has a very rigid choice of habitats. It is never found except up cool, westerly-facing, shady exposures of big limestone cliffs in the alps of Satanee and Thundercrown, hugging the underside of ledge-sods in clammy moist soil of loam or vegetable mould, and descending freely into the upper reaches of the Siku gorges, where they go lost at last in sombre inaccessible cañons of gloom and dankness. Usually it is found in clumps here and there, its piercingly refulgent violet flames hovering like blue sparks of electricity in May from the gloomy walls—but in one station I know, higher up on the open alps of the Ridge, it so abounds in little western couloirs and on a little turfy saddle beneath the cliff, so runs riot in loam or red earth or peat-mould, and so gaily flickers in and out of the minute 3-inch *Rhododendron* scrub, that those few and limited stations are all a shimmering dance of Violets in early summer, and there at least the plant gives better hope of a robust and hearty habit. As might be imagined from its preposterous flower and length of tube, it is a poor scant seeder, hardly five per cent. of the blooms (which are not by any means sent up from every crown either) resulting in the tall 6–8-inch seed-stem and its round capsule atop. I was late upon its final scene too; so that the distribution of seed will have been sadly niggardly. However, I felt profoundly grateful and fortunate to get what I did, the four or five last capsules lingering on the mountain-side, with the seed lying loose in its saucer, at the mercy of any moment's flow of

* *P. Viola-grandis* is much the smallest of the group; the others resemble fat-throated *Gloxinias* more than anything else, while this does really recall a giant violet.

wind or dash of hail. In autumn the whole thing dies back to a white scaly bud like a wee bulb of *Lilium*; some of these have also been sent, and I hope may arrive alive. [Alas, none survive; nor did the seed germinate.]

Primula sp. No. 7 (F 86) is almost certainly no more than *P. lichian-gensis*, and, as such, I have not troubled to collect it for general distribution, as it is now so generally grown. I do not very greatly love or admire it. Its interest lies in this far-northerly extension of its original distribution in the alps of Yunnan. It abounds at mid-elevations on Thundercrown, not at all avoiding hot dry flanks and exposures, but growing for choice in scant sunny scrub, deep woodland, and along the beshrubbed brows of cliff or boulder, from which its stiff and starry umbels of bright and golden-eyed magenta pink flaunt or flap with fine effect in May. In the main Min S'an its place is taken by F 197.

Primula Woodwardii No. 8 (F 116) is a most gorgeous species of the Nivalis group. PURDOM originally collected it on the foothills of Monk Mountain, and it was shown by VEITCH at the 1913 Conference under the false name of *P. "purpurea"* Royle. It differs absolutely and utterly from every form of *P. nivalis* in being completely smooth and glossy and devoid of powder in all parts of its growth. It forms a deep, woody stock, sheathed in brown membrane, and ending in a few fat white roots; this supports a cabbage-like tuft of dark-green foliage, and an 8-12-inch stout stem, carrying a great head of deep violet stars in June, on pedicels so distinct and slender that the cluster is a rayed wheel of blossom, not a piled dome. It grows in the open coarse turf of the alps, dotted here and there, between 9,000 and 13,000 feet, blazing from afar amid the lavender and gold and citron of the other reigning flowers that constellate the grass. Its long stock, and the rough herbage and steep slopes that it affects, all indicate that it may prove to possess a typical Nivalis sensitiveness to the least deficiency in drainage or moisture. All turf-Primulas, in fact, should, I think, be treated as such in cultivation, their coarse enveloping mat of grass and rootage equalizing their moisture in summer, and draining it uniformly away; while in winter it dies down upon their dormant crowns like a dry thatch, over which springy mattress lies the warm coverlid of the winter's snow. I should, indeed, make an Alpenwiese on a raking but well-watered slope for nearly all the Nivalis group, and especially for the forms of *P. nivalis* itself. *P. Woodwardii* is a joy to collect, with stalwart oval pods of hearty brown, standing starkly up from the moorland on lengthened scapes of a foot and more; two lots have been sent, as 116*a* and 116*b*, on the chance that the Monk Mountain form may perhaps prove in some way different from that of Thundercrown. In the main Min S'an I cannot be certain that it occurs, though I greatly suspect that this and no other was a very stalwart *nivalis* Primula of the upper grass

alps, especially haunting the fringes of light scant scrub (as often does *P. Woodwardii* on Thundercrown) at the edges and crests of the little pleated folds of the downs.*

Primula gemmifera No. 9 (Fig. 121) is a unique occurrence, which yielded no seed, and of which I have one sod here in Lanchow, which may possibly get no further. We found it only in the little mountain track ascending Thundercrown, between 9,000 and 9,500 feet, where, in clammy, limy loam, it grew in wads and clusters like seedling boxes-full of groundsel (and by no means, in their earlier stages, unlike). The majority seemed packed seedlings; only here and there arose the delicate 5-inch scapes in June, bearing flowers intermediate in appearance between *P. longiflora* and *P. farinosa*, but much nearer the former, round-faced, purple-tubed prettinesses of soft pink, above the minute leathern-grey foliage huddled on the ground. Abounding as it does in its limited area, it must seed and germinate copiously, but not perhaps every season, since in 1914 not the trace of a capsule was anywhere discoverable. It is a dainty pleasant thing, with its remarkable long-tubed flowers swinging horizontally usually in pairs; I suspect it of being very close indeed to F 168, from higher up the mountain—and perhaps a mere microform. But F 168 is a larger, finer plant in every way, with bigger, rounder flowers of milky pink; it does not grow in mats but in isolated crowns, and the shorter corolla-tubes are yellow and not purple.

Primula optata sp. nov. No. 10 (F 122) is a most important and beautiful species of the Nivalis group, which, however, instead of a long perilous neck with a few roots at the end, breaks straight, in hearty crowns, from such a mat of stout red fibres, ramified into such a mesh of white rootlets, that you can weed it up in big sods like groundsel from the slopes of bare fine silt where it lives, between 12,000 and 14,000 feet on Thundercrown, occasionally flaunting from the cliffs in big aged masses, but usually dotted about all by itself, over the otherwise bare earth-pans, beck-shingles, and loamy patches of scree beneath the crests, which it illuminates with its stout-pedicelled domed (and often two-tiered) heads of big lavender-blue stars in June, on stout powder-white scapes of 3–10 inches, rapidly lengthening in flower and fruit. Its pods are very long, straight, narrow-drain-pipe-shaped, flat-ended and pallid in colour, going transparent at the top as in *P. Maximowiczii*; the lovely flowers have a strong scent of an old apple-cupboard haunted by mice. It should prove an easy doer in loamy, well-watered moraine; and never shares its home with other vegetation, nor descends to less gaunt and barren places. It has so close a relationship to *P.* No. 22 from similar heights and

* [No need to fuss for *P. Woodwardii*: so far it is one of the kindest growers of the lot, and even more daintily lovely than at home, developing a white eye inside the ashen dark one (1916). In the Da-Tung range it differs slightly: more vinous in its flower-colouring and occasionally powdered on the scape.]

situations in the main Min S'an that I dare not yet quite propose it as a separate species, or more than a local development on its isolated mountain mass. In *P. 22*, however, the foliage is taller, more advanced with the flower, more upstanding, revolute, dark, leathery, opaque and stiff, with more powder in its young stage, and a clear white line of powder round the under margin of the mature leaf such as is very rare indeed on the much more explanate, glossy, succulent, bright-green foliage of *Primula optata*.*

Primula No. 11 (F 133) is *P. citrina* originally described from much smaller specimens than are the rule of its best. This gracious and glorious canary-yellow-headed beauty, lush and subtropical-looking in thin and powdered foliage, has been figured in the *Gardeners' Chronicle* beyond need of more description. It looks as if it had a sturdy constitution, yet in Nature is most rigidly restricted to the dry and powdery limy silt on the floors of overhung (and, for preference, sunless) grottos and crevices of the limestone cliffs at 9,000–10,000 feet from Thundercrown away up all the Border ranges, ascending to 14,000–15,000 in open crevice and crannies, where, however, it still markedly prefers the cold and overhung aspects, and is anyhow always wizen and compact by comparison with its luxuriant development in more comfortable cavities lower down. Here, and here only, untouched by sun or rain, it grows superb and lax as in the photograph referred to, seeding copiously over the fine silty surfaces, cool and powdery, of the dusty grotto-beds that are its happiest home, and from which it so graciously flaunts its loose citron heads of splendour on 5-inch scapes in June. [I believe *P. flava* to be only a xeromorph of *P. citrina* from the gaunt arid region round the upper Hwang-Hor.]

Primula No. 12 (F 187) is *P. conspersa*. It was collected first by PURDOM in 1911, and has been commented on in the *Gardeners' Chronicle*. It is not found at all until you reach the Minchow district, and ranges westwards thence into the foothills of the Min S'an, not mounting or descending from some 8,500 feet, where it occupies precisely the situations beloved by *P. farinosa*, on the damper grassy hillsides and in the small marish folds of the fells, and in level damp places beside the mountain-streams; precisely copying *P. farinosa* too in its whole effect, except that the scapes are usually 9–12 inches high, and carry two or three superimposed tiers of blossom. In the Tibetan Alps it blooms from early July; it is not absolutely a biennial, for specially stout crowns can be found preparing next year's leaf-bud at the base of the seedling stems; but by far the larger majority of seeding plants die in the act, and it is as a biennial that *P. conspersa* had better be grown in England, wherever *P. farinosa*

* [The seedlings, too, are so absolutely distinct as to remove these two species quite definitely from each other (1916).]

is happy, with a yearly sowing of seed broadcast over fine moist turfy tracts. [In cultivation it becomes perennial and so very much larger in growth and flower as to become hardly distinguishable from *P. gemmifera*.]

Primula gemmifera No. 13 (F 168) is represented by the original specimens of *P. gemmifera* in the Petrograd Herbarium, the sheets of which include a poor form of *P. Wardii* or *P. sibirica*. The August-borne blossoms are very large and comfortable-faced, and fat and round, of a melting milky pink with a yellow throat and delicate fragrance. This charmer begins in the moister upmost silt-slopes of Thundercrown (where it has a strange little offshoot or poor cousin, in *P.* No. 9, 2,000 feet lower down the mountain), but its main abundance is in the Min S'an, very high up, at 12,000–13,000 feet, where it loves the open earth-fans of the steep fell-sides, densely dotting the fine loam and shingle with its solitary crowns, so frail and scant of root; but thence even spreads by myriads into the finer alpine turf all round, and sends its seedlings far down into the valleys beneath, where their results occur in little colonies or bright specklings of colour, along the grassy or shingly levels of the beck-bottoms in the gorges and cool glens and shady places, very different from the naked exposure of the high-alpine heights, where it is at home in the barer moister slopes and channels of clammy and stony calcareous loam. [Abundant on the Da-Tung Alps also in 1915.]

Primula No. 14 (F 191) is *P. Maximowiczii*. This, the hyacinth-flowered, many-tiered stalwart, has an enormous range over all the grassy alps of Northern Central and Western China. Let it be noted that this must surely be both hardy and soundly perennial (unless where it may flower itself to death), but that it is a typical turf-*Primula* of *nivalis* habit, and therefore would be best if grown in grass on a cool, well-watered, and perfectly-drained slope, kept rigidly dry in winter. Stagnation and clogging damp will be its detestation, especially in the over-rich soil which it would clearly appreciate in summer. I have not yet seen it in flower, but it abounds in the hay of the cooler slopes on the Tibetan Alps, not descending to the flat and sedgy glen-bottoms like *P. Purdomii*. [I do not believe there is any real difference between this and *P. tangutica*.]

Primula alsophila sp. nov. No. 15 (F 178) is a most charming little beauty of the woodland group. It runs freely about with light frail runners, in the profound cold moss-banks in the highest Tibetan forest, towards the summit of the ridges, at some 12,000 feet, covering the deep beds of leaf-mould with a carpet of sharp-lobed, bright-green foliage, above which spring dainty little scapes of 4–5 inches in July, each usually flourishing, on long fine pedicels, a pair or more of charming rose-mauve flowers, wide and flat and starry, with a pale eye and darker tube. It has a most especial daintiness and charm; and its

divaricate calyx-lobes make its assignation uncertain. A later lot of seed, distributed as F 464, is almost certainly F 178 beyond shadow of doubt ; but as it was collected by a Chinese collector I have thought best to avoid the possibility of a confusion. This has a certain look of *P. jesoana*, but is clearly distinct, if only in the much longer and finer pedicels and better blossoms.

Primula No. 16 (F 193) is doubtful, and distributed only under a caution. It is a most precious find of PURDOM'S—a glaucous-grey erect-leaved clumping *Primula* of the *nivalis* group, with the habit of the rest, but blossoms of *clear yellow*. Only seven specimens of this were originally seen in 1911, on one high grassy crest of Tibet, in company with *P. Maximowiczii* and *P. Purdomii* ; on PURDOM'S return to the station in 1914 the flower was over, and the two solitary plants discoverable in seed could not therefore be *positively* guaranteed to be this new yellow *nivalis*, though the probabilities in their favour are so large as almost to amount to certainty. [Seed sent under the next number has proved to contain this in a huge percentage. 1916.]

Primula No. 17 (F 192) should be the unsurpassable and worthily named *P. Purdomi*. This Queen of the Nivalis group belongs to the high grass-lands of the Tibetan Alps opposite Jô-ni. Though I have not yet been dazzled by the spectacle of its bloom, I have been interested to watch its habit (they say it flowers best in alternate years) and to note that, while it is a typical turf-species of the *nivalis* cousinhood, like *P. Maximowiczii*, *P. No. 16*, *P. Woodwardii*, yet it has idiosyncrasies not shared by the others. It is perceptibly more local, and, though it may often freely be found in the folds and slopes of the vast upper hayfields, it has a clear liking for more level (that is to say, more moisture-retaining) tracts, such as small flat stretches along the descending ridges, and especially for the sedgy cool flats in the upper stretches of the valleys, beside the cold and brawling ice-green becks of the Min S'an. No hay or rushy turf can be too coarse and dense for it, it seems ; its need is evidently the even distribution of damp by the grass roots in summer, and then, in winter, a thatch of yet more special depth and dryness under the dry snow than that required by all the others. It is a noble and robust grower, very different from the small (yet how beautiful !) specimens shown at the Conference. I have seen the seed-scapes at least two feet high, with some thirty stalwart erect pods. It was first collected by PURDOM in 1911, and exhibited at the Conference of 1913.

Primula No. 18 (F 194) is *P. tangutica*, one of the few really frightful *Primulas*—so ugly that only under protest have I sent any seed at all, though it abounds with *P. gemmifera* in the highest earth-fans of the Tibetan Alps, in habit like a small untidy *P. Maximowiczii*, with *Maximowiczii's* variable flowers reduced to wispy starved little ragged stars of dull chocolate and

brownish black [but I think *P. tangutica* is *P. Maximowiczii* and no more].

Primula No. 19 (F 195) requires very careful watching, as this number contains certainly two distinct species, and possibly four. The number stands primarily for *P. "cognata,"* which I think is undilutedly genuine in the earliest lot of seed sent under the name (and already germinated)—a most beautiful species of the Auriculate group, with lush flat rosettes of glabrous foliage, in the vertical cliffs and shingle-walls of the lower Tibetan region about Jô-ni, and short scapes of an inch or two, generously furnished with large and deliciously fragrant flowers of rosy-lavender. It was first collected by PURDOM in 1911, but has never yet been shown. Unfortunately, we were too late in the Min S'an for its flowering season, and as our reports had a certain ambiguity as to the difference between "form" and "species," it was only too tardily that I discovered that at least one supposed "form," from the Lotus Mountain, was in reality an apparently perfectly distinct species, of similar stature, but with densely white-powdered foliage; which leaves me suspecting that the same may ultimately have to be said of another so-called "form" from Monk Mountain. Accordingly I have labelled all sendings of *P. "cognata"* with the name of their district, and advise that all these be kept apart and carefully watched, as my name at present is such a chimæra. It even, I believe, will be found to include a few stray seeds of *P. No. 20*, from collected crowns sent down with the true cognatas, to ripen their pods in Jô-ni. In the earliest lots, however, which alone were large enough for general distribution, I am certain that *P. "cognata"* will be found pure, and possibly unalloyed except for the Lotus Mountain plant, which undoubtedly comprises the majority, if not the whole, of the second sending, received in England about December 24.*

Primula No. 20 (F 196) is blurred with the last, and very scanty in supply, even if sent at all. It need not be regretted; it is a starveling little thing, replacing *P. scopulorum* in the highest cool cliffs and grassy rock-ledges of the uppermost Min S'an. It has the puny look of *P. yunnanensis*—a feeble tiny rosette, and a scape of an inch, more or less, with two or more flowers. These we never saw, unless some rather attractive starry recurving blooms of lilac-mauve from the great Ardjeri gorge did indeed represent this species in a stout and drawn-up form (for here the scape had attained 3-4 inches, and the abundant crowns seemed stronger

* [*P. cognata* is so far a myth unless it lurks in this lot, which is all really *P. stenocalyx*, the prevailing *Primula* of the Da-Tung Alps, and a species of amazing vigour alike in germination and growth in the garden. In this 1914 lot I have even noticed that among the hundreds of great stout plants which are the powderless *P. stenocalyx genuina*, one of my own plants belongs to *P. stenocalyx dealbata*, the powdered form which in the Da-Tung Alps replaces the other at higher elevations.]

than up above. It was here growing in damp cool silt, very loose, about the feet of great boulders in the shade, at the mouth of the ravine.

Primula No. 21 (F 197) may perhaps contain two species, of which only seed from Rou Ba Temple has been distributed. As I know the plant, in the cool silty grottos and shady boulders of the Ardjeri gorges, it stands in very close alliance to *P. lichiangensis*, precisely repeating its habit and foliage [but among the most heartily acclaimed of all my lot—a first-class grower, and of a refined and vivid beauty far surpassing *P. Veitchii*, *P. lichiangensis*, and all the others of that graceless aniline cousinship]. In any case, No. 5 gives the picture and the rule for this (and is, perhaps, the same), and also (whether it be the same or not) for the parent of the other seed sent under this number—a woodland species from forest banks about Rou Ba Temple, and opposite Jô-ni. [Two types may thus possibly be expected, but the prevailing one under this number has already captivated public affection.]

Primula No. 22 (F 248).—For the differences between this superb species and its smaller cousin, see under *P. optata*. *P.* No. 22 makes robust and clod-forming clumps of stiff upstanding foliage all over the gaunt consolidated silt-beds and hard earthy shingles of the uppermost arêtes of the Min S'an, in the same sort of places chosen by *P. optata* on Thundercrown, but growing much stouter and more abundant, often making quite a waving jungle of its stalwart stems over gaunt slopes where no other living thing occurs. It weeds up in sods like a groundsel, and roots in the same rampageous manner as *P. optata*, with the same long, pale, and chaffy pods, though I fancy it more rarely superimposes a second flower-tier on the first. The flower is so far unknown; judging by *P. optata* it should be a glorious *nivalis* of lavender-purple, and to judge by captured crowns now emerging from their biscuit-tins in Lanchow, it sends them up (after the leaves are well developed) with profusion, and grows with imperturbable vigour and copiousness of clump. [Seed was barely mature, none the less it germinated magnificently—far better than *P. optata*, and yielded seedlings of absolutely different appearance.]

Primula aerinantha No. 23 (F 273) has value as being our only representative of the spiked Muscarioides group. It is a most delightful find of PURDOM'S, rarely occurring on mossy slopes of a river-ghyll high on Lotus Mountain, with pine-trees well up above it on either side. I have seen it only in dry and seeding specimens; it appears to me perfectly *glabrous*, a wonderful and unique promise of prosperity in a Muscarioid *Primula*; its white-powdered stems, in capsule, are a foot or more in height, and it bears little bells of lavender-blue with the intoxicating fragrance of its group. [It is practically monocarpic and little to be mourned.]

Primula No. 24 (F 300) was, in point of fact, the first of all our *Primulas* to be found. It was already out of flower when we descended from the Feng S'an Ling upon Wen Hsien on April 28, and PURDOM had the happy idea to diverge up to the foot of a high-swaying little *Staubbach* of a water-spray that shot down over a great westerly-facing cliff to the left; and there, all up the ledges, found this *Primula* growing in great wads and masses of the neatest little mealed rosettes, from all of which shot sturdy scapes of an inch or two, carrying such sturdy pedicels and calyces as to give good hope that the flowers will be sturdy and large to match. The umbel seems to carry four to six blooms in a wide head. As yet I cannot assign this almost unexamined but most distinct species to any particular group, unless it be that of *P. sertulum*. The buds on collected plants here have unfortunately gone "blind," but I hope seed will prosper, and a cool rather damp cliff-crevice ultimately reveal the species in the beauty I feel safe in foretelling from its neat massed habit and doughty little scape.

Primula No. 25 (F 192) is almost certainly *P. septemloba*. I found it, in the very end of all things, on a cool loose-soiled bank at a cliff's foot, high up in the alps of Satanee, with scant willows growing about. Everything of it was gone to mush, except the sere, stiff scapes of 8 inches; but the very numerous, crowded, erect pedicels of these suggested obviously the drooping flowers of *P. septemloba*, and amid the decayed leaves could be discerned the relics of acute lobing, such as you get in *P. septemloba* and *P. alsophila*, but not in the more gently-rounded divisions of the *Polyneura* group. The plant, however, had bad luck; the collecting box was not prompt enough in recognizing its specific claims, and its large root-masses got mixed up with the frail crowns of *P. No. 5*, while the seven seeds which alone the exhausted capsules yielded were so carefully put away as never to be found again. It will no doubt turn up among the sendings of *P. No. 5*, but is, in itself, a much less important species, already known, and not pre-eminent, as it is closely rivalled by *Cortusa Matthiolii*, as delicate a thing and an older friend.

Primula F 464 is almost certainly *P. alsophila*.

Primula F 465 (Chiappa) is a doubtful woodlander, but is almost certainly *P. No. 21*.

Nivalis-Maximowiczii group	}	<i>P. Purdomi</i> (17).
		<i>P. Maximowiczii</i> (14).
		<i>P. tangutica</i> (18).
		<i>P. Woodwardii</i> (8).
		<i>P. optata</i> (10).
		<i>P. No. 22</i> .
		<i>P. No. 16</i> .

(?) *Davidi* group—*P. hylophila* (1).

Omphalogramma group—*P. No. 6* (*P. Viola-grandis*).

Muscariooides group—*P. aerinantha* (23).

(?) *Soulieii* group—*P. citrina* (11).

Farinosa-Auriculata group {
P. No. 4 (P. Loczii).
P. gemmifera (9).
P. conspersa (12).
P. gemmifera (13).
P. No. 19 (P. cognata).
P. stenocalyx (19).

Cortusoides group {
P. No. 5.
P. No. 7 (P. lichiangensis).
P. No. 21.
P. alsophila (15).
P. No. 25 (P. septemloba).

Incertae Sedis {
P. scopulorum (2).
P. No. 20.
P. No. 24.

Mollis group—*P. riparia* (3).

Prinsepia uniflora (F 272) is the correct name of the shrub erroneously called *Plagiospermum sinense*. True *Plagiospermum* has a limited distribution in Eastern China, but this plant is abundant throughout the lower loess regions of South Kansu, decorating the bare field-banks with its thorny, gracefully arising, arching boughs of 4-6 feet, which break into fluffs of small white flowers like Myrtle, to be followed by beautiful pendent oval berries of rich crimson on long pedicels. Seed was collected from the hedgerows high above Siku, on the topmost loess plateau beneath the Thundercrown ascent. Mr. MAYER believes the fruit of this may have comestible merit; perhaps this may be so in America, but for my own part I have always found that the splendid crimson drop, so elegantly dangling, consists of almost nothing but skin and stone.

Pyrus sp. (F 338) is a magnificent tree of 25-30 feet, of the *Sorbus* group, with oval-pointed undivided foliage, which turns of an unequalled scarlet in autumn. It is stately and graceful in habit, with terminal bunches of pendent fruit. Only one tree of this was seen (by PURDOM) just below Chago, on the edge of the forest, and the seed may not yet be sufficient for distribution.

Pyrus sp. (F 397) was collected by our Chinese headman, and cannot be precisely described, except that it is a small tree of the lower alpine woodland opposite Satanee, standing quite close, I take it, to the White Mountain Ash, but with larger oval fruits of pale fleshy tone, suggesting little oblong Whiteheart Cherries.

Pyrus sp. (F 398) belongs to the Satanee range, and was particularly beautiful in the steep sacred forest behind the village, a small round tree, with straight branches enclouded all along in loose flights of pearl-white flower in May, followed by a rich display of hard little crimson Morello Cherries in November, hanging long, and very showy. It must be near *P. spectabilis*.

Pyrus sp. (F 399) has not been distributed. It is a big, uninteresting-looking tree, from which a few of the rare little hard single fruits were tugged with difficulty one day, as I passed a small grave-copse some three to four miles north of Tan Ch'ang.

Pyrus sp. (F 400) (the White Mountain Ash) is perhaps the best of the lot as far as foliage goes, except for F 338. For this is simply a replica of *P. Aucuparia*, exactly like the Mountain Ash in leafage and habit, but that it is rather denser and more compactly erect in growth. The foliage, however, takes the most gorgeous tones of salmon-orange-vermilion in autumn, and the scanty fruit-panicles are of waxy white, containing rose-pink seeds. It abounds all up the alpine coppice and lower woodland, from Satanee to Jô-ni.

Quercus sp. (F 466) is a peculiarly graceful little light tree, suggestive of a Willow in habit, no less than in its very narrow dentate leaves, amid which sit buzzy-cupped acorns. It was only once seen, in a temple coppice high up on the hot loess downs above Siku (F 467). I believe it to be just the ordinary Oak; and it is not certain whether either set of acorns will prove sound enough to be distributed.

Rhododendron.—The alps of the Kansu-Tibet border, cool and high, have nothing like the luxuriance and variety to which *Rhododendron* attains on the steamy, warmer, wetter ranges of the provinces going down towards India. I am indeed surprised at the scant variety we have noticed, and must only remark that, with one exception, all these appear even passionately calcareous in their tastes.

Rhododendron (F 63) (? *brachycarpum*) is the one exception. It lives on reddish shaly subsoil in the steep copsy folds of the great ridge high above Satanee, at 9,000–10,000 feet. It is a singularly beautiful shrub—a compact pyramid of 8–10 feet, or a small round-headed tree of 15–18 feet—but always neat and brilliant, and well furnished with lucent bright-green foliage, otherwise after the pattern of *R. fulgens*. The flowers are borne in loose clusters in early May, and in the most ravishing profusion; and that this was not the accident of one particular season was shown in late autumn, when every shoot was seen graced again with a fat bud, preparing no less glorious a show than when PURDOM had first sighted it in the spring, when every bush was a mass of bloom. These blooms, too, are of the loveliest—four to six large trumpets of palest pearly pink with a rosier blush outside, suggesting in shape and size and texture a compromise between those of *R. Aucklandii* and *R. ciliatum*, and carried laxly in a way to reveal the full loveliness of each, if not to satisfy the exhibitor's passion for a tight, hard pyramid of blossom.

Rhododendron sp. (F 88) can probably not be distributed. It is not a very common plant, and has much the look of *R. anthopogon*, but that it flops and flounders along the mossy banks and limestone

boulder-tops of the alpine coppiced beck-sides on Thundercrown, with neat little dark metallic foliage, and lovely clusters of clear pale-yellow blossom in June.

Rhododendron sp. (F 119) probably contains an admixture of the last. F 119 is, I think, VEITCH'S 1889, a universal little *Rhododendron* of the open alps, replacing heather on our own, and forming neat round bushes of 6-18 inches, made up of bronzy-grey, small, oval foliage, with the shoots ending in bunches of mauve-lavender flowers in June-July.

Rhododendron sp. (F 79).—I cannot be quite certain if this has been sent. F 79 is a general species of the alpine coppices up the Border, being a very lax, straggling, erect bush or low tree, with large Azaleoid flowers of flaring crimson-magenta in April-May.

Rhododendron sp. (F 339) abounds in the alpine coppiced glens of the Min S'an—a rather straggling and not specially graceful low tree with flower as yet unknown, and foliage felted with rust beneath.

Rhododendron sp. (F 387) is a gigantic arborescent species of the upmost woodland zone of the Satanee range, stretching across, I think, to the fells of Thundercrown, where, on those drier, barer alps, it takes a much stunted form, growing only as a stiff bush of 3-4 feet, by comparison with the great lax old forest giants of the Chago woods, from whose aged hoary arms drop aged veils and films and trails of lichen, like limp tails of many despondent monkeys. It has large and brilliantly glossy green foliage; the flower does not seem very free on the veteran specimens, but, so far as I could judge on Thundercrown, is pure white, large, and gathered into large and crowded, rather tight pyramidal balls of bloom. Its wood, when burned, exhales the most entrancing scent of Primroses; and it ironically laughs at the calciphobe traditions of *Rhododendron* by the inordinate profusion with which its glistening seedlings sprout and prosper in nothing but sheer limestone silt and shingle, up in the highest reaches of the beck-beds in the Satanee Alps.

Rodgersia aesculifolia (F 132) is perfectly magnificent in the richest, coolest, and darker aspects of the great Siku gorge, growing 4-5 feet high in the corners under the cliff, with enormous metallic foliage and foamy-white blossom in crest over crest to the summit of the spumy pyramid—by far the most superb of *Rodgersias* when in such form, and completely vanquishing the utmost effort of *Astilbe* and *Spiraea*. It is general all over the lower alpine coppice of the Siku-Satanee ranges, and, above Siku, even lingers handsomely on hot dry hills of coarse grass, from which the woodland has been pitilessly cleared for many generations.

Rosa.—The Border hedgerows swarm with innumerable briars with which I have not thought fit to burden anybody, as they are horticulturally valueless—no better than *R. canina*, and not as

good as strangely-neglected *R. villosa*. And we were unlucky enough just to miss getting the evidently bird-beloved round red fruit of the very beautiful *R. xanthina*, whose bending sprays of great single Austrian briar-like blooms droop such showers of gold over all the scant coppice of the Blackwater region in April, from Kiai Chow up to the lower reaches of the Nan Ho. This, and not *R. sericea*, I believe to be the parent of the crimson-hooked *pteracantha* form sent out as a variety of *R. sericea*. Now, this development, with blood-red new shoots armed with enormous winged blood-red thorns, is very common in all these parts to the yellow *R. xanthina*, and never has here at all occurred, in my experience, to *R. sericea*. [*R. xanthina*, if it so prove, was secured in 1915.]

Rosa sp. (F 84) is a dear little shrub, not uncommon in the cooler reaches approaching Wen Hsien, and in all the lower alpine coppice of the Satanee region. It grows quite stiffly and rather densely, attaining 4-5 feet, exquisitely graceful in effect with its small fine foliage, and enshrouded all over in May with a countless multitude of small charming apple-blossomy flowers of palest pearly white with a pinky flush. Seed from the Mō-Ping pass; it may possibly not be available yet for distribution, though I rather think this is a false alarm.

Rosa sp. (F 291) is the most glorious *multiflora* Rose I have ever seen. It begins in the lower alpine coppice and hedgerows of the Satanee district, exists in magnificent specimens in the cool dank depths of the Mō-Ping cañon, and in Siku is used for a voluminous hedge, ascending for the same purpose to Ban S'an at the top of the loess hills at the foot of Thundercrown. It is a huge rampageous bush, making shoots of 12 feet in the season, dark purple and smooth, set with smooth lucent Banksioid foliage of deep leathern green and particularly strong-minded thorns, ferocious though sparse. Next year that shoot, all along its length, is bowed with a burden of blossom in superb enormous lax clusters, opening of a nankeen buff, passing to pure snow-white, and diffusing upon the intoxicated air an intense sweetness that ripples for a hundred yards around in the end of June. And then, as if this were not enough, these fragrant snow-showers pass into huge shock-heads of fruit, fiery orange at first, but gradually deepening to a rich bloomy vermilion, and hanging on, untouched, far into the early winter. At first, knowing it only at hot Ban S'an, I feared it might want Mediterranean sun-heat and ripening like the next, but having since seen it so luxuriant in the cool dank gorge of Mō-Ping, and in the cool sub-alpine coppice about Satanee, I no longer feel any fear that it will find impediments to its happiness and development in even moist north-country gardens at home. [It prevails all down S. Central Kansu, and under cultivation proves quite imperturbable. 1916.]

- Rosa Banksiae* (F 407), almost as sweet and brilliant as the last, forming mounded haycocks of snowy fragrance all over the hot lower coppice of the Feng S'an Ling, is perceptibly more arid and tropical in inclination than the last, and freely occurs in isolated specimens up the blazing valley of the Blackwater, differing in many points, and particularly in the tiny parsimonious clusters of dull orange-chocolate fruits.
- Rosa* sp. (F 463) is a big cluster-flowered pink briar of no great moment from the hedges of Satanee, and I can find no entry or number for another briar, sent (as I believe) in an earlier lot, with the remark that it is no improvement on a fine large pink Penzance, with curious long bottle-shaped fruit. [It was sent as F 298, a number really belonging to *Betula Bhojpatra*.]
- Rubus*.—Nothing will induce me to plague people with the countless huge and hideous brambles that infest every Chinese hedgerow with their frightfulness. Of these we already rejoice in a sufficiency; I send only *R. sp.* F 281, a pleasant plant of alpine scrub on Thundercrown and the Min S'an, being precisely a neat *R. Idaeus*, with large, long, and very delicious Raspberries of orange-yellow. [I hope it may not prove *R. xanthocarpus*, that profitless weed.]
- Salix* sp. (F 419) is our only notable Willow, and this only becomes notable in the far "back-end" of the year. It is a small tree of 15–18 feet, growing in the moister folds of the upland valleys of Tibet, opposite Jô-ni, where in November it so lavishly bedecks itself with white fluffs that the effect is precisely that of a white Almond or Peach in full bloom, and the sere enwintered coppice of the hillside looks from afar as if it were a fruit-orchard in spring, and strangely beautiful as the wintry sunshine touches those paradoxical beblossomed trees with a ghostly silver shimmer.
- Salvia* sp. (F 169) is a magnificent herbaceous plant of 3–4 feet, abounding in the lower alpine turf of the Tibetan highlands away down to Satanee. It is a stalwart and stately grower, and in August bears large heads and whorls of large and very richly violet purple heads, promising our gardens a really valuable addition in this none-too-common colour [if only under cultivation this did not always fade out to a pallid tone not so good as a *Prunella's* (1916)].
- Salvia* sp. (F 227) is very common in low, hot, dry places all up the Border. It is rather a rank and ugly thing, coarse and flopping, with voluminous flannelly foliage and weak stems of a foot or so, bearing loose spires of dim, baggy-belled flowers of vinous mauve in summer.
- Sambucus* sp. (F 337) belongs to stony slopes at mid-elevations on Thundercrown &c. It is a herbaceous and very rampageous Elder of 3–5 feet, with ample foliage and big flat heads of white flower, which are followed by yet bigger flat heads of

rather small but brilliant vermilion berries at the end of August.

Saussurea sp. (F 337) I had not meant to send for anyone but Mr. BOWLES, that lover of curious delights. However, as the quantity is sufficient, all may have their share, for what it is worth, of this odd thing which, perfectly tight to the ground in barer places of the upper alpine turf of Thundercrown and the Min S'an, there produces a fat head of (probably) quite dowdy flowers, followed by the plant's one attraction, a wide gleaming collarette of silver smoke, which when ripe detaches itself all of a piece and floats away upon the air like a filmy cigarette-ring. No other *Saussurea* attracted notice (and this only by its seed), though there is a flannelly-leaved one (if *Saussurea* it be) on the highest bare stone-slopes of the Min S'an, with Primuloid rosettes of grey foliage, and fat great buzzle-heads of undistinguished (so far as one could foretell) flower. [This proved weird in the Da-Tung Alps and was accordingly collected in 1915.]

Saxifraga.—Take it all in all, the Saxifrages of this part of the Border are not brilliant in flower, nor profuse in variety. Of the Kabschia group one species only; of the Porphyrians doubtfully one (out of flower and indecipherable in the topmost cold limestone crags of the Min S'an); the bulk belong to less interesting sections, and have so far yielded only one first-class plant.

Saxifraga sp. (F 73) is our one Kabschia; it is a neat and beautiful thing, forming masses like those of a rather lax *S. valdensis*, on which are applied solitary-blossomed stems of *S. marginata*, making a fine effect when the domes are covered in May with 2-inch stems, each flourishing a full-faced snowy flower. It haunts cool aspects of the upper limestone cliffs from Satanee to the Min S'an, never appearing in other situations, and varying, like all its group, in brilliancy and amplitude of blossom. So scant a pinch of seed was alone procurable that it will not yet be available for distribution.

Saxifraga sp. (F 200) is by far the most important, this year, of its race. It is a most splendid clump-forming species of the Hirculus group, very profuse in stems of 6-8 inches, beset with rather conspicuous glaucous-grey foliage, and expanding into generous corymbs, in July, of noble citron-yellow flowers with a deeper golden base. It abounds in all the higher alpine turf of the Border, between 10,000 and 13,000 feet, and ranges from Thundercrown up on to the lush, cooler flower-fields of the Min S'an, where, amid the pale-blue surf of *Gentiana hexaphylla*, its rich tufts of grey and gold make an effect of perfect beauty. (A quite inferior cousin, of the same group, often accompanies it.) No other species was really worthy of note or collection, though F 216 was a wee green moss with golden stars, that had a delicate gaiety in cool moist rock-ledges up the valley opposite Jô-ni.

Schizandra sp. (?) (F 288) is by no means certain, and I wondered at first if it might not be an *Akebia*. It is a very dark and leathery-foliaged elegant climber, haunting cool rocks here and there in the Siku gorge and the coppice of Da-hai-go (always a sporadic occurrence), which becomes notable in September–November for its fruits, hanging in long dense clusters, like spathes of 'Lords and Ladies' tied on to an *Akebia*-bush by fine threads, and gone of a beautiful bloomy coral-scarlet.

Sedum.—Of these the greater majority here are, as elsewhere, dull and uninteresting plants. *Sedum Farreri* sp. nov. (F 238), however, is a prettyish little thing, from the topmost bare scree of the Min S'an and Thundercrown, being like a small and dainty *S. rhodanthum* of 3–4 inches, with the fine-leaved shoots each ending in a fluffy head of white sodden-looking flowers in August. I cannot be certain if this will be to be distributed, as I cannot decide whether it is identical with F 322, or whether this number covers a cousin from similar sites and heights, still more like *S. rhodanthum*, with small, dull, reddish flowers on stems an inch or two taller, and more freely produced, than in the last.

Sedum sp. (F 336), however, if really *Sedum* and not *Umbilicus*, is a truly beautiful thing. It seems special to very hot stony banks about Siku, and in the little town itself grows in such abundance on every roof that the groove between each ridge of tiles becomes a solid channel of its lovely blue-pink metallic glaucous foliage, fat and cylindric, but in colour like a bedding *Echeveria*'s, from which in late August profusely arise dense fox-brush spikes of 6–10 inches, breaking into serried pyramids of little coldly-white or pinkly-flushing stars. The flowered crown of this expires in seeding, but the mass of the plant continues unperturbed, as in *Saxifraga Cotyledon*, and it ought, in hot, dry places, pebbly and parching and poor, to introduce quite a new charm into our gardens, unaccustomed to such a style of beauty in *Sedum*.

Senecio.—Of these many large and some magnificent species have been introduced of late years, and do not need to be re-collected. *S. tanguticus*, all over the Border, is as pervasive a pest as it promises to be in the garden; and polymorphic but always resplendent *S. clivorum* (if so indeed it be) occurs at intervals all the way from Siku at least as far north as Karta Pu. Otherwise nearly all are too-well-known weeds.

Senecio sp. (F 299), however, is (I believe) a new and most important species. Though a very closely allied but inferior thing is found in the higher reaches of the Tibetan becks about Ardjeri &c., true F 299 has been seen only in the Satanee range, scantily in one pool of the great mountain mass, and abundantly in the stream-beds high up above Satanee itself, in the ghyll-bottoms whose coppiced slopes are dotted with *Rhododendron* F 63. Here, actually in the running water and amid the stones of the

little rill, it sends up enormous foliage of metallic dark tone, almost as large as in *Petasites japonicus*, and borne on stout footstalks clothed in soft maroon plush of richest pile; from this, in August, towers far above a huge stem of 6 feet, fat and thick, clothed in the same plush, and breaking almost simultaneously at the top into four or five erect-standing stiff branches, each of which is densely hung with closely crowded tassels of small, tasselly yellow flowers hanging on thread-fine pedicels. The flowers I believe to be as feeble as they are certainly small; but their mass must be impressive, and their subsequent silver stars of seed are charming, and the stately imperious port of the plant, with its plushy empurpled stems and huge sombre foliage, is so impressive and splendid as to need no further enhancement from flower. A superb wet-bog species or for shingly water-sides, and the very beds of little streamy and stony pools themselves.

Senecio sp. (F 353) is the poor cousin of the last, from Ardjeri becks. It is slightly smaller, it lacks the purple plush, its foliage is of bright commonplace green—and altogether it is a feeble, inefficient imitation of F 299, in all points, missing all F 299's essential points of splendour, but luxuriating in the same conditions of running shallow water.

Senecio sp. (F 437) is a spiked, divided-leaved species of 3-4 feet, very abundant in the lower coarse cool places of the alpine ranges, akin to *S. Przewalskyi*, and rather coarse and weedy to tastes overfed of late with coarse and weedy Chinese Ragworts at enormous prices.

Senecio sp. (F 438) I have not seen. It is a find of PURDOM's from high on Thundercrown, and may have reference perhaps to the plant described as *Cremanthodium* F 239. It was collected so late that no judgment can be attempted.

Senecio sp. (F 450) is quite different. It suggests the Madeiran species called Summer Ivy, and flops trailing about in all the warm subalpine river shingles of the Border, with sprays of glossy hederaceous foliage about 8-12 inches long, and very loose corymbs of shrill-yellow flowers in July-August. Though bright and pretty as it flounders over the stones, it has a tang of that rank and virulent vulgarity from which the Ragworts so rarely escape. For the sunny moraine, however, though not choice, it should have a clothing and enlivening value.

Senecio sp. (F 494) I believe to be quite new, and it should certainly take rank as *S. Purdomii*, not only for its beauty, but because PURDOM was its original collector, and has always had all the danger and trouble of obtaining it. Successfully introduced in 1911, its seedlings only lived long enough to show the extreme difficulty of its cultivation. For, not only is it a plant of the wet and clammy bog, not only does it require to be raised in uniformly damp soil, but it is so passionately adored by slugs that it seems even to breed them for its own destruction in

irrepressible and undefeated multitudes, and is also of such extreme ill-temper about root-disturbance that it cannot be induced to survive removal or planting out if a single one of its scant fat roots be bruised or curtailed. With all this it is a species magnificently deserving of the cares it exacts; with handsome foliage, not unlike that of some enormous and faintly glaucescent plantain, and upstanding spires of 2-3 feet, up which depend and dangle the remarkable flowers. These are of soft yellow, and have few long and wavy ray-florets, flopping down in a manner suggestive of a very much glorified Hamamelis, and full of a quite especial charm. It is so far known only from one marsh on Monk Mountain (where it is in poor state, and whence it has yielded winter seed by far too scant for distribution) and from another slough near Shen-trick, far away in the Drokwa Alps of Tibet, where it attains the splendour and goodly stature of its finest specimens. (Dried specimens of PURDOM's exist in England, collected in 1911.) [Abundantly sent in 1915.]

(?) *Serratula* sp. (F 432) is a handsome but quite coarse thing, common in open moorland fields all up the Border at low elevations, growing some 3-5 feet high, and expanding, in August, in a spreading compound head of brilliant magenta-purple fluff like a gigantic *Ageratum*. In sunny rich stretches of the wild garden it should make a fine effect.

Sophora viciifolia (F 9) belongs especially to the hottest and sunniest dry slopes of the loess region, forming bushes of 4-6 feet, sheeted in May with little hanging racemes of white or palest water-blue. Its finest abundance was at the foot of the Feng S'an Ling, and the seed was collected from a hot little grave-copse behind Siku, where it has either been introduced or survives there alone, from the denudation of the now bone-bare loess downs.

Spiraea sp. (F 457) is a gracious shrub of the *arguta* persuasion, with larger clusters along the fine-leaved arching sprays. Seed of this (a type, I fancy, of very many varieties) was collected on the upmost copse-limit of the alps on Thundercrown, and sp. F 459 may be no different, but hails from Lotus Mountain.

Statice sp. (F 434) was in flower in mid-November on the sere dry downs approaching Lanchow. It is a low grower, and has yellow blossom.

Stellera sp. (F 93) is so named at Kew, but I find no other trace of a pink *Stellera*. In any case, whether really *Wikstroemia* or any other *Daphne*-cousin, this charming thing may be described as a herbaceous woody-stocked *Daphne*, springing abundantly in all the high hayfields of the Tibetan Alps, ascending to 11,000 feet, but no less happy in coarse dry turf on the hot and sun-baked foothills of Thundercrown. It springs in a mass of glaucous-leaved shoots to a height of 8-12 inches, forming a compact dome of growth and blossom, each undivided stem ending in June and July in a compact dome of fragrant pearl-

white Daphnes with a centre of varnished ruby-red buds. It is evidently poisonous as the rest of the family, for in the Tibetan hayfields the cattle pass it deliberately by, as they pass by buttercups in England. Its seed is scanty and doubtful, and hard to catch; it may not be sufficient for distribution. Young plants should be most carefully guarded from root-disturbance. [Abundantly collected on the Da-Tung Alps. 1915.]

Stellera sp. (F 112) may just as easily be *Wikstroemia* or *Farreria*.

It is a willow-leaved, brilliantly-green, sub-shrub of woody base, usually sprouting herbaceously to a height of about a foot, with undivided stems ending each in a loose thyrses of bright-yellow *Daphne*-flowers in June. On the hot bare loess downs, to which it is peculiar (I know of it only on the torrid hills of Siku, extending up to Lodani, and a little way up the Nan Ho), it is compelled to this habit by being pitilessly eaten back by the omnivorous goats; where let alone I have seen it develop into a branching bush of some 3-4 feet. The seed drops while still its envelope is green, and though lavish in germination must be spared root-disturbance in later stages.

Stephanandra sp. (F 54) abounds in all the subalpine coppices and hedgerows of the Border, especially in the Satanee region. It has all the elegance of its race—a gracious, beautiful-leaved shrub of 4-5 feet, with little terminal racemes of blossom in May-June, like a most delicate flesh-pale *Ribes sanguineum*.

Swertia sp. (F 334) is but an annual, I fear, and may indeed be nothing more than a specially fine Asiatic development of *Pleurogyne carinthiaca*. It abounds in the open turf all over the upper alps of the Min S'an and Thundercrown, from 9,000 to 14,000 feet, and is really most beautiful in September, forming loose 6-8-inch pyramids of large, wide, saucer-shaped flowers of a lovely soft, clear, electric blue, growing in exactly the same turfy open slopes that breed *Pleurogyne* above the Glocknerhaus. But this is so attractive as well to deserve an annual sowing, in light grass or little interstices of turf.

Syringa sp. (F 330) is a tall, slender, and very graceful Lilac of 6-8 feet, which I have only once seen, far up, on the shady side in a collateral of the great Siku gorge, growing in a big colony amid blocks of mossy detritus from the cliff-wall overhead. Its flower, so far as I could judge it at the end of June, seemed small and rather poor, in small insignificant panicles; it may, however, improve in cultivation.

Syringa velutina (F 309).—As we escaped out of Satanee on a grey dawn in May, I saw, far down across the brawling little grey torrent, flaring purple masses of a Lilac on the sandstone cliffs that overhang it. I believe and hope, though I cannot be certain, that to the same species belongs seed I collected from one tiny bush, growing in the same way, on a cliff, in the limestone gorge behind Gahoba, just over the neck. The seed, however, is too scant for

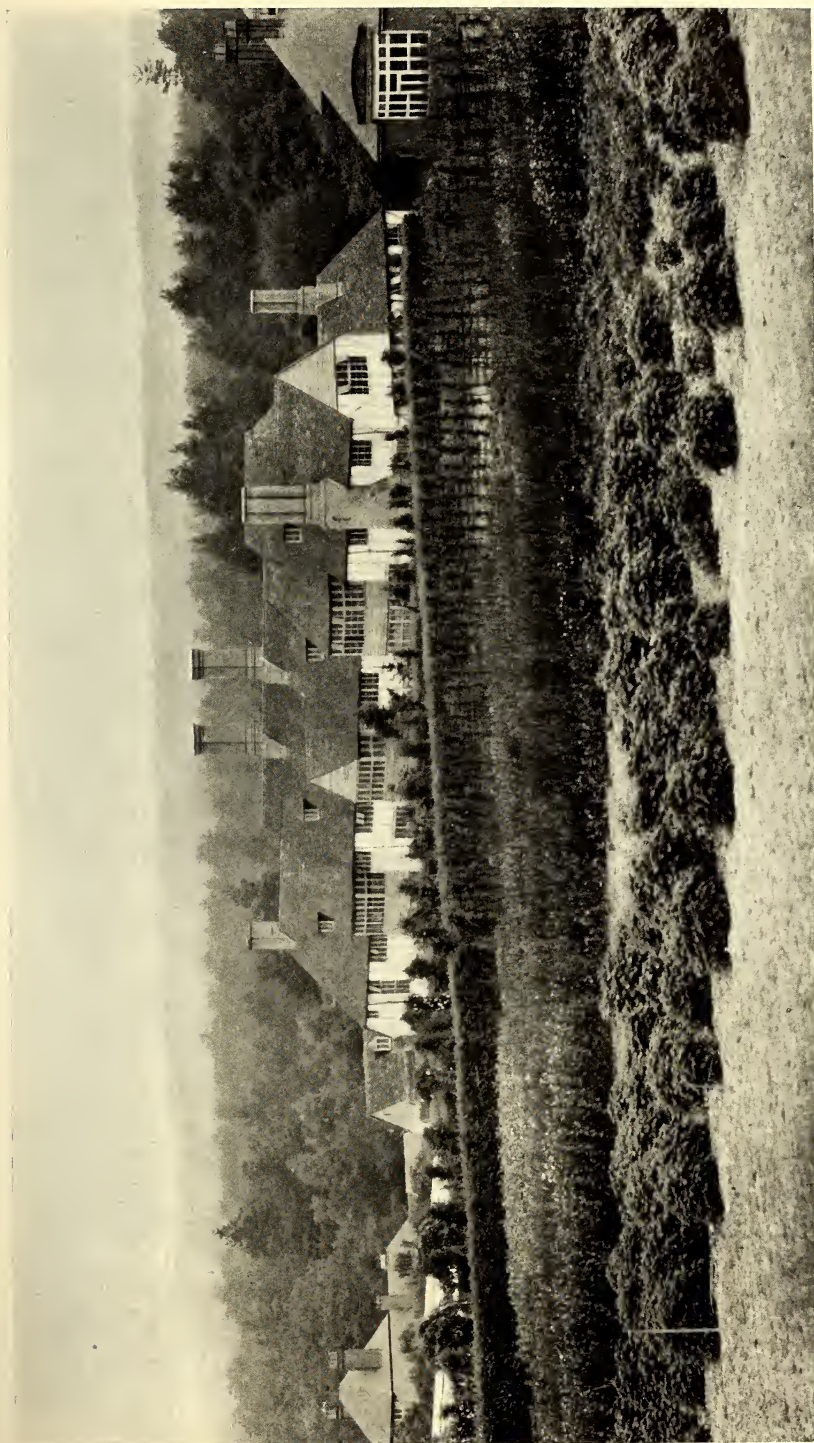


FIG. 19.—R.H.S. LABORATORY, WISLEY, AS SEEN FROM THE FRUIT QUARTERS.

[To face p. 112.



FIG. 20.—R.H.S. LABORATORY: THE MAIN ENTRANCE.

the plant to be immediately distributed, as only a few pods were still full, on the low branching shrublet of perhaps a foot high and twice as much across. No doubt, more fully developed, it will grow much larger; I feel lucky to have got any seed, for throughout South Kansu this (or these) rock-Lilacs are usually inaccessible in proportion to their brilliancy.

Tilia sp. (F 393) (? *T. mongolica*) is a low tree of some 15–20 feet, very abundant in flower and fruit, but not, so far, of any specially *éclatant* beauty, which is common in the lower alpine coppice and woodland of the Satanee range.

Viburnum fragrans (F 13).—This most glorious of shrubs we found for the first time as a wild plant, occurring, not abundantly, in scant coppice, and in little grassy bays down beside the fell-becks in the small hill-range between Shi-ho and Shi-ja-juang, at about 5,000–6,000 feet, on April 16. The flower was here passing over, but still lingered in the small wayside villages, enabling us fully to realize the glory of its capacious thyrses of blossom, like snow-white or rose-pink Lilac, so freely borne on the graceful, stately boughs and sprays of 6–10 feet, and exhaling the most entrancing scent of heliotrope. This first-class beauty, wild only here (so far as known), is a general culture-plant all over Northern China; great old specimens are seen in almost every palace- or temple-yard, in Minchow, Jô-ni, Lanchow, &c.; and its loveliness and fragrance even carried it to Peking, where it was among the most prized specimens in the Imperial garden, until the death of the Grand Dowager and the fall of the dynasty allowed it out at last into the eager hands of commoner cultivators. The flower is prepared in tight buds at the end of each spur and spray by December; it opens in April, and is then succeeded by the foliage, amid which in August hang clusters of glowing oblong berries of crimson scarlet, hardly less beautiful in their way than the blossom, as well as offering a favourite dish for dessert (but you must spit out the poisonous cloven stone). In fact, we should have got yet more seed than our present abundant supply, had it not been for a falling-out with the Prince of Jô-ni, who, to avenge himself, set to and sedulously ate up all the *Viburnum* fruits in his palace garden, and threw away the seed. At every stage *V. fragrans* takes the very highest rank; it will evidently like full sun, the better to ripen its wood; but, from its happiness in cool Tibet, I believe it will handsomely escape the tiresomeness that mars *Chimonanthus*, and will undoubtedly prove as precious and priceless for spring forcing as for the open garden a month or two later—where it seems likely to thrive in any rich and open loam, in China having often to put up with the most adamant and caky loess, into which it is rammed at haphazard, and there proceeds to prosper profusely. [It goes far up North, even into the cold foothills of the Da-Tung Alps, where not even corn will ripen. 1915.]

Viburnum sp. (F 363) is a very scanty, slight-growing, arching shrub, splaying about with a very few sprawling branches of 3-5 feet long occasionally in the lower alpine coppice of the Border. The leaves are pretty, and the flowers I believe to be negligible; but autumn produces brilliant oval berries of intense opaque scarlet, gathered tightly here and there in twos and threes.

Viburnum sp. (F 364) may perhaps be no more than a form of *V. Opulus*. It is, however, by far the finest fruiting *Viburnum* I know, being a tall graceful bush of 8-10 feet, with the sprays bowed down in autumn beneath enormous loose showers of the most gorgeous and luminous ruby berries. It abounds in the coppice of the Satanee region and the Mö-Ping pass, and its flower I have not seen.

Viburnum sp. (F 365) is only inferior to the last. It is stiffer in habit, with corrugated foliage, and more stiffly borne smaller heads of a less diaphanous crimson, usually drooping a little askew with their own weight. It haunts the same copses as the last, has the same stature, and is equally unknown in flower.

Viburnum spp. (F 366, 367, 388) are dim species from Chago and Mö-Ping, and collected by our Chinese headmen respectively.

Vicia unijuga (F 184).—This plant has all the appearance of a *Kennedya*, with several wiry 10-12 inch stems in August springing from the crown, and ejecting on fine peduncles rich racemes of brilliant blue violet pea-flowers from all the upper axils, more brilliant yet for their rich red-purple calyces. It is abundant throughout the alpine grass-lands of Tibet, extending south into the Satanee range and all over Northern Asia.

THE NEW LABORATORIES AT WISLEY.

WHEN, some months before the outbreak of war, the Council determined to establish at Wisley a Research Station in Horticulture which should be without rival in the world, it was confronted with the problem of how this might be done without destroying the amenities for which the Gardens at Wisley are so famous.

That the building now completed does provide a solution of the problem will be generally conceded by those who inspect the photographs accompanying this note, and still more by those who have recently visited the Gardens. It is indeed a matter for general congratulation that it has been found possible to establish a great Laboratory which not only does not detract from, but actually adds to the beauty of the Gardens.

The difficulties which had to be overcome before this happy result could be arrived at were not inconsiderable, and chief among them was the fact that Laboratories require in almost all their rooms far more light than is usually considered necessary in the rooms of dwelling-houses. This problem of lighting makes the pleasing treatment of the windows most difficult, and it has been met in the Laboratory by a skilful use of larger panes in the workrooms and smaller panes in the offices, corridors, &c.

The importance of Horticulture to our national welfare is so great and so rapidly increasing that it was essential, if the research work of the Society should embrace the chief branches of Horticulture, that the buildings should be planned on a liberal scale. When, moreover, it is remembered that there is already in existence at Wisley a large and flourishing School of Horticulture, it will be recognized that the accommodation which the Council has provided, liberal though it undoubtedly is, is none too large for the purposes of teaching and research.

The building is erected on three levels, owing to the steep gradient of the site, for the ground falls away some eight feet from south to north.

Externally the building is treated in a manner probably best described as picturesque. The front towards the road is faced with thin hand-made bricks laid with wide joints; the bricks are rough on the surface and vary in colour, the general tint being a low tone of purple pink. The front facing the Garden has a plinth of similar



FIG. 21.—PLAN OF R.H.S. LABORATORIES, WISLEY. GROUND FLOOR.

For references see p. 121.

bricks, with which also the chimney-stacks are faced ; above the plinth the walls are treated with oak half-timbering, filled in with rough plastering. The roof is covered with old tiles collected from various parts of the country.

All the window frames are of oak, with metal casements and leaded glazing. The entrance doors are also of oak, studded with wrought-iron nails and hung on armour-bright wrought-iron hinges, with furniture to match.

The old Botany Laboratory is incorporated in the new building ; and, in order to provide accommodation for a caretaker, the roof of the old Laboratory has been raised, and gables have been added on each side.

On the Garden front is a stone-paved terrace, following the levels of the ground floors of the building. The Terrace is terminated at the north end by a high wall of bricks similar to those facing the main building.

The Front Entrance opens into a porch having an oak dado of vertical moulded boarding and an oak-panelled ceiling. Between the Porch and Hall is an oak glazed screen with a door in the centre opening into the Hall. The Hall is carried up the full height of ground and first floors, and has at the east end a gallery at first-floor level. There is an oak-panelled dado to the lower portions of walls (which is also carried round the Staircase Hall), above which the walls are treated with plaster finished to a granulated surface and left the natural plaster colour. The ceiling is divided into three bays by heavy moulded oak beams supporting smaller oak beams, filled in between with plaster similar to that on walls.

On the north side of the Hall is the main Staircase, which is of oak, the design being of a Jacobean character, as is also the design of the oak gallery front above the Hall.

The windows of Hall, Gallery, and Staircase are glazed with old Dutch glass, and into some of the lights stained-glass panels have been introduced. The Society's crest is represented in stained glass in the centre upper light of the hall window, and in the gallery window are small designs representing the Seasons ; in the upper lights of the staircase window are decorative circular panels representing the Signs of the Zodiac, while in the centre lower light of this window is a larger design representing Nature.

The stained glass is the work of Mr. Herbert Bryans.

The walls and ceilings of the corridors are plastered in a manner similar to those in the Hall. The ground-floor corridor has a barrel ceiling. With the exception of the joinery already described and that in the Director's Room, which is in oak, the joinery generally, such as doors, skirtings, cupboards, bookcases, seats in the Lecture Room and Laboratory fittings, are all made in whitewood left clean, the doors on the corridor side only having been stained a dark grey tint, and the kirtings and picture rail in the corridors treated in a similar manner.

The building is heated throughout by means of hot-water radiators.

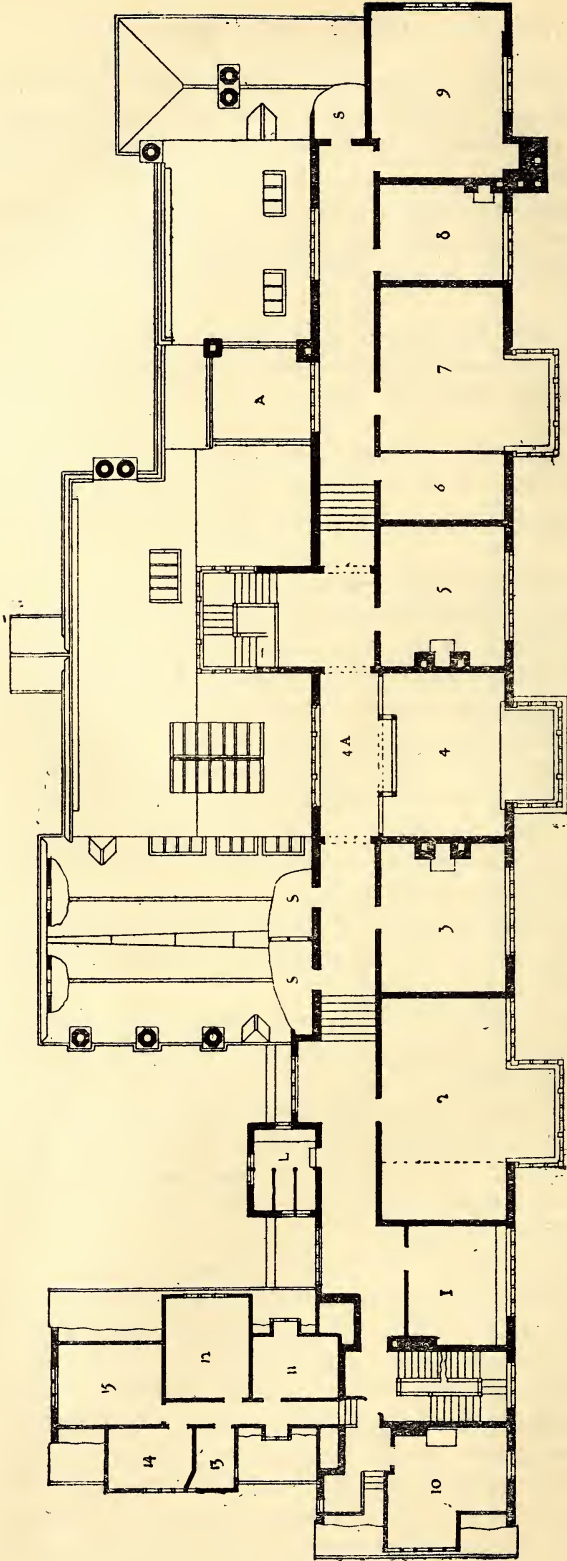


FIG. 22.—PLAN OF R.H.S. LABORATORIES AT WISLEY. FIRST FLOOR.

For references see p. 121.

Electric light is installed.

The Lecture Room is ventilated by means of inlet ventilators and an electric extract fan, and the fumes from all fume closets are drawn off through ducts connected to electric fans.

Petrol gas is laid on to all rooms for Bunsen burners &c.

The sewage is run to a large septic tank bearing an automatic distributor; into this tank the sewage from all other buildings in the Garden is also run.

For purposes of description the building may be divided into four sections, the Botanical, the Chemical, the Mycological, and the Entomological. The Botanical section includes the old Students' Laboratory, which is built into the new building and now serves as the Botany Laboratory for the students, a large room for physiological research (with accommodation for six workers), one for Electro-biology, and an incubator room. In the Chemical section there is a large students' laboratory which provides accommodation for twenty students. Attached thereto is the main Lecture Room, available for classes in all subjects, with a seating accommodation for fifty. Access to the Lecture Room is direct from the main entrance hall. This section also contains a Research Laboratory with accommodation for four investigators; a factory room which may be described as a chemical workshop; an outdoor combustion room; a room and a small private laboratory for the head of the Chemical department. At present the Chemist of the Society is in the Army, and the detailed fittings are to be left till his return.

The Mycological Laboratories comprise two chief rooms, which between them provide accommodation for six workers, a sterilizing room and an incubator room. The Botanical, Chemical, and Mycological laboratories are situated on the ground floor, where are also the photographic and dark rooms and the offices of the Director and the Head of the School of Horticulture.

On the upper floor, four rooms, two of which are of considerable size, are set apart for Entomology. There are also on that storey the Staff Common-room, Students' Common-room, and the Library and Herbarium. The Herbarium contains cupboards for 80,000 sheets, and will be devoted to collections of plants of horticultural importance. There is room on the bookshelves for 8,000 volumes, but the books which it is proposed to keep in the Library at Wisley are those which are required for the immediate purpose of research, scientific periodicals, and so forth, and not such as more properly find their place in the Lindley Library at Vincent Square. Already the Laboratory is fortunate in having received several donations of books both from private donors and from public institutions such as Rothamsted.

Although the staff is reduced considerably owing to the exigencies of the war, research work is going on. Thus Dr. Horne is pursuing his investigations into American Gooseberry Mildew, and has this year succeeded in demonstrating that it is possible to prevent infection of the berries by spraying with Burgundy mixture. Mr. Ramsbottom

is engaged in an investigation into the cause and the remedy for the Fusarium disease of Narcissus, which is causing so much loss to the growers of that plant. Mr. Chittenden is continuing his investigations into sterility of fruit trees, and into other problems connected with fruit-growing. Professor Lefroy's work for the Society, which was unfortunately interrupted by the claim of the Government of India on his services for research abroad, included investigations on the parasite of white fly and methods in the prevention of flies breeding in manure. The Acting Trials Officer, Mr. Turner, is preparing material for the classification of Bearded Irises as well as recording and comparing the numerous and important trials, peas, potatoes, cabbage, sunflowers, &c., which are being conducted at Wisley. The Superintendent, Mr. Wright, is conducting experiments on green manuring, and on the economical cropping of cottage gardens. The Assistant Superintendent and the Director are carrying out cross-breeding experiments with Primulas, and they have already found strains of hybrids which will prolong the beauty of the *Primula japonica* wood each year by several weeks. Similar breeding work is being carried out by Mr. Wilson, the fruit foreman, with the assistance of the Director, and new kinds of grapes, culinary peas, and Rubi have been made and their qualities are being tested.

The work of the School of Horticulture, always most efficient, will be made considerably less exacting by the great increase in accommodation provided by the additional laboratories.

In happier times the Council would have desired a formal opening of the new Research Station, but it was felt that such formalities as these are best deferred, and so the staff has, as the rooms became available, entered upon the occupation of the new Laboratory and set to work to put them to uses which it is their united hope will prove of permanent service to Horticulture.

The Staff wish to take this opportunity of expressing their thanks to the architects, Mr. Imrie and Mr. Angell, of the firm of Messrs. Pine-Coffin, Imrie, and Angell, of 46 Bloomsbury Square, for the great courtesy with which the many demands they have made upon their skill have been met.

The architects were Messrs. Pine-Coffin, Imrie, and Angell, of 46 Bloomsbury Square, London; the builders being Messrs. Youngs and Son, of Norwich. The internal plumbing and gasfitting were done by Messrs. Wenham and Fowler, of Croydon; the hot-water heating by the Brightside Engineering Co., of Victoria Street, S.W.; the electric installation, including engine, accumulators, wiring, &c., by Messrs. Drake and Gorham, of Victoria Street, S.W.; the septic tank by Messrs. Tuke and Bell, of Tottenham; the petrol gas plant by the County Light Co. of Westminster; and the ventilation by the Sturtevant Engineering Co., of Queen Victoria Street, E.C.

The illustrations which accompany this note are from photographs taken by Mr. Malby.

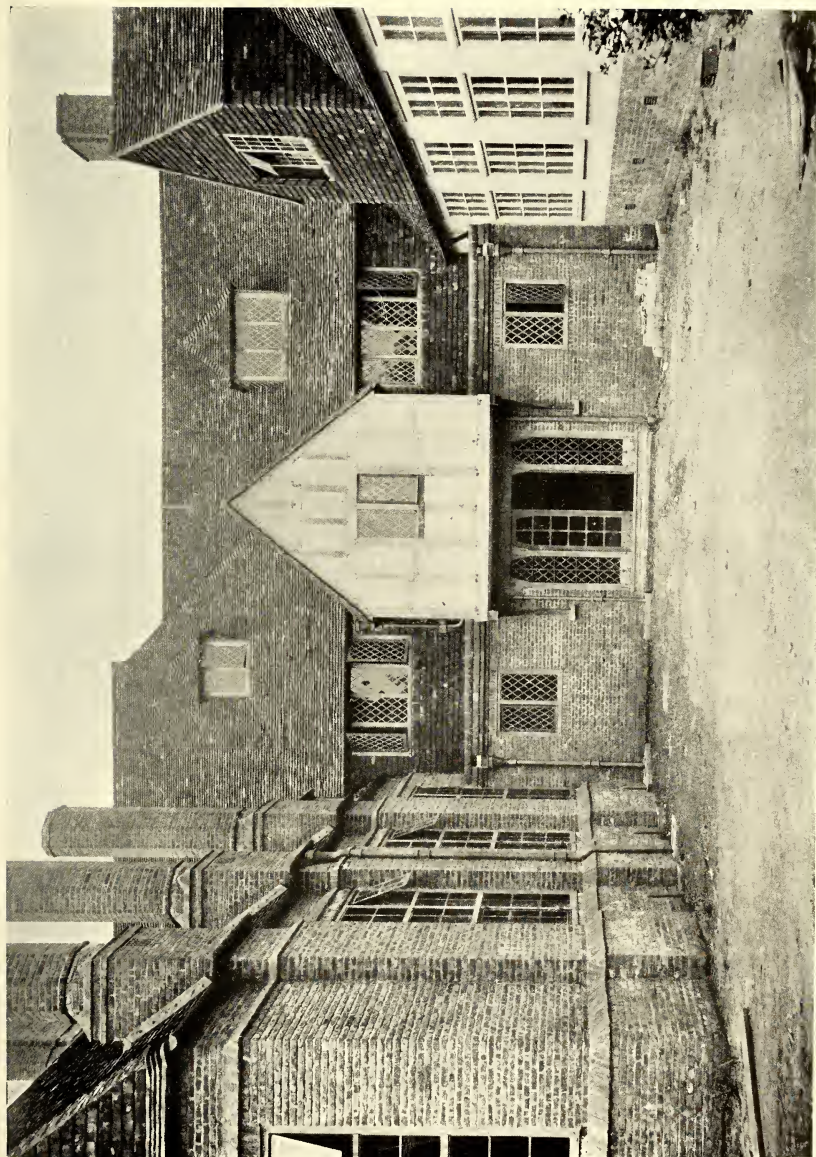


FIG. 23.—R.H.S. LABORATORY : THE GOODS ENTRANCE.



FIG. 24.—R.H.S. LABORATORY: A CORNER OF THE HALL.



FIG. 25.—R H.S. LABORATORY : THE UPPER CORRIDOR.



FIG. 26.—R.H.S. LABORATORY: THE LECTURE ROOM.

[To face p. 121.]

References to the Ground Floor Plan on p. 116.

- | | |
|---|---|
| 1. Entrance. | 15. Students' Botany Room (accommodation for twenty). |
| 2. Hall. | 16. Mr. Chittenden's Room. |
| 3. Lecture Room. | 17. Main Staircase. |
| 4. Preparation Room. | 18. Factory Room. |
| 5. Students' Chemistry Room (accommodation for twenty). | 19. Combustion Hood. |
| 6. Electro-biology Research Room. | 20, 21. Photographic and Dark Rooms. |
| 7, 7. Incubator Rooms. | 22. Physiology Room. |
| 8, 11. Mycology Rooms. | 23. Office. |
| 9. Balance Room. | 24. Dr. Keeble's Room. |
| 10. Goods Entrance. | 25-27. Chemistry Rooms. |
| 12. Secondary Staircase. | A, Light Area. |
| 13. Sterilizing Room. | S, Store Room. |
| 14. Caretaker's Entrance. | L, Lavatory. |

References to First Floor Plan on p. 118.

- | | |
|--------------------------------|-----------------------------------|
| 1. Students' Common-room. | 6. Store and way up to Tank Room. |
| 2. Herbarium and Library. | 10-15. Caretaker's Rooms. |
| 3. Staff Common-room. | S. Store Rooms. |
| 4. Upper part of Hall. | A. Light Area. |
| 4a. Gallery carrying Corridor. | L. Lavatory. |
| 5, 7, 8, 9. Entomology Rooms. | |

METEOROLOGICAL OBSERVATIONS AT WISLEY, 1915.

By R. H. CURTIS, Hon. F.R.H.S.

THE Climatological Observatory at Wisley has been efficiently maintained throughout the year, and the daily readings of the instruments have been made by the Observer, Mr. CARTWRIGHT, without a break. Some time ago three recording thermographs were added to the instrumental equipment, and set up at heights of one, two, and four feet respectively above the ground without shelter of any kind, in order to obtain some information as to the *range* of temperature to which plants growing to those heights in the open are subject. After they had been for some time at work it was found that, owing to a small defect in construction, some of the records were doubtful, and the instruments were therefore returned to the makers for alteration. They were reinstated early in the past year and have since been working satisfactorily, and it is hoped some useful information may now be derived from their records. In no other respect has any change been made in the equipment of the Observatory.

The weather of the year now under review presented one or two outstanding features of interest. Regarded as a whole the year was a cool one; in seven individual months the mean temperature was below the average, and in four other months it was only slightly above it. December was relatively the warmest month of the year, the normal temperature being exceeded by two degrees; whilst in November, which was relatively the coldest month, the average temperature was five degrees below it. The spring was cool throughout; and July, the middle month of summer, had a mean temperature two degrees colder than is usual. Three or four months were abnormally wet, especially the first two and the last months of the year; in February the average rainfall was more than trebled, and in July also it was doubled; on the other hand March was extremely dry, with less than three-quarters of an inch of rain. There was very little snow, the only fall of note occurring in January and disappearing very quickly. As is not very unusual, there were floods in the Thames Valley and in the river Wey, but this year they were of quite exceptional volume, and covered a greater area than any during the preceding twenty years.

On the whole, from a gardener's point of view, the year may be regarded as an ordinary one; and although the characteristic vagaries and fickleness of our English weather were sometimes perhaps more than usually evident, yet, as generally happens, they seemed to balance each other fairly well as the months passed on, and in the general

survey no excess or deficit in either of the elements of climate with which we are concerned stands out with special prominence, and the year as a whole takes its place after all as a fairly normal one.

January.—Throughout the greater part of the month the weather was continuously rough and windy, and so extremely wet as to interfere very materially with outdoor operations in the garden. Weather of this type in the British Isles is usually due, as was the case now, to a succession of cyclonic disturbances moving along a more or less north-easterly track lying either just beyond our western coasts or across the northern portion of the kingdom. Such systems are accompanied by a definite wind circulation which over their southern section is southerly or westerly; and as at this season of the year these winds are relatively warm as well as wet the temperature was generally above the average for January. At Wisley the thermometer occasionally rose above 50°, and rarely failed to exceed 40° as the maximum of the day; and neither there nor in any part of the kingdom was there a continuous frost. About the close of the third week, however, there was a sharp “cold snap” of very brief duration, accompanying which was a considerable fall of snow over south-eastern England, where in some parts its depth amounted to a foot; but it was the only fall of snow worth mentioning, and it disappeared very quickly. The rainfall of the month exceeded the average over practically the whole of England and Wales, but more especially over the southern counties; there were districts in Ireland and Scotland where it was less than the average. As the large rainfall followed upon an equally abnormal excess of rain in December, it is not surprising that there were large floods in the Thames Valley and elsewhere, the level of the water in the Thames being higher than for the preceding twenty years; whilst intermittent springs, as the “Croydon Bourne,” broke out with quite remarkable volume. The amount of bright sunshine was small, and averaged less than an hour and a half a day at Wisley.

The results obtained from the observations made at Wisley are shown in the following table:

Mean temperature of the air in shade	.	.	.	.	39·4°		
Highest	“	“	“	.	53·3°	on the	13th
Lowest	“	“	“	.	21·8°	“	23rd
“	“	“	“	on the grass	17·7°	“	30th
Number of nights of ground frost	.	.	.	.	.	.	18
						At depth of	
					1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	.	.	.	.	39·2°	41·4°	43·7°
Highest	“	“	“	.	43·7°	43·7°	44·8°
Lowest	“	“	“	.	35·9°	38·8°	42·0°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 88 per cent.

Rain fell on 19 days, to the total depth of 4·19 in. (equivalent to about 19½ gallons of water to the square yard). Heaviest fall on any day 1·18 in., on the 22nd.

The prevailing winds were south-westerly.

The average velocity of the wind was 7½ miles an hour.

There were 45 hours of bright sunshine, equal to 18 per cent. of the greatest possible amount.

There were 17 days on which no sunshine was recorded.

February.—The weather of February, like that of the preceding month, was stormy and unsettled, but whilst in January the area of disturbance was mainly the southern half of the kingdom it now became extended to Scotland as well, the worst weather occurring during the earlier half of the month, the last week being generally quiet and fine. For the fourth month in succession there was a large excess of rain, the fall over the whole kingdom approximating to twice the normal amount, and at Wisley to more than three times the average, garden work being again delayed; the flooded area in the Thames Valley became considerably extended; and there were heavy floods in the river Wey, which skirts the Society's Gardens. The temperature was generally nearly normal, and at Wisley there were no severe frosts; the warmest days came at the beginning, but there was only one day throughout the month on which the thermometer failed to reach 40°. Notwithstanding the large rainfall, the amount of bright sunshine was more than is usual in February; there were only a few days on which some was not recorded, and there were several really bright days, the average amount being rather more than two and a half hours a day. The winds were mainly from between south-east and south-west, and their average velocity was eight miles an hour.

The results obtained from the observations made at Wisley are shown in the following table:

Mean temperature of the air in shade	40·2°		
Highest " " " "	51·8°	on the	3rd
Lowest " " " "	24·6°	" "	13th
" " " " on the grass	17°	" "	25th
Number of nights of ground frost			15

		At depth of		
		1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	39·4°	40·8°	42·2°	
Highest " " " "	42·4°	42·6°	42·9°	
Lowest " " " "	36·3°	39·2°	41·6°	

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100) 88 per cent.

Rain fell on 21 days, to the total depth of 4·47 in. (equivalent to about 21 gallons of water to the square yard). Heaviest fall on any day 0·62 in., on the 13th.

The prevailing winds were south-westerly.

The average velocity of the wind was 8 miles an hour.

There were 75 hours of bright sunshine, equal to 27 per cent. of the greatest possible amount.

There were 6 days on which no sunshine was recorded.

March.—The mild unsettled weather of the preceding months persisted through the early part of March, but about the middle of the month there came a change to colder weather, which continued, with the exception of a few days about the end of the third week, until the close of the month. It was, however, a dry month, the total fall of rain at Wisley being but three-quarters of an inch; and it is worth noting that this was the first month since the close of October which could be regarded as other than exceptionally wet! The mean temperature was slightly below normal, but there were a few really warm days when the temperature at Wisley approached closely to 60°; these were, however, followed by the coldest days of the month, and on the night of the 29th the screened thermometer fell to 10° below

freezing, whilst a thermometer laid upon the grass, quite open to the sky, registered 22° of frost, the lowest reading throughout the winter. The amount of bright sunshine was again much less than usual for the season; there were a few really bright days, but the average daily duration of sunshine at Wisley was under three hours, or only three-fourths of the average, whilst in some parts of Scotland it averaged nearly five hours, which is largely in excess of the normal amount. Under such adverse conditions vegetation was, as might have been expected, very backward; trees and shrubs were very late in starting growth, and fruit trees did not bloom until from fourteen to twenty-one days after their time of blooming last year.

The results obtained from the observations made at Wisley are shown in the following table:

Mean temperature of the air in shade	41·4°		
Highest " " "	58·2°	on the 23rd	
Lowest " " "	21·9°	" 29th	
" " on the grass	11°	" 29th	
Number of nights of ground frost			19
		At depth of	
		1 ft.	2 ft.
Mean temperature of the soil at 9 A.M.	41·2°	42·2°	42·8°
Highest " " "	45·6°	44·2°	43·6°
Lowest " " "	37·2°	40·0°	41·6°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100) 86 per cent.

Rain fell on 10 days, to the total depth of 0·73 in. (equivalent to about 3½ gallons of water to the square yard). Heaviest fall on any day 0·23 in., on the 2nd.

The prevailing winds were from between north and north-east and west and south-west.

The average velocity of the wind was 5½ miles an hour.

There were 87 hours of bright sunshine, equal to 24 per cent. of the greatest possible amount.

There were 6 days on which no sunshine was recorded.

April.—During the earlier part of this month the weather continued cold and unsettled, with occasionally a strong wind, and it was not until the middle of the month that a normal temperature and conditions favourable for garden work had become developed. Even then, however, the nights continued cold, with low temperatures on the ground, and to this was probably due the very slow germination of seeds which was noticed; it was not until the middle of the month that the temperature at Wisley rose to 60 degrees, and there was a sharp frost on the ground so late as the night of the 24th. The south-east of England was favoured with more than its usual amount of sunshine, and in this respect was better off than some other districts; and it was also again a dry month throughout England, so that on the whole the weather of the month may be fairly described, so far as the neighbourhood of Wisley is concerned, as fine and dry.

The results obtained from the observations made at Wisley are shown in the following table:

Mean temperature of the air in shade	47·4°		
Highest " " "	71°	on the 30th	
Lowest " " "	28°	" 24th	
" " on the grass	17°	" 1st	
Number of nights of ground frost			14

		At depth of		
		1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	. . .	45·1°	45·2°	44·3°
Highest	” ” ” . . .	49·5°	48·4°	46·1°
Lowest	” ” ” . . .	38·6°	40·2°	42·3°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100) 74 per cent.

Rain fell on 7 days, to the total depth of 1·22 in. (equivalent to about 5½ gallons of water to the square yard). Heaviest fall on any day 0·39 in., on the 12th.

The prevailing winds were north-easterly and south-westerly.

The average velocity of the wind was 6 miles an hour.

There were 168 hours of bright sunshine, equal to 4·1 per cent. of the greatest possible amount.

There were 4 days on which no sunshine was recorded.

May.—Generally speaking, this was a month of very dry weather, the rainfall being generally much below the usual amount. There were, however, exceptions to this rule in the southern portions of England, due almost entirely to one or two extremely heavy rainstorms, which from a gardener's point of view did more harm than good. One of these, which occurred in London on the 6th, caused a fall of over three inches of rain over a small but well-defined area; whilst on two other days there were heavy falls over most of Surrey and Kent, varying from an inch to an inch and a half on both occasions, and together accounting at Wisley for more than two-thirds of the total rainfall of the month. The amount of sunshine was abundant and as a rule a good deal in excess of the average, and at Wisley there were but three entirely sunless days, including the two of heavy rain just referred to. The mean temperature for the month was above the average in the south, but the dominant north-easterly wind brought with it some "cold snaps" in the northern parts of the kingdom, and snow fell even over a portion of the Midlands. Night frosts, too, occurred three or four times at Wisley, sharp enough to injure tender vegetation, especially in those parts of the Garden which are sheltered from the wind. The frost which did most damage occurred during the early hours of the last day of the month, when Gunneras, potatoes, beans, bracken, and other plants were very badly cut.

The results obtained from the observations made at the Garden are shown in the following table:

Mean temperature of the air in shade	. . . . .	53·9°	
Highest	” ” ”	77°	on the 26th
Lowest	” ” ”	33°	on the 11th
” ” on the grass	. . . . .	22°	” 11th
Number of nights of ground frost	. . . . .		5

		At depth of		
		1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	. . .	53·9°	52·7°	49·9°
Highest	” ” ” . . .	58·4°	56°	52·6°
Lowest	” ” ” . . .	49·5°	49·5°	46·5°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100) 75 per cent.

Rain fell on 9 days, to the total depth of 2·95 in. (equivalent to about 13½ gallons of water to the square yard). Heaviest fall on any day 1·17 in., on the 13th.

The prevailing winds were north-easterly.

The average velocity of the wind was 4 miles an hour.

There were 221 hours of bright sunshine, equal to 46 per cent. of the greatest possible amount.

There were 3 days on which no sunshine was recorded.

June.—The weather throughout this month was upon the whole nearly normal; it was generally dry, nearly all the rain which fell at Wisley falling in the last week of the month; the amount of bright sunshine was somewhat less than usual over the whole of the southern half of the kingdom, but largely in excess of the normal over the northern half; and all over the kingdom the mean temperature differed but slightly from the average. But whilst the mean temperature was normal there was a very large daily range, and the warm days were several times followed by cold nights, and occasionally frosts were registered upon the ground. These conditions were of course very unfavourable for gardens, and a good deal of damage was done to vegetation in different parts of the kingdom. At Wisley the vegetable crops were considerably injured by a sharp frost at the commencement of the month, and even trees and shrubs, and the shoots of young oaks, were damaged and “cut,” and in some parts of Ireland much damage was done to the potato crop.

The results obtained from the observations made at the Garden are shown in the following table:

Mean temperature of the air in shade	.	.	.	.	58.6°		
Highest	“	“	“	.	85°	on the	8th
Lowest	“	“	“	.	35°	“	1st
“	“	“	“	on the grass	25.4°	“	1st
Number of nights of ground frost	.	.	.	.	.	.	4
						At depth of	
					1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	.	.	.	.	60.1°	58.6°	55.2°
Highest	“	“	“	.	63.6°	60.6°	56.9°
Lowest	“	“	“	.	54.7°	54.7°	52.6°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100) 69 per cent.

Rain fell on 9 days, to the total depth of 1.24 in. (equivalent to about 5½ gallons of water to the square yard). Heaviest fall on any day 0.63 in., on the 30th.

The prevailing winds were north-easterly.

The average velocity of the wind was 4 miles an hour.

There were 215 hours of bright sunshine, equal to 44 per cent. of the greatest possible amount.

There was only 1 entirely sunless day.

July.—This was a month of changeable, unsettled weather, cool for the time of year, and unusually windy. These unseasonable features were due to the passage of many cyclonic disturbances across the kingdom, of no great intensity, but bringing with them heavy falls of rain and sometimes thunderstorms. Generally speaking, there was a marked deficiency of bright sunshine, and therefore no very hot days; but neither were there any very low night temperatures, with the result that although the mean temperature for the month was below the average the difference was not large. But the weather was by no means ideal from a gardener’s point of view; the heavy splashes of rain played havoc with flower-beds, beating down and spoiling many, whilst the continued wetness of the ground resulted in the development of much disease amongst potato crops. The warmest days came

quite at the beginning of the month, but after the first week no day with a real midsummer temperature was experienced, and many days that were rainless were nevertheless dull and sunless, and very cool.

The results obtained from the observations made at the Garden are shown in the following table :

Mean temperature of the air in shade	60.4°		
Highest " " "	81°	on the	4th
Lowest " " "	46°	"	13th
" " on the grass	37°	"	13th
		At depth of	
		1 ft.	2 ft.
Mean temperature of the soil at 9 A.M.	62.0°	61.1°	58.3°
Highest " " "	66.5°	63.5°	58.9°
Lowest " " "	58°	59.6°	57.2°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100) 76 per cent.

Rain fell on 14 days, to the total depth of 3.51 in. (equivalent to about 16½ gallons of water to the square yard). Heaviest fall on any day 0.77 in., on the 22nd.

The prevailing winds were south-westerly and westerly.

The average velocity of the wind was 6½ miles an hour.

There were 193 hours of bright sunshine, equal to 39 per cent. of the greatest possible amount.

There were 4 days on which no sunshine was recorded.

August.—The weather throughout this month was in marked contrast to that of July. Although in some districts there were many thunderstorms, they were not spread over a very wide area, and at Wisley only one was experienced ; whilst nearly everywhere the aggregate rainfall for the month was less than usual, and the mean temperature above the average. These conditions were just what were required for gardens, and throughout the month plant and tree growth made excellent progress, as did also flowering plants and vegetables. The warmest period of the month was the second week, when the thermometer rose to 76° at Wisley, and although this was by no means an abnormally high temperature for August, yet, on the other hand, the minima were also high and there were no cold nights, with the result that the range of temperature was small, and the average higher than usual. The month was not exactly a brilliant one, because, although more or less bright sunshine was recorded at Wisley every day, the amounts were sometimes small, and the total for the month was below the average. The conditions at Wisley were fairly typical of those experienced over the greater part of the kingdom, and the month may be justly summed up as warm, dry, and rather dull.

The results obtained from the observations made at the Garden are shown in the following table :

Mean temperature of the air in shade	61.4°		
Highest " " "	76°	on the	10th
Lowest " " "	42°	"	30th
" " on the grass	31°	"	30th
		At depth of	
		1 ft.	2 ft.
Mean temperature of the soil at 9 A.M.	63.2°	62.5°	59.6°
Highest " " "	65.6°	64.1°	60.5°
Lowest " " "	60°	60.9°	58.7°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100) 81 per cent.

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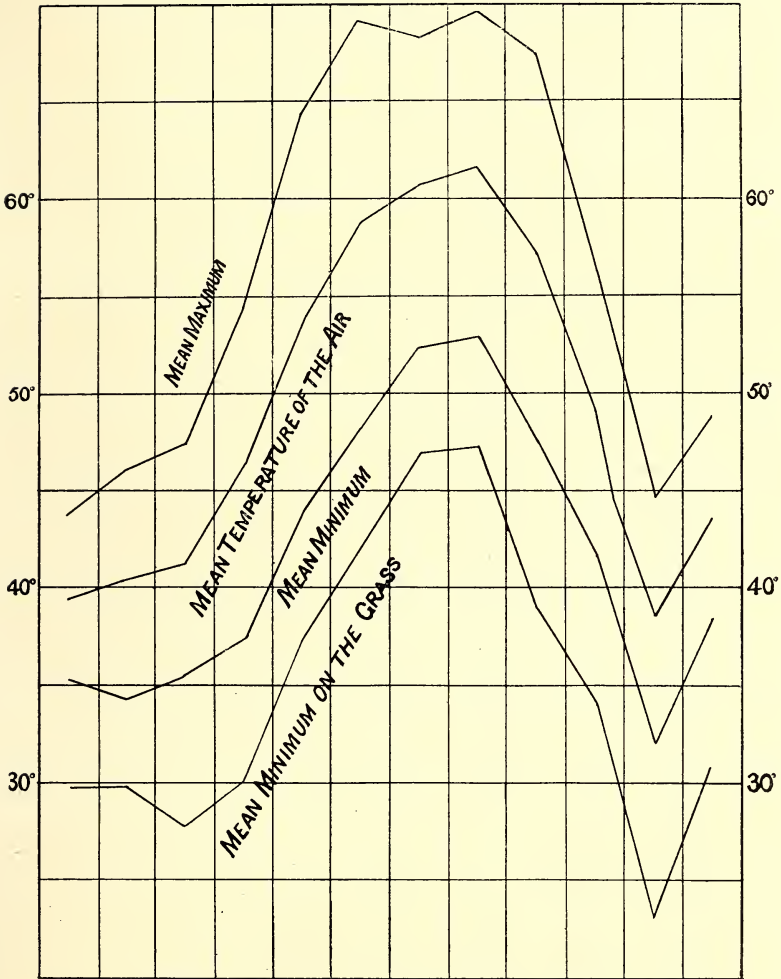


FIG. 27.—DIAGRAM SHOWING MEAN MAXIMUM, MEAN, AND MEAN MINIMUM TEMPERATURES OF THE AIR, AND THE MEAN MINIMUM TEMPERATURE ON THE GRASS AT WISLEY FOR EACH MONTH OF 1915.

(To face p. 128.)

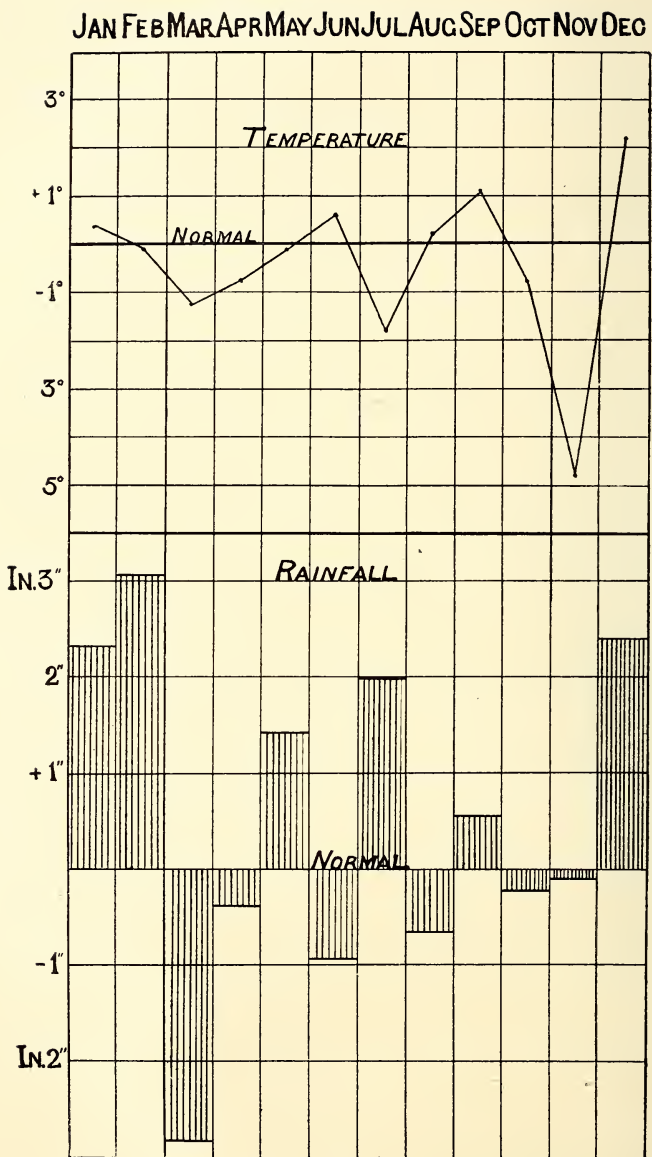


FIG. 28.—DIAGRAM SHOWING DEVIATIONS OF TEMPERATURE AND RAINFALL FROM THE NORMAL DURING 1915.

[To face p. 129.]

Rain fell on 12 days, to the total depth of 1.62 in. (equivalent to about 7½ gallons of water to the square yard). Heaviest fall on any day 0.52 in., on the 2nd.

The prevailing winds were south-westerly.

The average velocity of the wind was 3½ miles an hour.

There were 160 hours of bright sunshine, equal to 36 per cent. of the greatest possible amount.

There were no days on which sunshine was not recorded.

September.—The weather right through this month was bright and mild all over the kingdom, the temperature being somewhat above the mean, and the amount of bright sunshine considerably more than the average; in addition the weather was dry in most districts, the exceptions being due to very heavy falls of rain in certain parts, accompanying the passage across the kingdom of areas of disturbed weather. The chief of these, so far as the south of England was concerned, made itself felt near the close of the month, and was responsible for considerably more than half the total amount of rain measured at Wisley; but in other parts of the kingdom there were some phenomenally large falls on other days of the month. It was a little peculiar that both the early and late days of the month were abnormally cold, and quite a sharp frost occurred on the ground at Wisley on the last day, whilst marrows and beans were badly damaged by one less severe on the night of the 4th. On the whole, however, it was a month of genial weather, very welcome to gardeners, and especially helpful with the next-year buds on fruit trees.

The results obtained from the observations made at the Garden are shown in the following table:

Mean temperature of the air in shade	57.2°			
Highest " " "	78°	on the	17th	
Lowest " " "	34°	"	30th	
" " on the grass	23°	"	30th	
Number of nights of ground frost			5	
		At depth of		
		1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	58.5°	59.2°	58.1°	
Highest " " "	62°	61°	60°	
Lowest " " "	53°	58°	58°	

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100) 77 per cent.

Rain fell on 7 days, to the total depth of 2.31 in. (equivalent to about 10¾ gallons of water to the square yard). Heaviest fall on any day 1.37 in., on the 28th.

The prevailing winds were south-westerly.

The average velocity of the wind was 4 miles an hour.

There were 188 hours of bright sunshine, equal to 50 per cent. of the greatest possible amount:

There were no entirely sunless days.

October.—The observations made at Wisley since the Climatological Observatory was organized in 1904 show October to be usually the wettest month of the year. This year, however, it was, right up to the last day of the month, unusually dry, and it was only owing to an exceptionally heavy downpour of rain on the 31st that the fall was not one of the smallest of the year, instead of the largest. The temperature was normal, but becoming rather cool at the close of the month, with a slight frost (the first of the season) on the 30th. Sunshine was

intermittent, and less in amount than the average; there were but few days when none was recorded, and fewer still when the daily amount approached to half the possible total, the net result for the entire month being only one-fifth of that number of hours. On the whole the month from a gardener's point of view was an average October, in which ordinary routine work could be carried steadily on without interruption from unfavourable weather.

The results obtained from the observations made at the Garden are shown in the following table:

Mean temperature of the air in shade	. . . . .	49°		
Highest	“ “ “	65°	on the	12th
Lowest	“ “ “	30°	“	30th
“ “ on the grass	. . . . .	23°	“	1st
Number of nights of ground frost	. . . . .	.	.	11
			At depth of	
			1 ft.	2 ft.
Mean temperature of the soil at 9 A.M.	. . . . .	51.4°	53.2°	54.3°
Highest	“ “ “	54°	55°	57°
Lowest	“ “ “	47°	49°	52°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100) 92 per cent.

Rain fell on 12 days, to the total depth of 2.86 in. (equivalent to about 13½ gallons of water to the square yard). Heaviest fall on any day 1.04 in., on the 31st.

The prevailing winds were from between south-east and north-east.

The average velocity of the wind was 3 miles an hour.

There were 69 hours of bright sunshine, equal to 21 per cent. of the greatest possible amount.

There were 6 days on which no sunshine was recorded.

November.—As a rule this is one of the most stormy months of the year; in the present instance it was unusually quiet and calm, but at the same time exceptionally cold. At Wisley there was frost upon the ground, more or less severe, on twenty nights, the lowest temperature recorded being 8 degrees, twenty-four degrees of frost, on the night of the 27th–28th; the temperature in the screen, four feet above the ground, falling to 17 degrees on the same occasion. Taking the country generally, it was one of the coldest Novembers on record, and in some districts the thermometer failed to rise to the freezing-point for several days in succession. The rainfall at Wisley was very close to the average amount, but it fell infrequently, and the relatively large total was due to the falls being heavy. Upon the whole it was a bright month, and the sunshine recorded was in excess of the average. From a gardener's point of view the weather was seasonable, and the cold had the effect of bringing all growth to a standstill.

The results obtained from the observations made at the Garden are shown in the following table:

Mean temperature of the air in shade	. . . . .	38.4°		
Highest	“ “ “	56°	on the	12th
Lowest	“ “ “	17°	“	28th
“ “ on the grass	. . . . .	8°	“	27th
Number of nights of ground frost	. . . . .	.	.	20
			At depth of	
			1 ft.	2 ft.
Mean temperature of the soil at 9 A.M.	41.9°	45°	48.1°
Highest	“ “ “	48°	49°	51°
Lowest	“ “ “	37°	41°	45°

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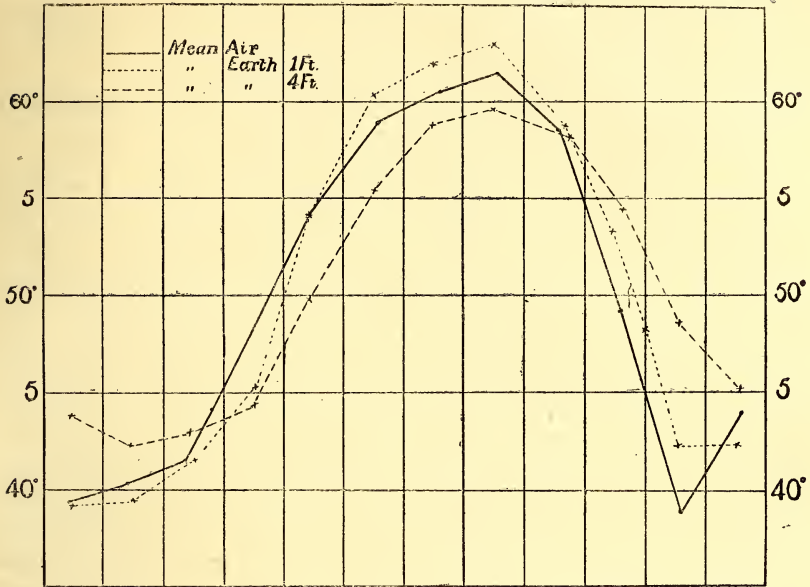


FIG. 29.—DIAGRAM SHOWING MEAN TEMPERATURE OF AIR, AND OF EARTH AT 1 FOOT AND AT 4 FEET BELOW THE SURFACE AT WISLEY, FOR EACH MONTH IN 1915.

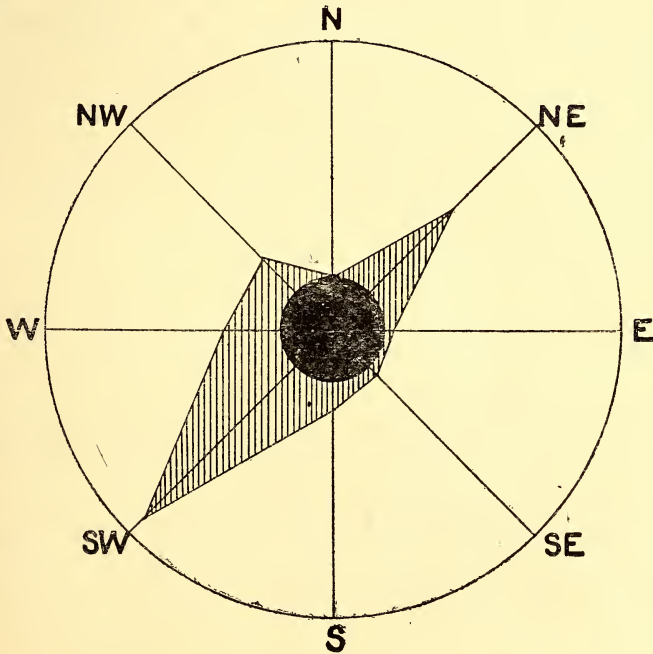


FIG. 30.—DIAGRAM SHOWING THE RELATIVE PREVALENCE OF WINDS DURING 1915, THE BLACK CIRCLE REPRESENTING CALMS.

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100) 92 per cent.

Rain fell on 8 days, to the total depth of 2·12 in. (equivalent to about 10 gallons of water to the square yard). Heaviest fall on any day 0·65 in., on the 11th.

The prevailing winds were north-easterly and south-westerly.

The average velocity of the wind was 4 miles an hour.

There were 65 hours of bright sunshine, equal to 25 per cent. of the greatest possible amount.

There were 10 days on which no sunshine was recorded.

December.—In the closing month of the year the type of weather became entirely different from that of its immediate predecessor, the change having begun to develop at the close of November. Right through the month, with very brief intermission, a series of atmospheric disturbances continued to pass across the country, bringing with them wet and stormy weather to all parts of the kingdom, some of the gales being very violent and destructive, and accompanied by excessive falls of rain. In one of these storms it was stated that in one part of South Wales over one thousand trees were uprooted by the wind, and that in other districts much damage of a miscellaneous kind was done to buildings. With these gales there was an excessive rainfall, rain falling nearly every day, and in some districts to between three and four times the normal amount. At the Garden the total was double the normal, but in parts of East Surrey it was fully fifty per cent. larger than at Wisley. The temperature was higher than is usual, at any rate in most parts of the kingdom; frosts were rare and did not last long when they occurred; but nevertheless very little gardening work could be done, owing to the persistent wetness. Bright sunshine was, as might have been expected, very intermittent and scanty, and at Wisley there was but one really bright day.

The results obtained from the observations made at the Garden are shown in the following table :

Mean temperature of the air in shade	.	.	.	.	43·5°		
Highest "	"	"	"	.	56°	on the	10th
Lowest "	"	"	"	.	28°	"	13th
"	"	on the	grass	.	12°	"	13th
Number of nights of ground frost	.	.	.	.	.	.	14
						At depth of	
					1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	.	.	.	.	42°	43·2°	44·8°
Highest "	"	"	"	.	45°	45°	46°
Lowest "	"	"	"	.	38°	42°	44°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100) 92 per cent.

Rain fell on 24 days, to the total depth of 5·07 in. (equivalent to about 23½ gallons of water to the square yard). Heaviest fall on any day 0·59 in., on the 9th.

The prevailing winds were south-westerly.

The average velocity of the wind was 8 miles an hour.

There were 33 hours of bright sunshine, equal to 14 per cent. of the greatest possible amount.

There were 13 days on which no sunshine was recorded.

MEDICINAL HERBS: THEIR CULTIVATION AND PREPARATION IN GREAT BRITAIN.

By E. M. HOLMES, F.L.S., F.R.H.S.,
Curator of the Pharmaceutical Society's Museum.

[Read April 11, 1916; HENRY CUST, Esq., in the Chair.]

SINCE the commencement of the war, considerable interest has been aroused concerning the necessity for cultivating some of the more important medicinal plants on a larger scale than heretofore, for two of the facts that stand out clearly as a result of the war are that there is a shortage of supply, and that we have been hitherto largely dependent on Austria and Germany for medicinal plants and herbs, many of which have been imported at a lower price than they can be grown or collected in Great Britain—so much so, indeed, as to have seriously affected the home industry.

It will perhaps be useful to direct attention to some facts concerning the present position of the cultivation of medicinal plants in this country. It must be distinctly understood that it is only a minor industry, as compared with that of food products, but it is, nevertheless, one of national importance, seeing that it concerns the health of the nation, and the enormous requirements of our sick and wounded sailors and soldiers, as well as of our ordinary hospitals and dispensaries. Why there should be any necessity to import from Austria and Germany plants that grow well in this country is not at first sight obvious. The real reason for their importation is clearly a financial one, viz. the well-known law of commerce to buy in the cheapest market and sell in the dearest. This tendency, together with the neglect of scientific organization and the absence of a protective tariff, has led to the purchase by this country of cheaper material from abroad. As in many other cases, the public has remained in ignorance of the way in which free trade has injured the home industry.

The demand for cheap physic, fostered by the co-operative stores, has reduced the price of drugs to a point at which no pharmacist can make a living unless he sells other articles, properly belonging to other trades; and this unfair competition has naturally led to the importation of cheap medicinal plants and herbs to meet the demand. These imported medicinal plants are naturally, in nine cases out of ten, of inferior quality, and sometimes mixed with dangerous herbs. I may mention a case in point. Some years ago I was asked to examine and report upon a sample of Belladonna root which had been supplied under contract to one of the large London hospitals,

and I found that it contained quite a large proportion of Poke root (*Phytolacca decandra*), which possesses violently emetic and purgative properties. Tracing the root to its source, I learned that it came from Trieste, but as the root is an American drug, why it should have come from Austria remained a puzzle until, some years subsequently, when the Hungarian Exhibition took place in London, a Hungarian Professor of Materia Medica informed me that the plant had been grown in Bosnia for many years past for the sale of the berries, which were employed to colour wines, but that a more satisfactory berry, imported from Chile, known as Macqui (*Aristolelia Macqui*, Fam. Tiliaceae), has superseded it, and as the leaves of the Bosnian plant resembled those of Belladonna in shape and size, and the root resembled that of Belladonna in colour, the roots were got rid of by mixing them with Belladonna root, and the dried leaves with those of Belladonna leaves. Instances could be multiplied showing the danger of allowing cheap European drugs to compete with those obtainable in this country. In the United States there is a Government Inspector of Drugs, but the medical profession in this country has no such protection against the importation of inferior and adulterated medicinal plants.

No country, as a rule, exports its best products, but keeps them for home consumption, unless the price offered is a sufficient inducement to do otherwise. Even India does not send to England the best quality of Indian hemp, but the product of the previous year, which is less active than that of the current year. Germany and Austria follow the usual rule, and send abroad their surplus produce at the cheapest possible rate.

The purity and good quality of medicinal plants are of the greatest importance from a medical point of view, and any inequality in the strength of important and highly active medicines is sure, in the long run, to discourage the use by medical practitioners of those particular medicines. It is to avoid variation in the strength of preparations made from medicinal plants that the Pharmacopœia is issued by the General Medical Council; but unfortunately the compilers of the Pharmacopœia do not, as a rule, inform themselves of the commercial difficulties connected with the medicinal plants industry. Thus a few years ago some careful scientific experimentalists found that different commercial samples of the active principles of Aconite varied so considerably in strength that one sample was seventy times stronger than another, or in other words that the dose of a medicine made from one would be equal to seventy doses made from the other. This was due to the use of roots of wild Aconite imported from Germany. As there are about twenty-four wild varieties of *Aconitum Napellus*, and all are not known to be equally active, and the roots are gathered indiscriminately so long as the plants have a blue flower, it is obvious that roots obtained from a definite cultivated variety are better than those of wild plants. But the use of the cheaper German root, which is almost always of a mixed character, has led, in the case of this very

powerful and most valuable medicine, to its cultivation in this country having practically ceased, and to the medicinal preparations of the plant falling almost into disuse, through unreliability of therapeutical action, due to their variation in strength, from being derived from different species of Aconite in Germany. As the genuine Aconite root no longer pays to cultivate in this country, being undersold by German and Japanese roots, it has become unobtainable, and the Pharmacopœia has consequently been compelled not to restrict, in the present edition, the medicinal root to plants cultivated in Britain, as it did in the previous edition of 1898. A protective tariff would have prevented this undignified and undesirable position.

I am informed that a good many owners of large country houses, who have large gardens and skilled gardeners, are anxious to take up medicinal plant cultivation from a patriotic point of view, but in most cases have no particular knowledge of herb-growing except for the herb-gardens which are grown for amusement in so many large establishments, and are desirous to learn something about the industry, and by what means Great Britain can be made independent of the importation of medicinal plants and herbs from Germany and Austria. And as it is quite possible for owners of country houses and large landowners to help in this matter, I will first indicate how this might be done, using two important medicinal plants for the purpose of illustration, viz. Belladonna and Foxglove.

Belladonna is a most valuable plant in the treatment of eye diseases, and also taken internally for some forms of pulmonary disease, and as a local application to ease pain ; it is also used as a source of the alkaloid Atropine. It is one of the medicinal plants of which the exportation is forbidden. It is a somewhat local plant, being almost confined to calcareous soils, but nevertheless occurs in twenty-eight British counties, finding its southern limit from Dorset to Kent, and its northern one in the counties of Fife and Argyll, although comparatively rare north of Yorkshire and Westmorland. It is a perennial plant, growing most luxuriantly under the shade of trees on wooded hills, on chalk, limestone, and oolite, but becoming dwarfed when growing in old quarries, or spots exposed to the sun, and consequently, although cultivated in the open, it there rarely attains a large size, and is more subject to insect attacks under cultivation than when grown under natural conditions. An enormous increase in the yield could be obtained if the head gardeners on estates where it grows wild were instructed to distribute, in April, all seedling plants to other positions in the same woods, since the seedlings are often too crowded where they do occur. If the gamekeepers were instructed to see that the plants were not stolen, and the plants were cut at the proper time, and sold to the agents of the wholesale drug trade, there would, in my opinion, be no need to import Belladonna at all, whether herb or root, and it is quite possible that there would be a sufficient supply even for export to those of our Colonies where the climate and local conditions prevent its successful cultivation. Its limits are latitude

50°-55° N., an altitude of 300-600 feet (although it may descend to sea-level where the soil is calcareous, as in Lancashire, especially where the drainage is good and the necessary amount of shade is found). The range of temperature is 50°-47° F. Young seedling plants, unless protected by dead leaves during the winter, often perish. It is therefore a plant that cannot be successfully grown in every small garden.

With respect to *Digitalis* (Foxglove), there is an enormous quantity growing wild in damp hilly woods in this country. I have seen on the banks of the Dart, in Devonshire, a whole hillside purple with the flowers, where the coppice wood had been cut. But unfortunately large landowners object, as a rule (or perhaps it is only the gamekeepers) to people collecting the leaves until after June 15, or indeed at any period of the year, for fear of disturbing the game. It is a biennial plant, and seems to exhaust the soil, for it will often disappear entirely from places where in previous years it had been abundant, although this may be due partly to the attacks of a small pug moth (*Eupithecia pulchellata*), the larvæ of which feed on the flowers. It seems to require a fair amount of moisture and plenty of humus, but also good drainage, and is rarely found on calcareous soils, preferring siliceous and slaty or sandy ground. But I will venture to say that if large landowners, whose soil is siliceous, will give instructions to their head gardeners to plant out the young plants, or scatter the seed in autumn, in fresh localities to which access is possible without disturbing the game, there would be no necessity to import *Digitalis* from the Continent. It is, perhaps, the most important remedy for strengthening the action of the heart, but is very liable to lose its strength if not properly dried and preserved. I have, however, been able to dry the leaves so that they retained their colour and their activity for eleven years. Foxglove leaves, properly prepared, might become a national export. Indeed, one firm does export to the United States large quantities, which are physiologically tested after drying and before being exported.

There is another way in which landowners and large farmers who are patriotic enough to wish to help the industry might render a considerable service. A very large quantity of herbs are used in this country in the manufacturing districts in the Midland counties, where a decoction of herbs, sometimes fermented with sugar, is drunk under the name of Herb Beer or Botanic Beer, especially by those working in the great heat of iron manufactories and potteries, and it is necessary that the herbs used should be cheap. Hence they are largely imported from the Continent. This is so much the case that last year English Melilot and Woodruff were not procurable, and this year even the largest wholesale herbalists could not supply even a few pounds of Agrimony, which is quite a common English herb, and is one of the herbs used in making the beer. This scarcity is due to the fact that the thorough organization of the herb industry that prevails in Germany does not exist in this country. The way in

which landowners could help, together with the local authorities, would be by inducing the farmers to let their labourers' children learn, from the local teacher of botany, to recognize all the herbs that grow in their neighbourhood, and to induce the local authorities to arrange for the economic use of the waste heat of refuse furnaces, lime-kilns, and brick-kilns to heat drying-rooms that might be built near by. Means for doing this could be easily devised, without danger from the carbonic acid or carbonic oxide formed by the fires, on the principle adopted in the old Roman villas.

So far as I can learn, German children are taught to recognize and collect all medicinal herbs that grow near their homes, and these are dried in small quantities in sheds or attics, and probably finished off in farmhouse bread ovens after the removal of the bread. A collector or middleman calls round and buys up the small parcels, and forms them into bales to be forwarded to the wholesale herbalist; and with three profits to be taken, *i.e.* by the gatherers, middlemen, and wholesale herbalists, the herbs can still be sent to this country cheaper than a working man can collect them here. Yet I saw last year on one waste hilly field near Sevenoaks enough Centaury, Purging Flax, St. John's Wort, and other herbs to yield several hundredweight, and in another field close by enough Wild Carrot to supply a wholesale herbalist for a twelvemonth. There was even an oasthouse for drying hops close by, which is only used in September, and could be available during other months. It seems absurd to import Coltsfoot by the ton, when every clayey railway bank, or heavy waste ground, is covered with the plant. The means of drying these, if provided by local authorities or wealthy landowners at small cost, would help the industry to overcome competition. If children of farm labourers were taught to collect them, it would encourage industrious habits in them, give them a healthy occupation on holidays, keep them out of mischief, and add a little to the scanty wages of their parents.

Another way in which the medicinal herb industry could be very considerably improved could be adopted in the herb gardens of large country houses. Many ladies take a great interest in the history and uses of medicinal plants, but have probably paid no attention to improving the strains by cultivation. This is a subject well worthy of attention, and could easily be studied by the aid of an intelligent gardener. Thus, *Aconitum Napellus* exists in twenty-four or more wild varieties, yet it is not known how far these vary in the strength of the active principle, nor which are the strongest growers. Careful observation would also show the best and quickest methods of reproduction. Thus, young Aconite plants can be produced at the lower joints of the stem by earthing them up, and in other conditions young plants can be developed on the roots. The seeds of Aconite, like many other Ranunculaceous seeds, will not, as a rule, germinate unless planted as soon as ripe.

Belladonna herb and root are sold by analysis, the value depending upon the percentage of alkaloid present; and although some experiments

have been made in the United States we have as yet no conclusive evidence as to the conditions of soil and temperature, &c., under which the highest percentage of active principle can be developed.

Similarly, the conditions under which the annual form of the biennial Henbane is developed, and the possibilities of obtaining the more valuable biennial form from the annual one, yet remain to be shown. There is no doubt, however, that the character of the seed has a good deal to do with it. The first-formed seeds are naturally the strongest, and as the fruits do not all mature at the same time, but the seed is usually collected at one time, there is sure to be a large proportion of seed too weak to produce strong plants, or too immature to germinate when sown.

It is obvious, therefore, that there is plenty of room for much interesting work to be done in connexion with improvements in the cultivation of medicinal plants. I might add one more illustration. The double-flowered Chamomile, which is the variety chiefly used in medicine, is apt to revert to the single-flowered form, and the conditions under which this occurs, and the remedy for it, are also worthy of investigation.

There is another and less fortunate class of the community who, although intensely patriotic, are anxious to help themselves, or those dependent upon them, at the same time that they help their country. I allude to educated women with small incomes, many of whom have joined the Women's Herb-growing Association, formed since the war commenced. Unfortunately they have, I fear, been misled by extravagant statements in newspapers, both in this country and in the United States, as to the large possible profits arising from the cultivation of medicinal plants and the collection of wild herbs. I endeavoured a year ago to make known the only conditions under which herb-growing can be made to pay by publishing an article on the subject in the "Pharmaceutical Journal" (for January 2, 1915), but as that number is out of print I have had it reprinted, together with two others, giving lists of the herbs which at the present time are wanted by the cwt. and ton. I pointed out that it would not be possible for the wholesale trade to deal with small quantities, as they would not get uniformity of quality, and it would necessitate additions to their staff to deal with them, and that cultivation and collection of medicinal plants and herbs can only be profitably carried out on co-operative lines.

It may be useful, perhaps, to take this opportunity of briefly recalling some of the statements there made, which can be read at leisure in the reprint alluded to, and to add a few facts concerning the present conditions of the industry.

First, with regard to two of the principal medicinal plants, viz.: Henbane and Belladonna. It may be taken for granted that the plants yielding the largest profit under cultivation are just those which are the most difficult to cultivate, and it is those very difficulties which enhance their value. To take Henbane for an example. The

wild plant occurs in two forms, and has been found wild in sixty British counties, or rather twice the number of counties that Belladonna occurs in, and yet it always exceeds the latter in price, because it nowhere occurs profusely, and is found under circumstances that appear at first sight to be quite contradictory, growing in some places on sandy spots near the sea, in others on chalky slopes, and in cultivation flourishes in a good loam. When sown, the seed sometimes comes up quickly and flowers the first year, when only a few inches high, especially in a dry spring and summer. In other cases it produces only large leaves, in the autumn, often more than a foot long, and the second year sends up a large branched flowering stem, but sometimes the whole of the foliage is destroyed by the larvæ of a leaf-mining fly, *Pegomyia hyoscyami*, and the crop rendered worthless in a week. But sometimes the seed will not germinate the first year, or even the second, and when the field has been ploughed, and some other crop sown, up it comes. A curious case occurred some years ago at Weymouth, showing that the seed in certain circumstances may retain its vitality for a very long period. A house on the Parade, which had been built 100 years, was pulled down, and next year there appeared on the cleared building-ground numbers of Henbane plants, although this plant does not occur in the neighbourhood within many miles of the spot. Even if Henbane seed comes up strongly the first year, when the large autumnal leaves decay away the large terminal bud is often destroyed by one of the many macro-lepidopterous caterpillars that, like the Agrotids, hide themselves in the soil; or floods may rot the plants in winter if grown on level ground.

It would probably pay well to cultivate Henbane in sandy ground near the sea, especially on rich estuarine soil, or in sandy ground in such places as the Golf Links at Westward Ho or Dawlish Warren, where the seaweed could be used as manure and there is sufficient moisture at a depth of two feet for the roots to reach it. It obviously is therefore not a plant for profitable cultivation in small gardens, especially as the yield of dried leaf is extremely small.

CULTIVATION.

The actual cultivation of medicinal plants can only be carried out properly on a fairly large scale under present conditions. To the ordinary grower the first year's outlay brings in practically no return, so that sufficient capital is required to meet the outgoing expenses in labour, manure, and rental for that year, and for the second also if the crop fails from any cause. There is also the initial expense to be considered of apparatus for drying herbs, and the difficulty of getting labour, when wanted, unless it is employed all the year round.

So far as I have been able to judge, the cultivation of the most important medicinal plants in this country only pays well when there is sufficient capital to run a pharmaceutical manufactory close to it so as to utilize the fresh plants in years when the crops are more than

equal to the demand, by making them into extract or other preparations that will keep.

If medicinal plants are grown on an ordinary farm where labour and animal manure are always available, the difficulties in the case of Belladonna and Henbane are, that unless the farmer has suitable drying apparatus he must sell the fresh plant, and if he is far from a large town the expense of cartage and rail considerably reduce his profits, and he is at the mercy of the buyer, who knows that the green herb must be sold within about a fortnight, or the plants will have passed their best condition. But if he has a good drying-house the farmer is able to keep the dried plants over the winter, and is thus able to secure some profit.

As the wild plants are collected from estates by men who sell them without knowing their market value, and are therefore at the mercy of the buyer, they are sometimes bought up by growers who can dry them. The farmer who has no drying-house finds it better to grow potatoes than medicinal plants. It will therefore be readily understood that the growers who have manufactories, and the growers who have drying-houses but no manufactories, are few in number, and when an unusual demand arises the prices both of the wild and the cultivated plants increase, and it is then that the Continental supplies are employed to lower the price of the home production.

COLLECTION OF MEDICINAL PLANTS AND HERBS.

As a general rule, the direction given in the Pharmacopœia for the collection of leaves is at the period when the flowers are beginning to open, because it is supposed that the active principles of the plant are then most abundant in the leaves, before migrating to the flowers, the active principle serving apparently as a protection against insects, and thus moving on from root to stem, leaf, flower, and seed, as each organ is successively developed.

Roots are most active when the new root is fully formed, before the plant is developed, as in Aconite ; or in the case of some perennials like Dandelion, in the spring, before the flowers are developed. To some extent the collection of roots is ruled by other circumstances, such as the convenience of the farmer, as they are more easily and conveniently collected when the land is ploughed, or when the crops which permit it, such as turnips, are weeded. It is then comparatively easy for the weeders to put on one side in definite heaps such wild herbs as Fumitory, Parsley Piert, and Cudweed, which are common in cultivated fields. In collecting tall herbs, it is necessary to cut their stems off above where the lower leaves have turned yellow or brown, so that when dried they may present a bright, not faded, green colour. The collection should take place so far as possible on dry or sunny days. Easterly winds are particularly favourable for this purpose, as the dry air causes rapid withering, and facilitates the process of drying. Herbs should never be collected in wet weather.

DRYING.

There are many methods of drying. Ordinary herbs with fairly rigid stems, like Peppermint and Wormwood and Yarrow, are best tied loosely up into bundles, and hung on strings or wire, until the leaves are withered, but should be kept under cover in case of a shower. Artificial heat may then be used to dry the stems, and thus finish the operation. The bundles should be made as far as possible nearly equal in length, and uniform in size, for convenience of packing. In the case of flaccid herbs these should be thinly spread on a flat, dry surface, in a place freely exposed to a current of air and sunshine. This may be done in the open air in summer weather, provided an arrangement is made by the use of Willesden scrim or tarpaulin, supported on a roller, so that it can quickly be drawn over the herbs to protect them in case of a sudden shower. This is especially necessary in the case of Chamomile flowers, which soon turn brown if wetted. Smooth leaves like those of Belladonna, or sticky leaves like those of Henbane, require to be dried in a single layer at first, as they shrivel and become discoloured if treated in masses. The secret of all good drying is to deprive the leaves or other plant organs of moisture as rapidly as possible, and to see that the lamina or thin part of the leaf is fairly dry before using artificial heat to dry the stems. It must be understood that the majority of plants lose at least 72 per cent. of moisture in drying, and some leaves, such as Belladonna, lose 85 to 90 per cent., so that it usually requires 4 lb. of fresh herb to yield 1 lb. of dried, and in other cases 6 or 8 lb. to yield one. It must also be borne in mind that, after herbs, &c., are thoroughly dried, on exposure to the air they will absorb from the atmosphere about 12 per cent. of moisture and become flexible, but leaves that are allowed to do this, although less brittle and therefore more convenient for handling, are apt to deteriorate in physiological action. In some cases, such as *Digitalis* and Ergot, this consideration is of the utmost importance. I have found, however, by experience, that, if kept chemically dry by means of lime, they retain their activity unimpaired for at least ten years, and probably much longer. I have placed on the table some specimens to illustrate these facts. This process has not as yet been generally adopted, but firms who use it have acquired an excellent reputation for the quality of their goods, especially of Foxglove. It is in this direction, *i.e.* carefully dried and preserved herbs, that there is an opening for extending the market to other countries, since much of the cheap Continental supply is inferior in quality and often largely adulterated.

MARKETING.

It must be distinctly understood that wholesale buyers are not willing to take small parcels from a number of sellers, but

prefer to purchase by the cwt. or ton, and buy by sample, requiring the bulk to be up to sample, so far as regards appearance and quality.

In the case of herbs in the green state, these should be gathered late in the afternoon, so as to be sent off by night train and arrive at their destination next morning, or they would be apt to heat and ferment and lose colour. They are usually packed loosely in $\frac{1}{2}$ cwt. bundles, and when possible in quantities of a ton or more, so as to fill a railway truck. Under present conditions, owing to the delay in railway traffic, they should be sent labelled through to their ultimate destination, and marked "Plants for Medicinal Use, Urgent." Supplies of fresh medicinal plants are usually contracted for in April and delivered in June and July. Dandelion root, however, is usually delivered in autumn.

It must be borne in mind that the trade in medicinal plants is a very curious one. Some herbs are required in quantities of many tons, and some only in a few cwts. But there are herbs used in proprietary preparations, which perhaps only one firm uses, but, although that one might require a dozen cwts. only, or a dozen tons, it would not buy them through the ordinary trade channels, but from special growers, or in the way best calculated to keep its secret. It must also be remembered that every country has medicinal plants that cannot be so profitably grown elsewhere. Thus *Anemone Hepatica*, which grows on limestone hilly districts, is wanted at $4\frac{1}{2}d.$ a lb. for the dried leaves (which means 4 lb. of fresh leaves for that price). This can be done where the plant grows wild like a weed, but not otherwise. Similarly *Hydrastis canadensis*, which grows wild in Canada, and American Ginseng root (*Panax quinquefolium*), both of which fetch a high price, do not succeed well in this country, and even in the United States the cultivation is so difficult that the price is accordingly very high. We must be content to recognize that there are certain medicinal plants that cannot profitably be cultivated in England, and that these must be left to our Colonies to cultivate where the climate and conditions suit them.

If I may venture to offer a few suggestions to the members of the Herb-growing Association, they would be as follows :

There must be a Central Depôt where all parcels of dried herbs can be received, graduated as to quality, and put up in uniform parcels of 7, 14, 28, or 56 lb. I believe such an arrangement is now being made.

There must be in connexion with the Depôt a Bureau in touch both with producers and buyers, where it would be possible to take orders and execute them, and arrange prices and date of delivery. There needs to be published each month a Calendar of herbs procurable during the month, indicating the parts of the plants required, and containing directions how to grow or propagate such herbs as might be grown in small gardens. An Exchange column would also be useful for those who wish to exchange or purchase plants and seeds. The

expense of such a publication should be met as far as possible by advertisements of sellers.

An expert competent to determine if the herbs sent in are rightly named and sufficiently dried, and in a saleable condition, is necessary.

Lastly, I would suggest that there is a large demand for culinary herbs, such as sage, mint, angelica, basil, thyme, and other sweet herbs in a dried state.

The only two possible ways, it appears to me, in which herb cultivation in small gardens could be made to pay would be, first, by increasing the quantity of any one culinary herb that suits the soil, drying it, and forwarding it to the Central Warehouse, where it could be used to form the large bales for wholesale trade. There is a far larger demand for dried and powdered culinary herbs for winter use than the public is aware of.

Secondly, by cultivation for seed. Thus, in a chalky garden, a few plants of Belladonna might be grown in a shady corner for the seed, and where Henbane will succeed it would be well worth while to save the seed from the largest plants. Similarly the seed of the Dalmatian insect-powder plant (*Pyrethrum cinerariaefolium*) should be saved for sale, also white poppy seed and some others, and where Chamomile produces double flowers it should be propagated for the sale of cuttings.

QUESTIONS PUT TO THE LECTURER, AND HIS ANSWERS.

1. If not in possession of a kiln or other special apparatus of the nature mentioned in the lecture, what should be used ?

Ans. Any drying-place will do, provided it has a current of hot air, such as an ordinary stove with hot air issuing from the top. The important point is rapidity, for the quicker the process of drying the better the colour of the product. A temperature from 80°-90° Fahr. up to 140° is sufficient for roots.

2. When, where, and how can seeds of Belladonna and Henbane be got ?

Ans. It is impossible to get seeds now, though April is a good month to sow them when they are obtainable. Seeds must be collected in the summer and autumn from the wild plants.

3. Should dried herbs be kept in air-tight vessels ?

Ans. Yes, or in paper in a dry room if the colour is to be preserved. If exposed to the ordinary atmosphere after drying they turn brown, and the absorption of moisture is as much as 12½ per cent.

On this occasion the Society was honoured by the presence of Mr. Henry Cust, Chairman of the Central Committee for National Patriotic Organizations, at whose instance the lecture had been prepared. In moving a vote of thanks to Mr. Cust, Lieut.-Col. Sir ALBERT ROLLIT said:

The authorship, the reading by the Rev. Mr. Wilks, the Chairmanship, had all been excellent. The Chairman had quoted some old party emblems, Protection and Free Trade, but he had very wisely appealed to Patriotism as the best security that in the future the country will never again be left dependent on other nations, and possible enemies, for certain essentials of our great trades, such as dyes for our staple textile industries, and optical glass in the electrical and other trades, which are called key-industries, and as drugs and herbs in medicine. Voltaire wrote, "You put drugs, of which you know little, into a body of which you know less, to cure a disease of which you know nothing at all." The neglect of the highest and most practical scientific and commercial education, and the lack of curative products, must no longer be tolerated. Indeed, even in the past, something had been done to grow herbs, medicinal and hygienic, but chiefly for domestic use; and in the Surrey home in which he himself lived Charles James Fox, the statesman, had planted an old herb garden, which still flourished, and was referred to in Miss Bradley's book on the subject. There was nothing more interesting than the cultivation of Economic Plants, and those who, like his late friend Sir Clements Markham, had taught India how to produce quinine in plenty, had been the greatest benefactors. And to help to secure such scientific philanthropists was one object of the Society in having aided in securing the foundation of a Degree in the Science of Horticulture, by the University of London. Sir Albert eulogized the patriotic action of the Chairman, and, adding his name, put the vote of thanks, which was carried enthusiastically by the crowded audience.

IN PRAISE OF SINGLE ROSES.

By GEORGE BUNYARD, V.M.H.

AFTER critically examining a prize box of Roses, giving full credit to the grower and every point to the setting up and arrangement, I never feel fully satisfied.

I have been trying to analyse the sentiment, and have come to the conclusion that it is because the flowers are not quite perfect. "Not perfect," the exhibitor retorts. "Why, they have gained the First Prize!" "Just so, but a perfect flower should have anthers and pistil. Where are they?" "Ah, I see you are more of a botanist than a gardener." "Perhaps so, but your fat flowers fail to hold me like a single Rose; and I must call these God-made, while yours are man-made. The singles, to my mind, leave nothing further to be desired."

My plea is that in single Roses there is perfection in form and outline: elegant, twisted, recurved, and cupped blossoms, pure colours and dainty blends; while the jaunty way they nestle on their foliage suggests a butterfly resting. The central golden boss of anthers completes the picture, leaving a sense of satisfaction to the vision.

The public are gradually learning to appreciate single Roses as well as those with two rows of petals, like that exquisite yellow Tea 'Lady Hillingdon.' I propose to give a list of the best singles I know, with instructions for making borders of these neglected species and varieties, which I feel certain will please the planter and gain admiration from every visitor. Many come into flower by mid-May, and are thus doubly welcome; while even after flowering many have elegant foliage and fruits, with fragrance in their leaves.

Single Roses need no special preparation of the borders, the object being to keep them healthy without any stimulants, and so true in size of flower and growth to their natural conditions.

The border should be trenched two feet deep and be allowed to settle before the Roses are planted.

Early in April the plants should be carefully cut over to induce a shrubby growth: and in after-years those shoots which have flowered should be removed, where there is enough new growth to furnish for next year's bloom. This and such needful cutting as is required to keep the bushes in shape are all that will be required with an annual forking over of the borders.

I cannot name any very dwarf Roses as singles for the front rows, but 'Laurette Messimy' or 'Mme. Eugene Resal' are only semi-double, and, planted at one foot apart, would be appropriate, or the old London Pride or White Pinks look well, while at the back of the

border the Madonna and Tiger Lilies, with Montbretias in the half-distance, would give some colour when the Roses have finished blooming. Among the single Roses shown in 1915, 'Queen Mary,' a glowing crimson, seems very promising, but I have not seen it. 'Clytemnestra,' one of Mr. Pemberton's seedlings, seems a good single buff, growing three to four feet as a bush.

I now sketch two borders of thirty-nine feet long, six feet wide. These can be placed back to back, number 1 against 14 and so on, with a six-foot gravel or grass path between, in order that in time (as the rampant Penzance Briers grow freely) the shoots can be trained overhead to form an arch or pergola; or the border may be continued for the full seventy-eight feet.

ARRANGEMENT OF BORDER A.

Back row 1, 3, 5, 7, 9, 11, 13.

Central row 2, 4, 6, 8, 10, 12.

Back Row.

1. Amy Robsart, P.B.,* deep rose.
3. Lady Penzance, P.B., creamy yellow with coppery shading.
5. Anne of Geierstein, P.B., rich dark crimson.
7. Dawn, softest blush, with golden anthers, shading to white; lovely.
9. Brenda, P.B., peach pink.
11. Lord Penzance, P.B., fawn with golden centre.
13. Flora McIvor, P.B., white with faint blush.

Central Row.

2. Altaica, pure primrose, most elegant.
4. Irish Elegance, apricot with pink edging.
6. Simplicity, H.T., pure white, large flowers striking.
8. Irish Fire Flame, very brilliant.
10. Mrs. Rosalie Wrinch, buds rosy red, fading to rich pink, petals waved; new.
12. Copper Austrian Brier, quite alone in its intense coppery-red colour.

ARRANGEMENT OF BORDER B.

Back row 14, 16, 18, 20, 22, 24, 26.

Central row 15, 17, 19, 21, 23, 25, 27.

Back Row.

14. Rose Bradwardine, P.B., clear bright cherry rose; very free.
16. Macrantha, a gem, palest blush shading to white; lovely.
18. Lucy Bertram, P.B., deep cerise rose.
20. Mrs. W. T. Massey, may be called a single Gloire de Dijon; fine.
22. Moschata nivea, pure white, of exquisite form.

* P.B. means Penzance Brier.

24. Pomifera, lovely pale pink, almost transparent; foliage glaucous green.
 26. Lucy Ashton, P.B., white centre, edged with pink.

Central Row.

15. Berberidifolia var. Hardii, a lovely species; flowers clear yellow, with black spot on each petal.
 17. Sheila Wilson, carmine scarlet; very beautiful.
 19. Rugosa, rich amaranth; glossy green foliage, with large heps.
 21. Irish Glory, T., cherry carmine in clusters; very taking.
 23. Yellow Austrian Brier, pure in colour and elegant in shape; lovely.
 25. Silver Moon, a new very large single white; a good climber.
 27. Moyseii, quite a novelty; flowers deep brick-red—striking.

* * * * *

To render this list more complete I give the names of the most distinct and beautiful of the Single Climbing Roses, adding a few that carry two rows of petals. This class has come to the front during the past few years, and they are eminently suited for pergolas or pillar subjects. The Penzance Briers are all fine, as named above.

American Pillar, deep pink, semi-double, grand foliage; very vigorous.
 Coronation, semi-double, crimson to scarlet, flecked with white; very large flowers.

Coquina, creamy rose, shaded primrose.

Dawn, softest blush, shaded yellow, with golden anthers; extra fine, - vigorous.

Delight, cherry-rose, in large clusters; very free-flowering, late.

Ethel, semi-double, pale pink, free.

Fairy, white, yellow anthers, perpetual.

Flame, semi-double, pink and salmon, free.

Francis, a single Crimson Rambler, flowering in large clusters.

Hiawatha, rich bright crimson, in large trusses; one of the finest.

Jersey Beauty. This old single lemon-shaded variety is yet one of the best, with shining Wichuraiana foliage.

Leuchtstern, white edged pink, very floriferous; best as a pillar.

May Queen, semi-double, cherry-pink, white centre; pretty.

Morgenroth, cherry-crimson, white centre, flowers early; best as a pillar.

Moonlight, white, flushed lemon; perpetual.

Paradise, bright pink, with twisted starry petals, distinct; flowers early.

Paul's Carmine Pillar, fiery carmine, very vigorous, striking colour; - early.

Pink Pearl, exquisite shell-pink; of the shape of a Maltese cross.

Silver Moon, silvery white, flowers large and elegant, large trusses.

Starlight, white, edged rosy violet.

Una, palest primrose, semi-double; fine.

White Wichuraiana (species), flowers late; very suitable for banks or on long stems.

SCIENCE DEGREES IN HORTICULTURE.

As announced in the Annual Report (see pp. iii, ix), the University of London has instituted Degrees in the Science of Horticulture. The regulations are as follows: inquiries with regard to the Degrees should be addressed to the Academic Registrar, London University, London, S.W.

REGULATIONS FOR INTERNAL STUDENTS.

The University confers the Degrees of Bachelor of Science (B.Sc. and Master of Science (M.Sc.) in Horticulture. The course for the Bachelor's Degree extends over three years, and consists of training in practical as well as scientific Horticulture. The course must be taken at one or more of the Schools of the University or under recognized teachers at the institution or institutions in connexion with which they are recognized.

Students who have passed the Internal Intermediate Examination in Science in all the subjects required for the Intermediate Examination in Horticulture may be admitted to the Final Examination in Horticulture under the same conditions as are applicable to students who have passed the Intermediate Examination in Horticulture.

Students must have passed the Preliminary Examination for the National Diploma in Horticulture,* or an equivalent examination approved by the University, before being admitted to the final course of study for the Degree in Horticulture.

Candidates for the Degree of B.Sc. (Horticulture) must either (a) have passed the Matriculation Examination or (b) have fulfilled such other tests of fitness in lieu of matriculation as may be prescribed from time to time by the Senate.

The Senate is empowered under Statute 126 to grant in special cases modification of, or exemption from, prescribed courses of study.

Students taking a complete course in the University or granted special exemption under Statute 126 must pass the various examinations required by the regulations as set out below.

* The Royal Horticultural Society are prepared to admit Matriculated Students of the University who have signed a declaration that they intend to proceed to a Degree in Horticulture in this University to the Preliminary Examination for the National Diploma in Horticulture, without insisting on the following requirements set forth in the Regulations for the Diploma, viz. that they shall—

“(a) have reached the age of 21 years, and

(b) have

- (1) served at least four years in a public or private garden or nursery; or
- (2) taken a four years' course in an approved Horticultural Institution, and have received a satisfactory report as regards conduct and work from the authorities of such institution; or
- (3) partly as in (1) and partly as in (2).”

(Regulations for the Degree of M.Sc. in Horticulture will be considered later.)

Candidates for the Degree of D.Sc. must fulfil the conditions required by the regulations for that Degree as set out on pp. 316-318 of the University Calendar.

The complete course of study and examinations is as follows :—

INTERMEDIATE COURSE.

The subjects of the Intermediate Course are as follows :—

- (1) Chemistry.
- (2) Botany.
- (3) Zoology.
- (4) One of the following subjects :—
 Physics.
 Geology.

[From this point the regulations are identical with those for Agriculture from the beginning of the second paragraph on p. 298 of the Red Book, 1915-16, to the end of the third complete paragraph on p. 307, except that in the Regulations in Horticulture the syllabuses in pure and applied mathematics are omitted.]

General Intermediate Examination.

The General Intermediate Examination in Science (Horticulture) will take place once in each academic year, commencing on the first Monday in July.

The subjects are as follows :—

- (1) Chemistry. (Two papers of three hours each and a practical examination.)
- (2) Botany. (Two papers of three hours each and a practical examination.)
- (3) Zoology. (Two papers of three hours each and a practical examination.)
- (4) One of the following subjects :—
 Physics. (Two papers of three hours each and a practical examination.)
 Geology. (Two papers of three hours each and a practical examination.)

Questions will be set involving (1) the translation of passages in French *or* in German, and (2) answers with regard to the subject-matter thereof.

The Examiners shall be at liberty to test any candidate by means of viva-voce questions.

The examination will be a Pass Examination only, and the list of successful candidates will present the names in alphabetical order without division into classes.

Candidates shall not be approved unless they have shown a competent knowledge in each of the four subjects selected ; but a

candidate who passes in three subjects out of the four may be allowed to offer the fourth subject alone at the next following examination. [See General Regulations for Intermediate Examinations, pp. 15-18.]

Any student who has passed the Intermediate Examination in Science, in Agriculture, or in Engineering, will be excused (at the Intermediate Examination in Horticulture) the examination in the subjects he has taken which are the same for both examinations. He will be required, however, to complete the subjects necessary for the Intermediate Examination in Horticulture, and to have attended approved instruction-courses in each of the subjects, either in preparation for the Intermediate Examination in Science or in Agriculture or in Engineering, or for the Intermediate Examination in Horticulture, or to have substituted a higher course of equivalent length for each course which he has omitted.

Students who have passed the Intermediate Examination in Engineering will be exempted from the examination in either Electricity and Magnetism or in Heat, Sound, and Optics, or in both (should they have already passed in both), at the Intermediate Examination in Horticulture, provided they have attended the full instruction-courses in these subjects in preparation either for the Intermediate Examination in Engineering or for the Intermediate Examination in Horticulture, or have taken equivalent courses in these subjects at a higher stage.

The time-table of the examinations will be furnished by the Academic Registrar to each school and to each internal student not attached to a school, showing both the time and place of the Written and Practical Examinations.

Every student entering for this examination must apply to the Academic Registrar for a form of entry and a certificate of course of study, not earlier than April 15, which must be returned duly filled up and attested in accordance with the General Regulations as to Approved Courses of Study (pp. 6-14), together with the proper fee, not later than May 24.

The fee for each student is £5 for each entry to the whole examination and £2 10s. for re-examination in one subject.

All cheques should be made payable to the University of London or bearer, and crossed "London County and Westminster Bank, Ltd., 1 Brompton Square, S.W."

A provisional list of successful candidates, in alphabetical order, will be published by the Academic Registrar at 2 o'clock on Wednesday in the second week following that in which the examination closes.

Certificates of having passed the examination will not be issued except to qualified students applying for such certificates.

FINAL COURSE.

The Approved Instruction-courses for the Final Examination may be taken in two years or more, but no candidate will be admitted to the Final Examination unless he has been a student in a school of

the University or under recognized teachers for at least three years, and has satisfied in other respects the General Regulations as to Approved Courses of Study (pp. 6-14).

Students will be required to have attended approved instruction-courses in each of the three following obligatory subjects :—

Botany.

Chemistry.

Entomology.

These subjects will be treated in relation to the Science of Horticulture. Candidates will be required to obtain a knowledge of the practical as well as the scientific side of Horticulture.

Students will further be required to have attended courses in Meteorological Instruments and their use, Practical Surveying and Mensuration, and in Garden Management (including the uses and care of garden implements) and Garden Economics.

Although the study of French and German is not included in the Final Course of Study, questions will be set at the Final Examination involving (1) the translation of passages in French and in German and (2) answers with regard to the subject-matter thereof.*

The Syllabuses are as follows :—

Botany.

First Year.

Course A.—Special morphology relating to the methods of training and pruning of fruit and other trees and to methods of propagating plants. Descriptive morphology of plants and fruits in general cultivation. Seeds and seed-adulteration. General anatomy and histology of flowering plants and ferns.

Course B.—The physiology of plants, with special reference to germination, assimilation, including the effects of atmospheric impurities on plant growth, nutrition, respiration, fermentation, together with the special physiology of horticultural operations, such as propagation, pruning, forcing and retarding; the scientific basis for rotations; the relations of plants to heat, light, and moisture, and their horticultural applications.

Course C.—Systematic botany, with special reference to the angiosperms, gymnosperms, and pteridophyta in general cultivation.

Second Year.

Course D.—The pathology of plants, including diseases due to fungi and bacteria.

Course E.—The ecology of garden and greenhouse plants, including plants of the rock garden, bog, water and woodland gardens. The geographical distribution of plants in general cultivation.

* Candidates are recommended to read some books or papers in French and in German on the subjects of the examination.

Course F.—Genetics. The improvement of plants by hybridization. The essential facts of Mendelism, and their application to the breeding of plants. The origin and history of certain selected groups of garden plants.

There will be a practical and viva-voce examination at which candidates will be expected to show an acquaintance with specimens of materials, &c., dealt with in the syllabus.

Candidates will be required to bring to the Practical Examinations their note-books, for inspection by the Examiners, certified by their teachers as being the actual working notes made by them in the laboratory. These note-books must be taken away by the candidates at the close of the examination.

Chemistry.

The student will be required to show a knowledge of the chemistry of the more important substances and processes involved in plant life, including common typical results of enzyme action and the chemistry of fermentation. He must also be familiar with the main lines of inquiry and the chief results obtained at Rothamsted and Woburn, and also with the principal recent work on soil and plant-chemistry of foreign stations. Proximate and ultimate constituents of plants, their distribution in the plant, current views as to their functions; methods of investigation. Composition of the ordinary market garden and fruit crops, variation with soil, season and manuring. Changes during storage.

Soils.—Origin, composition, chemical and physical properties of soils. Relation of soil to temperature and water content, effect of tillage operations, methods of improving soils, draining, irrigating, liming, chalking, marling, &c. The soil as a medium for plant life. Bacterial changes in soil, nitrification, denitrification, humification, fixation of nitrogen and partial sterilization, &c. Methods for mechanical and chemical analysis of soil, interpretation of results. Movements of salts in soils, drainage water, alkali soils. Soil types.

Manures.—Organic and inorganic manures; leaf-mould. The special needs of particular plants.

Insecticides and Fungicides.—Composition and properties of the chief insecticides, fungicides, weed-killers and sprays. Their mode of action. Methods of analysis of materials used; adulteration.

There will be a practical and viva-voce examination at which the candidate must submit note-books, duly signed by his teacher, containing a record of experiments carried out by him. These note-books must be taken away by the candidates at the close of the examination.

Entomology.

The cockroach, external anatomy and terms used.

The cockroach, internal anatomy, the living mechanism.

Life-history, cockroach or locust, dragon-fly, thrips, butterfly or moth.

Wings, structure and function.

Mouth-parts, structure and function.

Classification, its meaning, the terms used, &c. ; the chief orders of insects.

Life-history, egg, larva, nymph, pupa, imago. Hibernation, æstivation, esuriation, dependence on food and climate.

Food, food-habit classification.

Reproduction, parthenogenesis.

Social insects.

Colour, form, mimicry.

The Orders, short account of each. Orthoptera, Thysanoptera, Rhynchota, Lepidoptera, Coleoptera, Diptera, Hymenoptera.

Pests, their origin, checks, the Wave-Law.

Pests, types—locust, grasshopper, termite, bug, scale-insect, gipsy-moth, surface-caterpillar, potato-moth, codling-moth, cockchafer, wire-worm, flea-beetle, boll-weevil, bark-beetle, crane-fly, Hessian fly, fruit-fly, saw-fly.

Preventive measures.

Remedies, insecticides, spraying, fumigation.

Legislation, internal and on imports.

Field work and exercises in spraying, &c.

There will be a practical and viva-voce examination. Candidates will also be required to show note-books recording their work.

B.Sc. Examination (Horticulture).

The subjects of the Final Examination are as follows :—

Botany. (Three papers, a practical and a viva-voce examination.)

Chemistry. (Two papers, a practical and a viva-voce examination.)

Entomology. (One paper, a practical and a viva-voce examination.)

Candidates will be further required to produce evidence of having attended instruction-courses on Meteorological Instruments and their use, Surveying and Mensuration, Garden Management (including the Uses and Care of Garden Implements) and Garden Economics.

Questions will be set involving (1) the translation of passages in French and in German, and (2) answers with regard to the subject-matter thereof.

Candidates shall not be approved by the Examiners unless they have shown a competent knowledge in each of the three subjects.

The Examiners in the practical and viva-voce examinations shall be at liberty to ask supplementary questions on those subjects

mentioned above in which the candidate has attended instruction-courses, but in which no written examination is held.

The B.Sc. (Horticulture) Examination will take place once in each year, beginning on the fourth Monday in October.

No student will be admitted to this examination unless he has passed the Intermediate Examination in Horticulture, and has completed the prescribed course of study.

Every student entering for this examination must apply to the Academic Registrar for a form of entry and a certificate of course of study, not earlier than June 1, which must be returned, duly filled up and attested in accordance with the General Regulations as to Approved Courses of Study (pp. 6-14), together with the proper fee, not later than September 25.

The fee for each student is £5 for each entry to the examination.

All cheques should be made payable to the University of London or bearer, and crossed "London County and Westminster Bank, Ltd., 1 Brompton Square, S.W."

A provisional list of successful candidates, in alphabetical order, will be published by the Academic Registrar at 2 o'clock on Friday in the second week following that in which the examination closes.

A diploma for the Degree of B.Sc. (Horticulture), under the seal of the University and signed by the Chancellor, will be delivered to each candidate who has passed, after the report of the Examiners shall have been approved by the Senate.

NATIONAL DIPLOMA IN HORTICULTURE.

THE second Final Examination of Professional Gardeners for the National Diploma in Horticulture took place in June 1916. Owing to the war the number of candidates was small, seven only offering themselves, viz. four in Section I. (General Horticulture), of whom two passed; one in Section II. (Hardy Fruit-growing for market), who passed; one each in Section V. (Landscape Gardening) and Section VII. (Horticultural Inspection), who both failed to satisfy the Examiners; and one in Section VIII. (Horticultural Instruction) who passed.

The third Preliminary Examination was also held in June, fifteen candidates presenting themselves, of whom nine passed.

LISTS OF SUCCESSFUL CANDIDATES.

FINAL EXAMINATION.

Section I.

Ekins, E. Helen, Studley College, Warwickshire.

Turner, Archibald D., Madryn Castle Farm School, Pwllheli, N. Wales.

Section II.

Coombes, John, Research Station, Long Ashton, Bristol.

Section VIII.

Turner, Archibald D., Madryn Castle Farm School, Pwllheli, N. Wales.

F. J. CHITTENDEN, F.L.S.	} Examiners.
W. HALES, A.L.S.	
H. HOOPER.	
A. G. L. ROGERS.	
T. STEVENSON.	
EDWARD WHITE.	

PRELIMINARY EXAMINATION.

Division A.

Elsden, Harry Claude, Maesbrook, 27 Emscote Road, Warwick.

Harrison, Alfred T., Eynsham Hall Gardens, Witney, Oxon.

Ramsbottom, J. K., 61 Ennerdale Road, Richmond.

Division B.

Heron, May, 5 Wellington Road, Handsworth Wood, Birmingham.
King, Grace D., Gayton Rectory, Blisworth, R.S.O.

Division C.

Copley, George H., 37 Sowden Street, Great Horton, Bradford.
Lucas, Evelyn, The Elms, Pulborough, Sussex.
Plumley, Dorothy G., Belgrave Road, Clifton, Bristol.
Willan, George, The Nurseries, Lymm, Cheshire.

F. J. CHITTENDEN, F.L.S. }
W. HALES, A.L.S. } *Examiners.*
T. STEVENSON. }

EXAMINATION OF SCHOOL TEACHERS IN COTTAGE AND ALLOTMENT GARDENING.

APRIL 21, 1915.

Two hundred and eighteen candidates entered for the Examination of School Teachers in Cottage and Allotment Gardening held on April 12, 1916. Of these, 33 obtained a first class, 103 a second, and 67 a third, leaving 12 failures and 3 absentees.

The Examiners, Mr. F. J. Chittenden, F.L.S., Mr. John Fraser, F.L.S., Mr. W. Crump, V.M.H., and Mr. C. R. Fielder, V.M.H., report that of the ten questions in Division A, Nos. 3, 8, and 10 were very well answered. Two hundred and three candidates took No. 3; 150 took No. 8, and the majority of the answers showed decided intelligence as to cultural details and a few obtained maximum marks for this question; 196 took No. 10, a most important question, and it was gratifying to find that it was on the whole the best answered of all, the deep and thorough cultivation of the land being quite well understood; fifteen candidates obtained maximum marks for this question.

The answers to Questions 2, 6, and 7 were on the other hand very disappointing. In answering No. 2 many candidates gave remedies without saying when they should be applied, and not a few included such things as canker and silverleaf amongst insect pests. With No. 6 it was decidedly curious that those whose duties must often include the making out of requisitions should give such weak and disappointing replies. One hundred and forty-seven answered No. 7, but almost all of them entirely overlooked the ideas of economy of labour and cost of materials, and many recommended artificial manures to be used indiscriminately and mixed all together.

The answers to the remaining questions were very fair, though in No. 5 Dahlias were included amongst *sweet scented* flowers, and in No. 9 Annuals were hopelessly mixed up with 'hardy herbaceous plants.'

In Division B in several instances only one question had been answered which does not fulfil the requirements distinctly laid down,

and consequently the names of some candidates do not appear in the lists. The answers in this section were in the main satisfactory, and No. 12 was really well done. Some candidates failed to give the earthworm his due, several had but little knowledge of artificial manures, and not one seemed alive to the difficulties in the way of a proper trial of varieties of Potatos.

Notwithstanding these defects, the examiners were on the whole very well satisfied with the results of the examination.

W. WILKS, *Secretary R.H.S.*

Class I.

1. { Parsons, Miss M., Richmond, Yorks.
Hart, Leonard W. J., Fakenham, Norfolk.
3. { Lumb, W. P., Broad Oak, Sturminster, Newton.
Harris, W. E., Kelsall, Saxmundham.
Davies, Frank, Withington School, nr. Hereford.
6. Bielby, L. S., Beeford, Driffield.
7. Oliver, J. S., Gable Cottage, Tiverton.
8. Beeston, R. W., Rosslyn, Coalpool Lane, Walsall.
9. Goode, B. R., 79 Folkestone Road, Dover.
10. Jones, J. E., Llaniestyn, Pwllheli.
11. Cook, Thos. E., Keele, Newcastle, Staffs.
12. Forster, Wm., 117 Front Street, West Auckland.
13. Bridge, A. S., Highfield House, Farnworth.
14. Fuller, A. G., Thelma, London Street, Swaffham.
15. { Moores, S. H., Heyton, Cricket Field Road, Torquay.
Jennett, A. W., Southdene, Bonnyfields, Godley.
Davies, H. A., 2 Castle Road, Hadleigh.
Smith, G. H., Northleach, Gos.
19. { Stratford, A. P., 37 Belle Vue Street, York.
Kidsley, E. L., Mill End, Rickmansworth.
Lowe, F., Hill Crest, Brinsley, Notts.
21. { Bell, A. G., 5 Markham Crescent, York.
Roberts, W. W., East View, Newland, Hull.
Peppiette, C. H., 81 Moor Pool Avenue, Harborne.
24. { Burke, R. E., Todds Green, Stevenage.
Roberts, T. O., Bronawel, Llanfyllin, Mont.
Divine, W. J., 24 Cromer Road, Leyton.
Leworthy, H. N., Clee Hill, Ludlow.
29. { Allan, M. B. G., 27 Marlborough Street, Seaham Harbour.
Poplestone, C. G., Tresparrett, St. Juliott, Boscastle.
Crapper, Wm., 359 Bellhouse Road, Shiregreen.
31. { Earney, H. J., Abbots Ann, Andover.
Smith, C. H., Barsham, Beccles.

Class II.

34. { Barnett, Wm. L. D., Connaught, Highfield Road, Felixstowe.
 Hulme, A., Ryle Mount, Ryles Park, Macclesfield.
 Stanford, E. A., 4 Leech Street, Longsight, Manchester.
 Huggett, A. H. R., 122 Worple Road, Wimbledon.
38. { Higham, S., Cheadle House, Burbage.
 Morris, E. E., 9 Grafton Street, Adlington, Chorley.
 Jones, D., Bryndeilo, Nantgaredig.
 Wardman, E., Litlington, Royston.
 Anderton, Nathan, 14 Collins Road, Bamber Bridge, Preston.
 Howes, A. J., Badwell Ash, Bury St. Edmunds.
 Hamer, D. T., Llanfaircaer, Welshpool.
45. { Varley, W. T., Sway, Hants.
 Billett, A. E., Heytesbury, Grosvenor Road, Swindon.
47. { Wood, W. H., Meifod, Chilwell, Nottingham.
 Crouch, C. N., St. Margaret's, Kingsland Road, Broadwater.
 Price, S., 49 King's Road, Sedgley, near Dudley.
 Poole, A. S., 21 Montague Road, Cambridge.
 Perry, G. W., Belmont House, Hendford Hill, Yeovil.
 Birbeck, T., Mill Field House, Cottenham.
 Turner, G. K., Buckfold, Petworth.
54. { Worland, A., Clifford Grove, Ashford, Middlesex.
 Miller, J. M., 17 Fort Matilda Place, Greenock.
56. { Davies, T. Cleaton, 21 Palalwyf Avenue, Pontyclun.
 Maynard, H. C., 110 Christchurch Road, Ashford, Kent.
 Warrington, L. H., The Hollies, Winterbourne Down.
 Archer, B. A., Roundwood, Ossett, Yorkshire.
 Lawrence, D. A., 345 London Road, Reading.
 Brinn, A. J., Toppesfield, Castle Hedingham, Essex.
 Woodrow, A., 29 Marjorie Grove, Clapham Common.
 Whent, A. F., Gt. Comberton, near Pershore.
64. { Pennington, W. G., Hampstead Norris, Newbury.
 Grant, Robert, 9 Mutual Street, Wallsend-on-Tyne.
 Garaway, A., South Moreton, Wallingford.
 Jones, D. E., Moreton Corbet, Preston, Brockhurst.
 Taylor, G., Endcliffe, Sackville Street, Grimsby.
 Hainsworth, G. C., Oxspring, Penistone, Sheffield.
 Stokes, I., 1 Hill Street, Cheslyn Hay, near Walsall.
 Robb, I., Double View, Cinderford, Glos.
69. { Johnston, J., Flimby, Maryport, Cumberland.
 Grudgings, F. U., Desborough, Market Harboro'.
 Bristow, C., Fyfield, Marlborough, Wilts.
 Gill, B., 210 Nelson Road, Gillingham, Kent.
 Beal, D. E., Waresley, Sandy, Beds.
77. { Charlesworth, J. W., Cross Roads, Holmfirth.
 Newton, G., 323 Hertford Road, Waltham Cross.

- Foster, S. J., Colley Elm, Southey, Wadsley Bridge.
 Freegard, F. E., 11 London Road, Pulborough.
 Perks, H., Arcadie, Station Street, Cheslyn Hay.
 Smart, Denis, 7 Hanover Street, Bath.
79. { Jones, S. A., 62 Meyrick Street, Pembroke Dock.
 Beams, T. H., Bradpole, Bridport.
 Toyer, R. V., Cliffden, Brotton, Yorks.
 Foxcroft, H. E., Thornton Hough, Chester.
 Fletcher, B. T., Sevenhampton, Andoversford.
 Hay, C. B., Clayton, Bradford, Yorkshire.
89. { Mullett, E. G., 211 Abbey Road, Barrow-in-Furness.
 Smith, H. C., 110 Como Street, Romford.
 McQuade, J., 24 Dempster Street, Greenock.
 Foote, Frank, 34 Drayton Gardens, W.
 Perry, S. S., 38 Dirleton Gardens, Alloa.
 Smith, A., 18 Waverley Road, Southsea.
94. { Matheson, G. H., 2 Careton Place, Kilmacolm, N.B.
 Edwards, J. G., Georgeham, Braunton, S.O., N. Devon.
 Berryman, P., Corp. 469, 20th Sanitary Sect., c/o G.P.O.
 Wells, B., 43 St. John's Road, Westcliff-on-Sea.
 Bannon, J. J., 1 Sydney Villas, Frimley Road, Ash Vale.
97. { Hoad, F., The Briars, Grimthorpe Avenue, Borstal Hill.
 Stonely, S. L., Roslyn, Hildenborough.
 Robson, J. A., Rosedale, Shelfield, near Walsall.
 Robinson, H. M., 22 High Street, Brentwood.
 Dixon, J. H., Nantmel, Rhayader, Radnorshire.
105. { Wright, F. M., Alexandra Villas, The Sands, Mow Cop.
 Baxter, E. E., New Villas, Warsop Vale, Shirebrook.
 Allan, B. B. F., 27 Marlborough Street, Seaham Harbour.
 Thorpe, A., 20 Avondale Road, East Finchley.
 Davies, W. J., Bertham, Chester Road, Flint.
 Hatchett, T. H., 30 The Green, Hugglescote.
 O'Leary, F. T., Main Street, Tallow, Co. Waterford.
 Dean, W. A., Lyndene, Stockton Brook, Stoke-on-Trent.
 Sowerbutts, M., Rose Cottage, Cadishead.
110. { Hooper, L. M., Brimpsfield, Gloucester.
 Jarvis, M., 23 Ashmore Road, King's Norton.
 Matthews, P., The Terrace, Market Drayton.
 Johnson, M. A., Station House, Brocklesby.
 Smith, E., Gravenhurst, near Ampthill.
119. { Graham, J., 6 Highthorn Terrace, Moortown, Leeds.
 Bigland, N., Woodlands, The Avenue, Bare, Morecambe.
 Housden, J. B., St. Leonards, Highlands Road, Leatherhead.
 Dalby, G. V., 133 King's Road, Harrogate.
121. { Jones, M. K., Flitcham, King's Lynn.
 Pride, H. S., 3 Chatsworth Road, Luton.
 Caban, M. A., Knarr Fen, Thorney, Peterborough.
 Brophy, J., Tinnlyland, Carlow.

127. { McSweeney, W., Killorglin, Co. Kerry, Ireland.
 Bates, H., 67 Broad Street, Chesham, Bucks.
 Harvey, F. T., Bishops Cleeve, Cheltenham.
 Axon, W. T., South View, Netherton, near Morpeth.
 Knott, W. H. H., Falcon Villas, Waltham Cross.
132. { McGuinness, J., 52 Hyde Park Road, Halifax.
 Dixon, T. W., Washington Station, Co. Durham.
 Place, H., King Street, Whetstone, Leicester.
 Litchfield, E. A., Sandbeach, near Cambridge.
 Coombes, F., St. Mark's Road, Binfield, Bracknell.

Class III.

137. { Robertson, I. M., 18 Seymour Street, Lisburn, Co. Antrim.
 Lewis, J. L., 128 Margam Street, Cymmer, Port Talbot.
 Parkinson, M. G., 5 Granville Street, Kettering.
 Brandish, E., 8 Wingfield Street, Bungay, Suffolk.
 Mason, E., Hyde Terrace, Kidsgrove, Staffs.
 Maddy, J. E., Berrydene, Pontlottyn, Glam.
 Carless, C. J., 28 Wick Road, Brislington, Bristol.
 Young, R. E., Jubilee House, Marton, near Rugby.
145. { Johns, F. W., 37 Daniell Road, Truro, Cornwall.
 Jones, F. E., 267 Caerleon Road, Newport, Mon.
 Stewart, G. R., 95 Foundry Road, Parton, Whitehaven.
 Dakin, F. G., Welshampton, near Ellesmere, Salop.
 McCurdy, J., 28 Patrick Street, Greenock.
 Sheppard, R. J., 51 Feckenham Road, Headless Cross.
151. { Brown, P. L., Barkway, Royston.
 Williamson, B., Widdrington, Acklington.
 Lidbetter, T. R., 29 Parkfield Road, Willesden.
154. { Astley, M. A., Kedleston Park, near Derby.
 Matthews, A., Camerton, Bath.
 Coulson, F., Buckland, Betchworth, Surrey.
 Fletcher, L., 18 Foster Street, Kinver, near Stourbridge.
 Harris, H. V. W., 3 Verulam Place, Bournemouth.
159. { Beaumont, G., 11 Westfield Avenue, Oakes, Huddersfield.
 Cleverley, L., 28 New Park Street, Devizes.
 Helson, E., 21 Endsleigh Park Road, Peverell, Plymouth.
 Mack, J. H., 7 Ventnor Road, Southsea.
 Preston, H., 96 Woodgrange Avenue, North Finchley.
 Pellett, W. N., 19 Wellmeadow Road, Lewisham.
165. { Martin, E. A., Twycross, Atherstone.
 Batchelor, C. E., 46 Britannia Road, North Southsea.
 Jones, J., Clifton House, Brassington, near Wirksworth.
168. { Taylor, H. F., Somers Park Avenue, Malvern Link.
 Prebble, C. S., Meadow Walk, Walton-on-the-Hill.
 Middleton, W. M., 1 Westfield Crescent, Springwell, Gateshead.
 MacDonnell, M., Great Chishall, Royston.

172. { Barker, W. V., Coningrey's, Wolverhampton Road, Bloxwich.
 Ellis, J., 17 College Street, Aberdare, S. Wales.
 Bennewith, A. E., Upminster Road, Rainham.
 Davidson, C. C., Feltwell, Brandon, Norfolk.
175. { Harger, S. A., Lyndhurst, Ambrose Lane, Harpenden.
 Perry, T. L., Belmont House, Hendford Hill, Yeovil.
 Pearson, E. W., Holy Island, Beal, Northumberland.
179. { Dilworth, J., 190 Denten's Green Lane, St. Helen's.
 Barker, M., 64 St. George's Avenue, Northampton.
181. Doxsey, M., Ashley, near Tetbury, Wilts.
182. { Hudson, A. L., Hanley Villas, North Shore Road, Ramsey.
 Witty, E. H., Gaswell House, Kilmhurst, near Rotherham.
 Smith, F. J., Upper Hill, Leominster.
185. { Greenwood, G., 21 Hartley Street, Mexborough.
 Farrow, M. A., 68 Grosvenor Avenue, Wallington.
187. Mellor, J. M., 8 The Crescent, Tadcaster.
188. { Trist, W. J., Liscard, Cheshire.
 James, T. R., 173 Harold Road, Upton Park, E.
 Hughes, C. W., 109 Dudley Road, Sedgley.
191. { Gibson, P. E., 5 Victoria Street, New Sheldon.
 Bevan, R. G., Townsend, Chittlehampton.
193. { Raney, A., 13 Earlsborough Terrace, York.
 Raistrick, K., Hanham, near Bristol.
195. Evans, L. J., 43 Dartmouth Park Hill, Kentish Town.
196. { Magor, L. L., Longney, near Gloucester.
 Hargett, H., Denshaw, Oldham.
198. { Mason, Annie, Hyde Terrace, Kidsgrove, Stoke-on-Trent.
 Hull, T. H., Gainsford, Darlington.
200. { Ames, A. M., Smyllum, Lanark.
 Cree, J. P., 67 High Street, Jedburgh.
202. Longhurst, C. E., Black Notley, Braintree.
203. Howard, J., 25 Derby Road, Weaste, Salford.

R.H.S. GENERAL EXAMINATION.

MARCH 8, 1916.

SENIORS.

THE total number of candidates in the Senior Examination was eighty-eight. Of these nine were placed in the First Class, forty in the Second Class, and twenty-six in the Third, whilst eight candidates failed to satisfy the Examiners, and five were absent.

The Examiners, the Rev. Prof. G. Henslow, M.A., V.M.H., and Mr. James Hudson, V.M.H., say that it affords them much satisfaction to be able to record that, although there was a considerable falling off in the number of candidates, the average excellence of the answers in former years was well maintained. Indeed, in a few instances the replies were of unusual merit. Moreover, it was plainly evident when observation and practical experience had been the groundwork of a candidate's preparation—notably in the answers relating to "present-day economy in the Garden."

JUNIORS.

There were twenty-one entries in the Junior Examination, and nineteen candidates sat. Of these one succeeded in securing a place in the First Class, six in the Second Class, four in the Third Class, and four in the Fourth. Four candidates did not secure a sufficient number of marks to appear in the Pass List.

This Junior Examination is a direct preparation for the Senior, and as a guide and help to the young student of horticulture it is invaluable. Young gardeners to-day should try to realize that gardening is no longer in the background of the professions, as in their fathers' days. The introduction by the R.H.S., with the co-operation of the Board of Agriculture, of the National Diploma in Horticulture, which can be won only by gardeners who possess a thorough knowledge of the technique and principles of their art, has once and for ever raised their status. The greater dignity thus bestowed on the profession of gardening by the Society three years ago has been more recently emphasized by the University of London, which has this year established a Degree in Horticultural Science (B.Sc.), of which the Society's Preliminary Diploma Examination forms an integral part. It is therefore evident that the earlier young gardeners begin to study the principles of plant growth and the greater the attention they give to perfecting themselves in carrying out the practical operations involved in their craft the easier will be their attainment of those professional

honours which are now held out to them, and which will stamp them as ranking foremost in the country in the work to which they are devoting their lives.

May 1, 1916.

W. WILKS, *Secretary R.H.S.*

SENIORS.

Class I.

1. Lucas, E., Puckrup Hall, Tewkesbury.
2. Gaisford, D. F., Thatcham Fruit Farm, Newbury.
3. { Sparks, E. M., Kirk Langley Rectory, Derby.
Stein, A. H., Horticultural College, Swanley.
5. { Hatten, J., Studley College, Warwickshire.
Gresham-Barber, A. M., Fernbank, Harmondsworth.
Williams, G. W., Thatcham Fruit Farm, Newbury.
8. { Ross, N., Horticultural College, Swanley:
Wilson, J. N., Horticultural College, Swanley.

Class II.

1. { Allen, E. L. C., Horticultural College, Swanley.
de Poer Trench, K., St. James's Gardens, West Malvern.
3. { Gould, N. K., R.H.S. Gardens, Wisley.
Suhr, X. D., Studley College, Warwickshire.
Wheatley, J., Studley College, Warwickshire.
Eagle-Bott, E., Thatcham Fruit Farm, Newbury.
7. Hett, R., Thatcham Fruit Farm, Newbury.
8. { Cavalier, D. F., The Cottage, Wood Green, Salisbury.
Harral, M. H., Studley College, Warwickshire.
Leeper, F. D., Horticultural College, Swanley.
Baur, M., Horticultural College, Swanley.
12. { Bond, H. A., School of Gardening, Clapham, Worthing.
Bains, M. A., 28 Broomfield Road, Chelmsford.
Nash, O., Henwick House, Newbury.
15. { Beale, H. I., School of Gardening, Clapham, Worthing.
Goad, M. E., 302 Kew Road, Kew.
Wallis, C., R.H.S. Gardens, Wisley.
Harford, E. D., The Homestead, Meopham.
19. { Blake, M., Briarholm, Hadleigh.
Strong, G. E., Clovelly, West View Road, Keynsham.
Hake, W. L., 48 Gillingham Street, S.W.
Wynne, C., The Homestead, Meopham.
23. { Pickles, M., Bent Head Cottage, Pecket Well, Yorks.
Stowell, C. E., 77 West Side, Clapham Common.
25. { Ratcliff, E. E., Oak Cottage, Park Road, Chelmsford.
Ross, A., Greenway Court, Hollingbourne.
Burr, V., Greenway Court, Hollingbourne.
Rowan, H. A., School of Gardening, Clapham, Worthing.
Arnold, C., R.H.S. Gardens, Wisley.

30. { Robertson, I. M., 18 Seymour Street, Lisburn.
 { Wilson, C. W., 94 Nightingale Lane, Balham.
 { Hood, M. J., The Roundwood, Ipswich.
 { Gillett, E. A., The Roundwood, Ipswich.
34. { Howard, M., Horticultural College, Swanley.
 { Bayley, M., Horticultural College, Swanley.
 { Butterworth, Irene, St. James's Gardens, West Malvern.
 { Wotherspoon, A., Broomrigg, Dumfries.
37. { Jameson, E. W., Fairhaven, Thundersley.
 { Garner, T. W., Claybrook Grange, nr. Lutterworth.
 { Kendall, E., Studley College, Warwickshire.

Class III.

- I. { Browne, N., Huntsmoor Park, Iver.
 { St. John, R., The Homestead, Meopham.
3. { Cocks, H., 2 Sea View Terrace, Beacon Hill, Camborne.
 { Hobby, S. C., R.H.S. Gardens, Wisley.
5. { Thomasset, T. C., Acacia House, Mortlake.
 { Greenway, P. J., R.H.S. Gardens, Wisley.
7. { Gilbert, H. J., Swettenham Hall, nr. Congleton.
 { Pegram, M., Greenway Court, Hollingbourne.
 { Warner, D. E., School of Gardening, Clapham, Worthing.
 { Smith, M. N., Thatcham Fruit Farm, Newbury.
- II. { Bates, M. K., Bois Hall, Halstead.
 { Lewis, A., The Homestead, Meopham.
13. { Bainbrigge, M., Manor House, Northfield, Birm.
 { Hughes, E., Addiscombe House, Havelock Road, Croydon.
15. { Webb, C. M., Holeyn Hall, Wylam-on-Tyne.
 { Rigby, K. B. La M., The Gables, Burnham.
17. Tickle, J., 105 Alexandria Road West, St. Anne's-on-Sea.
18. { Griffiths, W. S., The Gardens, Eastington Hall, Upton-on-Severn.
 { Pearce, B. C., Tingleton, Dorchester.
 { Landau, M., 28 Grove End Gardens, N.W.
21. { Barry, M., Greenway Court, Hollingbourne.
 { Castell, D., Greenway Court, Hollingbourne.
 { Hill, G. R., 3 Mill Pit, Shiney Row, Fence Houses.
24. { Twyman, G. J., Huntsmoor Park, Iver.
 { Singleton, J., Banastre Holme, St. Anne's-on-Sea.
26. Marchant, M., The White House, Gayton Road Harrow.

JUNIORS.

Class I.

1. Athron, Dora L., "The Pightle," Letheringsett, Holt.

Class II.

1. { Woodhead, L. A., Baldersby Park Gardens, Thirsk.
Willoughby, Edward Victor, 1 Augusta Villas, Loughton.
3. Ainger, Herbert C., Horsley Cross, Mistley, Essex.
4. King, Fred., New England, Castle Hedingham.
5. Price, Isobel H., Felix Hall, Kelvedon, Essex.
6. Durham, Roger J. W., Farley Court, Reading.

Class III.

1. Hawkins, Jos., Chyreen, Rosemount, Romford.
2. Hammond, Cecil, E., Gestingthorpe, Castle Hedingham.
3. { Allan, Alec, Fylde Farm School, Poulton-le-Fylde.
Carey, H., Fylde Farm School, Poulton-le-Fylde.

Class IV.

1. Reynolds, J., White Oak School, Swanley.
2. { Mayfield, H., Fylde Farm School, Poulton-le-Fylde.
Smith Clarence G. R., Fylde Farm School, Poulton-le-Fylde.
4. Poynter, A., White Oak School, Swanley.

BOOK REVIEWS.

‘Studies of Trees.’ By J. J. Levison, M.F. 8vo., 253 pp. (Wiley, New York: Chapman & Hall, London.) 7s. net.

For the beginner, this will be found a useful handbook which gives in brief and plain terms the structure, uses, and identification of the commoner North American trees.

That the Weymouth or White Pine (*Pinus Strobus*) can be recognized by the branches running out at right angles to the stem, though true in certain cases, is certainly not so in all, and depends greatly on the situation in which the tree is growing, isolated specimens showing this characteristic to the greatest extent. In what respect the Austrian Pine approaches our native Scotch Pine is hard to see, unless that in each case there are two pins in a sheath. The dark shaggy foliage of the Austrian certainly does not resemble the refined blue of the Scotch.

Some excellent advice is given in the chapter on pruning trees, particularly in reference to how sickly specimens are rejuvenated by removal of dead and dying wood. There is little new in “Tree Repairs,” and we strongly dissent from the practice of boring a hole through the stem and branch that requires support. Properly made and adjusted iron bands and connecting rods are far preferable, and there is no reason why such should eat into the trunk if loosening screws and leather padding are used. Granted, that boring a hole into the living wood and so fastening the supporting rod is cheaper than when the iron band is employed, yet, whether from a physiological point of view or on the score of utility, the encircling band and jointed connecting rod have many advantages.

In the chapter on the “Care of Trees,” much information that will be useful, not only to the amateur, for whom the book is written, but also to the practical woodman, is given; while the notes on the identification of various woods are sound and will greatly aid in the recognition of several of the American and other timbers.

“The Book of Old Sundials and their Mottoes.” With eight illustrations in colour by Alfred Rawlings and thirty-six drawings of some famous sundials. By Warrington Hogg. 8vo., 103 pp. (Foulis, London. 1916.) 3s. 6d. net.

There is a tendency to severity of tone or something akin to a Sunday sermon about most books which relate to sundials and their mottos! This is no fault of the writers of these books, for it arises from their representing to us the home truths which we are confronted with, when, impelled by curiosity, we decipher the words that are

inscribed upon the grey stone pedestal that forms the centre of some garden of pleasure. We have perhaps wandered towards it upon a path strewn with rose petals, and are abruptly reminded that "Life's but a walking shadow," or we are recalled to some prosaic everyday appointment by "It is later than you think"; and if we do still linger, we may be yet more harshly awakened from dream fancies by "Thou mayest never see to-night."

It is as a compensation for these crude realities found in the long list of stern sundial mottos, that we rejoice in the gaily coloured, somewhat medieval-looking, and most attractive binding of this book, and gloomy thoughts are also dispersed by the eight coloured pictures of nosegay gardens, seemingly all with their grey stone dials emerging from flowery backgrounds of pink, dark red, or scarlet flower borders or arbours. Each garden seems gayer than the last, and the frontispiece alone, which represents an autumnal park-like scene, takes our attention back to the wise words which those who lived in past centuries used to inscribe upon stone.

Perhaps one of the most inspiring mottos that Mr. Warrington Hogg quotes is that which was used in modern times by the great artist G. F. Watts, on his dial at Limnerslease. It is "The Utmost for the Highest," and the food for reflection, the incentive to future effort that this one and some other mottos give us, together with the pleasing *tout ensemble* of this book, make it a charming gift to offer to a garden lover.

"How to Lay out Suburban Home Grounds." By Herbert J. Kellaway. 2nd edition. 8vo., 134 pp. (Wiley, New York: Chapman & Hall, London. 1915.) 8s. 6d. net.

It was the famous but self-taught landscape gardener Repton who first carried to a degree of excellence the art of giving instruction in his craft by means of illustrations. Each year modern writers add more and more books to the garden library, and, by showing in them representations of a house or garden in two stages of existence, they convey to the student what improvement can be achieved by careful study of lines, contour, and judicious planting. Plates XXXIII. and XXXIV. are instances of this, for we see a newly-built house, devoid of front garden, and then a second picture gives it with its strip of cultivated ground, its hedges now full-grown, which, by means of varying height, have a softening effect upon the building itself, as seen between their swaying branches. This book is eminently suited to those who, either for pleasure or from economical reasons, wish to lay out their own small suburban gardens, and the only regret is that where pictures and plans are so plentifully interspersed between the letterpress, they should not have been numbered by consecutive pages instead of only as individual plates and plans. Those who continually wish to refer to the pictures whilst reading the instructive contents of the chapters are apt to find the task a lengthy one. The

directions that are given as regards drawing a topographical plan (Plan II.) are clear, and, having made this and drawn the outline of the future house upon a separate paper, it is easily moved about upon the survey plan until the most suitable site is found.

The main idea of the book is that the garden should be considered even before the house is built. By doing this and counting the cost of upkeep and maintenance, the possibilities of future developments and the amount of lawn and shrubbery space to be looked after, the householder can keep all well within the limits of his income. So often a large sum is spent upon building and nothing is left over for garden use, or the design of the garden is so complicated that it needs a large staff to maintain it.

Plan IV. is admirable and very simple to read, although even the depth of the top-soil and the contours of different levels are shown. On Plan V. it is possible to see how, by building a pergola at the end of a garden, several purposes are answered, for shadow and a restful arbour are obtained, and the neighbour's back entrance is concealed thereby.

The book should be considered chiefly as a guide to the "lay-out," giving as it does suggestions for walks, drives, ornamental boundary fences, but it is not so helpful where colour arrangement in borders is required. The works of modern designers of colour schemes would not advise so free a use of white, even if it is intended thereby "to avoid the clash of inharmonious colours." The smaller the garden, the more restricted should be the use of white flowers if glare is to be avoided.

"Rose-growing for Amateurs." By H. H. Thomas. 8vo., 151 pp. (Cassell, London, 1916.) 1s.; cloth, 1s. 6d.

This little book certainly provides a good deal of information within its covers. The author is right in insisting on a thorough preparation of the beds before the roses are planted. In a well-made bed or border, roses should last for from seven to ten years with comparatively little attention, whereas if the preparation is neglected in the first instance no amount of subsequent manuring of the surface soil will give equally satisfactory results. There may be some favoured districts where roses will grow with little preparation beyond turning over the soil, but they must be quite exceptional, and anywhere in the London district careful drainage and attention to the preparation of the rose-beds are the first conditions of success in rose-growing.

The usual subjects, such as pruning, propagation, and pests and diseases, which are almost common forms in a Rose-book, are sufficiently dealt with; the chapter on pruning gives the essential details concisely and simply, and is one of the best of these. Another chapter on the author's favourite roses is also likely to be appreciated.

Some of the chapters dealing with the different sections into which garden roses are divided are perhaps rather less satisfactory. The

author may have attempted a little too much in the space he has allowed himself, with the result that we often find long paragraphs consisting merely of selected lists of varieties with their colours. These are not very interesting reading, nor are they put in a form which is likely to be very convenient for reference.

From among the hybrid perpetuals the author selects a few which provide a fair number of autumnal blooms. It is curious that he omits 'Oscar Cordel' from his select list, for of all the H.P.s this is one of the most certain autumn flowerers.

The arrangement of the chapters is open to some criticism, for those dealing with the different sections are interrupted by the interpolation of a few chapters on subjects such as a year's work in the rose garden, and other general subjects, after which chapters on the special sections are resumed as if by an afterthought.

The application of the term "Fairy Roses" to the dwarf polyanthus roses is somewhat to be deprecated, for this name is already occupied by the pretty little forms of *R. indica* known as "Miss Lawrence's roses."

Notwithstanding these slight defects, this little book contains a large amount of most useful information in a small space. It is well illustrated with numerous photographs, which are generally both clear and appropriate, and any who may invest in the purchase of a copy will obtain very good value for their shilling.

"Landscape Gardening as applied to Home Decoration." By S. T. Maynard. 2nd edition. 8vo., 396 pp. (Wiley, New York; Chapman & Hall, London, 1915.) 6s. 6d. net.

It is satisfactory to learn that on account of the increase in the "Back to the Land" movement a second edition of this useful book has been found necessary. Stress is laid upon the importance of not merely considering Home Decoration from the owner's aspect alone, but embracing with it a consideration of how distant effects can be sought for; and if small houses all joined in a co-ordinated endeavour to improve and beautify the surroundings, large tracts of country and suburbs could be improved.

Although the student has to be warned that the practical hints upon planting apply chiefly to American soil and weather conditions, there are many wise suggestions that the English reader can glean from Mr. Maynard's experience. For instance, he advises that an analysis of water should be made at two or three different times of year, so as to determine whether the supply is affected at one season more than at another. Then too his remarks about placing the most stately trees at the rear of a corner group or in the centre of isolated groups are good. The pictures help considerably to bring enlightenment before the reader, and to show how at the entrance of grounds or at the forkings of paths or roads a good group of trees is helpful in making us less conscious of any change of direction.

He is eminently practical in his advice about the use of a good side till plough, and also in urging that pumps for spraying or for the use of insecticides should be obtained from near home, so that if any part of them should need repair this can quickly be attended to. In regard to the increasing interest that women of all nations take in out-of-door matters, it is satisfactory to find that two practical books that he recommends are written by women. One is "Home Sanitation," by Mrs. Ellen M. Richards and Marion Talbot, and the other is "Women Plumbers and Doctors," by Mrs. H. M. Plunkett. The pictures that he shows of houses and roads are perhaps somewhat overshadowed by trees and climbers according to our English notions of the necessity for admitting as much sunlight as possible, but these again must be looked at critically as applying to weather conditions that differ from English ones.

"Market Gardening." By F. L. Yeard. 8vo., 102 pp. (Wiley, New York; Chapman & Hall, London, 1915.) 3s. 6d. net.

This book, so full of useful practical hints given in a marvellously condensed space, should be most serviceable at a time when we are all considering not only how we ourselves can best grow profitable vegetables, but how children can be trained to understand the importance of increasing our national food supplies. The pictures, which are beautifully clear, are most impressive, for we are shown large fields in which nothing but cucumbers is grown, another in which dandelions are cultivated, and a third given over entirely to horse-radish. It is the commoner kinds of vegetables and the methods and practices for growing and marketing these that Mr. Yeard deals with. We learn how much wheel hoes are used in school gardens, and we see by their use and that of the combined Hill and Drill Seeder and Wheel Hoe, and the picture of the Macker Smoothing Harrow, how many labour-saving implements are employed in Massachusetts, and how desirable it is that we should teach their value to our people. Little hints such as the following are not usually found in so slender a book, for we often have to search in an encyclopædia to obtain details such as "the quality of the seeds is determined as much by the conditions under which they have been stored as by the conditions under which they have been grown." He advises their being kept in tight bags in a cool, dry place. There are excellent pictures and notes upon testing seeds, and another picture demonstrating the use of the Skinner Overhead Sprinkler system of irrigation. This consists of overhead pipes that have small nozzles in the perforations and which can be turned round so that they distribute water in all directions. The details about lifting and storing celery, cabbage, and onions are interesting as showing the difficulties that the American grower is confronted with owing to cold weather. His hints are all given with a view to growing as large a quantity of food as possible in all ground whether it belongs to large or small gardens.

The following extract shows this: "A good plan for planting early and late celery is to set the two kinds in alternate rows two feet apart. The early celery is to be blanched with boards or heavy paper staked against the plants. The early celery is harvested before the late celery needs much banking, leaving the late celery in rows, four feet apart."

The book is practical and it is inspiring too, for it shows what can be done on a large scale if intelligence is brought to bear upon work and the latest inventions in the shape of implements are utilized.

"Vegetable Growing for Amateurs." By H. H. Thomas. 8vo. 151 pp. (Cassell, London, 1916.) 1s. net.

A well-written and practical little book, eminently suitable for the class of readers it is intended for.

"My Growing Garden." By J. H. McFarland. 8vo. 216 pp. (Macmillan, London and New York, 1915.) 8s. 6d. net.

The author has written a most enthusiastic and interesting book on the making and gradual development of his garden, that charms the reader from one cover to the other, and although he writes about the snow and climate in which he lives in the United States, he names many plants that can only be grown in the most favoured parts of the British Isles, but which evidently succeed well with the author, but it would be most misleading to imagine he could succeed equally well with them in this country. The book is splendidly printed and beautifully illustrated.

"Round the Year in the Garden." By H. H. Thomas. 8vo. 275 pp. (Cassell, London, 1916.) 6s. net.

Although there are almost innumerable books on horticulture, garden matters provide an inexhaustible theme. Success and failure, pleasure and disappointment, all add to the never-ending interest and fascination the garden holds for its owner; all this is well described by the author. Not only is the work defined for each month of the year in the fruit, flower, and vegetable quarters, but a mass of information on cultivation is given, as well as other useful matter. It is an excellent, well printed, and well illustrated book, worthy of a place in every garden library.

"The Ferns of South Africa." By T. R. Sim. 2nd edition. xii + 384 pp. and 186 pl. (University Press, Cambridge, 1915.) 25s. net.

The land of bulbs, of Mesembryanthemums, Pelargoniums, and Heaths, seems to those who are unfamiliar with its varied climates, and forget for the moment what vast regions "South Africa" connotes, to hold little promise of ferns. Seasons of drought and a summer sun burning all the earth to brown, and stretches of sand inhabited by curious desert plants, are the pictures often conjured up by the

mention of South Africa. Yet one ought to expect great variety of vegetation, for South Africa stretches far and its mountain ranges ensure much variation in precipitation, so that many large areas are suitable homes for the moisture-loving ferns and their allies, the horse-tails, club-mosses, and Selaginellas. No fewer than 220 species are described and figured in this second edition of Mr. Sim's careful work, more than forty more than were known in 1892 when the first edition was published, and in addition there are many varieties. Outline and detail drawings of all the species are included in the plates which form an important feature of the book. Christensen's "Index Filicum" has been followed in nomenclature, so that the work is quite up-to-date in every way.

Of the 220 species 42 are endemic in South Africa, the remainder being distributed as to 151 in other parts of Africa, 16 in Europe, 76 in Asia, 60 in Australasia and Polynesia, and 77 in America. Fourteen British species are included, and forms nearly related to *Dryopteris Filix-mas* (*D. elongata*), *Ophioglossum vulgatum* (*O. capense*), and *Ceterach officinarum* (*C. cordatum*) are also found. Some of these are, of course, of practically world-wide distribution, such as *Dryopteris Thelypteris*, *Polystichum aculeatum*, *Asplenium Trichomanes*, *Adiantum Capillus-Veneris*, *Pteris longifolia*, *Pteridium aquilinum*, and *Lycopodium clavatum*.

It is evident that a considerable number of new ferns still await introduction to our gardens, though most of them will no doubt need the protection of glass in order to bring them to perfection.

The work will prove the standard one upon the subject with which it deals, whether from the point of view of its completeness, the fulness and lucidity of its descriptions, or the clear figures which illustrate it. Where a species is now described for the first time, in addition to the English description a Latin one is given.

"Garden Farming." By Lee Cleveland Corbett. 8vo. 473 pp. (Ginn & Co., Boston, New York, Chicago, London.) 8s. 6d.

This book is well worthy of study by all those who possess an ardent desire that our waste, uncultivated land in England should be put to greater use towards increasing our national food supply. With the return of disabled soldiers from the Great War, it will become imperative for us to understand the value of the use of machinery as a labour-saving means of production, and this book, with its beautifully clear illustrations, should be of assistance in this respect. In the United States, the home garden, small as it often is, can be cultivated by horse-power, because crops are planted in long rows. A good picture is given of a disk harrow, which is used on the same day after ploughing, and loosens, lifts, and pulverizes the soil, marking thus one of the greatest advances that has been made in good cultivation. These harrows, and the Acme harrow in a lesser degree, do not compact the soil, but the McColem pulverizer and clod-crusher answers this purpose. These machines, together with the mechanical transplanter

of cabbage, shown on page 46, are of course essential in "truck-farming," which Mr. Corbett deals with chiefly. This department of olericulture (vegetable cultivation) should be clearly distinguished from market gardening, for it is described as an extensive rather more than intensive market gardening, because more or less remote and very large markets are catered for in preference to small local towns. Vegetables and fruit are grown upon a very large scale, as is shown by the extensive field in fig. 71, where celery is being transplanted. Again, fig. 74, with its long lines of double-mouldboard type of celery bankers, will give an inspiring impression to English people of the wealth that could be had from our own land or that of the Dominions if co-operative working colonies of growers were set to work under expert guidance. In speaking of those who grow for the trade, figures are mentioned which convey even to the uninitiated the gigantic size of these Garden Farms. One grower, we are told, uses 1 ton of seed on about 70 acres of land, and with this he is continually raising young cabbage plants to send to other growers who again sell them.

A large portion of the book should be read critically by the young student, because details of cultivation and of storage requirements which are no doubt applicable to the United States would not be useful in our climate. On the other hand, some of the pictures, which are so admirably clear, are instructive because they show with what care the vegetables are bunched and packed (note fig. 38, asparagus buncher, and Brussels sprouts, fig. 56), and the letterpress reminds us continually of the importance not only of cheap rates but of rapid transit facilities, combined with well-ventilated cars. Then, too, we are told how important it is to handle produce carefully, and that only perfect products yield good results when goods have, owing to climatic difficulties, to be pre-cooled before they start on their long journey in refrigerated cars.

The information must all be sifted before it can be applied to English market gardening, but we certainly can learn much from the United States if we study alone their way of impressing knowledge upon the worker by means of clear illustrations. Our English books are often defective in having few and poor pictures.

"Garden Pests." By H. Clements. 8vo. 116 pp. (Colston Co., Bristol.) 1s. net.

Written for the amateur gardener, and laudatory of the wares advertised in it.

"Standard Cyclopædia of Horticulture." By L. K. Bailey. Ed. 2. Vols. iii., iv. 8vo. 560 + 662 pp. (Macmillan, New York, 1915.) 25s. net each.

We have already noticed the first two volumes of this comprehensive work; the two just issued maintain the high standard reached by those and take us to *Ozothamnus*. Long articles on American

horticulture, American horticulturists (with portraits), inspection of horticultural merchandise; articles on various gardening operations, irrigation, the kitchen garden, and the like, are interspersed with articles on the genera in alphabetical order. It is impossible in a short review to discuss the articles in detail, and what we said in referring to the earlier volumes applies equally to these. One thing calls, perhaps, for comment. Very few horticultural varieties are mentioned unless they happen to have names of Latin form. This excludes numbers of well-known garden forms. For instance, among Daffodils, 'Empress,' 'Golden Spur,' 'Henry Irving' are the only varieties with fancy names mentioned; no form of *incomparabilis* (except 'Sir Watkin' in a footnote) finds a place, except *albus* and *aurantius*, neither of which names is used in gardens.

The little line-drawings are very useful and refreshing after the constantly-recurring half-tone plates one meets everywhere nowadays.

"The Apple." By Albert E. Wilkinson. 8vo. (Ginn & Co., Boston, U.S.A., 1915.) 8s. 6d.

This book is one of the Country Life Education Series, which are well known in America, and it sums up in a convenient way the experience of apple-growing which has been gained in that country. Owing to its continental climate and wide diversity of temperature, American cultivation differs radically from that of our cooler and moister island. The British fruit-grower can, however, nearly always turn with profit to the experiences of America. The greater adaptability in the face of new problems and the relentless scrapping of conservative ideas provides always some points of interest and often information of value. The recent introduction of American spraying methods is a case in point. It will not be necessary, therefore, to discuss the routine practices which are common to all fruit-growers, but rather to glance at certain details which are of special interest to us in this country.

A point which is new is the influence of large bodies of water upon the temperature of adjacent orchards, and evidence is brought to show that this is considerable, the Ontario orchards being a case in point. It is said that 70 oil-burners an acre will raise the night temperature during the flowering season 4 degrees, while a body of water 1 foot deep and 1 acre in extent will give off considerably more heat. The popular idea in this country is that the neighbourhood of water is to be avoided by fruit-growers as more liable to frost. It would be of interest to know upon what basis this idea is founded.

A chapter on the adaptability of certain apples to different soils is of great interest, even though the varieties named are not those much cultivated in this country. The mechanical texture of the soil seems to be of considerable importance. The information in this section is stated to be "after" H. J. Wilder. As, however, a great deal of it is a verbatim quotation of a special article by Wilder

in the "Tribune Farmer," we think these portions should have been acknowledged by inverted commas.

In the matter of self-sterility of varieties, so much discussed in this country in recent years, the writer lays stress on factors which may influence this so that "no one can make hard-and-fast lists of self-sterile and self-fertile varieties." This is a point which the advocates of "mates" would do well to investigate, the subject being evidently one which is not quite so simple as first thought.

American orchards are practically all of standard trees, and "dwarfs" have not been generally approved in that country, and we think they can hardly have been tried very widely, as the author considers that the "Doucin" stock, for instance, will so dwarf a tree that it will not attain a greater height than five to eight feet. It does not seem to be realized even in this country that our dwarf apples are so mainly because they are pruned to fruit soon, and if allowed to go ahead they will, on any of the so-called "Paradise" stocks generally used, make a tree of equal size to the same variety on the "crab" or "free" stock.

The author apparently accepts without question the so-called "pedigree" stock—a stock propagated from selected trees as against random selection of grafts.

Experience in his country has, however, failed to produce the slightest confirmatory evidence in its favour when the experiments were conducted with any real accuracy. When we can submit trees to identical conditions of cultivation we may be able to decide this interesting point, but till then the case is decidedly not proven. A chapter on pruning is of interest, though somewhat sketchy. It is apparently needed in the States, as a recent American writer on pruning illustrates a spur and emphasizes its value. "Yet many pruners systematically cut them off the trees." Pests are fully treated, the photographs of the various fungus diseases of the fruits are capitally illustrated, and we note the "fly-speck" rot, which is, we presume, the disease which has recently attracted attention in this country, is described as of fungoid origin.

All the various phases of cultivation, packing, and marketing are well dealt with, and the question of advertising is also touched upon. As a leader to English growers the following quotation may be of value should anyone contemplate magazine advertising: "Have you a hankerin' for those firm, sweet apples you used to knock off the trees with a club when the old man wasn't looking?" The appeal *ad hominem*! As is usual in such books, the printing and illustration are excellent, but at the cost, alas, of heavy paper which bars arm-chair reading.

"Studies of Soils." By A. G. McCall. 8vo. viii + 77 pp. (Chapman & Hall, London, 1915.) 2s. 6d.

This slender profusely illustrated book is intended to be an elementary manual for students of agriculture. It is a brief series of

elementary laboratory and field exercises with soils and plant-roots. Each exercise is divided into three parts: equipment, method, and discussion. The last is necessarily short, and will need to be amplified by the teacher in order to show the relation of one exercise to another and to the growth of plants. Any teacher needing a guide to a short but fairly complete series of exercises with soil will find this little book of very great value, and an earnest study of the different exercises in the book would make the young student far wiser after than when he started the study.

“Public Parks and Gardens of Birmingham.” By R. K. Dent. 8vo. 80 pp. (Birmingham City Parks Committee.) 2s. 6*d.*

This record is of much more than local interest. It recounts the story of the inception, progress, and development of the Public Park and Open Space movement in a great industrial centre, and tells how a gradually-roused sense of public duty in this direction in local governing bodies and public-spirited benefactions on the part of land-owners have ensured “lungs” in all parts of the great city of Birmingham. Twenty-five parks, thirty-six recreation grounds, and nineteen open spaces, with a total area of over 1,425 acres, are a record for any old industrial city to be proud of, and the City Council has these under its care, besides some 20,000 street trees. The illustrations show what success has been attained in spite of the black pall which dims the light, and speak well for the enlightened care bestowed upon the open spaces.

“In a College Garden.” By Viscountess Wolseley. 8vo. xvii + 255 pp. (John Murray, London, 1916.) 6s. net.

“Women and the Land.” By Viscountess Wolseley. 8vo. xiv + 230 pp. (Chatto & Windus, London, 1916.) 5s. net.

The work of women on the land is no new thing even in this country, though of late years it has become gradually less, until the Great War gave an impetus to it which will probably be felt for many years and may have very lasting and beneficial effects. Women’s connexion with the land has been mainly with dairy work, harvesting of various types, hoeing, and other “lighter branches of agriculture,” or with the home garden and the utilization and preservation of its products. Technical education, as developed mainly by the County Education Committees, has led to training in better methods of dairying (but generally, so far as women are concerned, only on the butter and cheese-making sides of it), poultry-keeping and utilization, bee-keeping, jam-making, fruit-preserving, and so on, but, as a rule, far less to actual work upon the land itself. We cordially agree with the authoress that in such things as these alone are short courses of instruction likely to be of service—they are, indeed, matters with which many girls are in daily contact from their childhood; and

familiarity with them, while insufficient to ensure their being fully equipped, serves at least as a good grounding upon which to build up, with such aid as well-arranged progressive short courses can give, an efficiency to which those starting without such familiarity rarely attain.

With the advent of an enlarged area of technical instruction in land work, women have begun to invade a field which had hitherto been particularly man's, viz. that of the professional horticulturist, and now there are many colleges and gardens where courses of instruction are arranged for women with the object of fitting them for some department of professional horticulture.

In the author's opinion, in order to train efficient workers in this direction (and the reviewer is entirely of that opinion too), longer courses are necessary. Such long courses "should fit women to undertake supervisory or advisory work connected with farms and gardens dairy-managing posts, educational directorship of colleges and of school gardens, lecturing, inspection of cow-feeding, all horticultural employment, whether for market gardens or private ones, as head or under-gardeners, and jobbing gardening." The author considers too that such "occupations are suited only to educated women belonging to the upper or middle classes," and this opinion she gives more than once.

It is only here and there among professional men gardeners in England that one meets a man of what are usually called the "educated classes," but they are becoming more frequent and will increase as the importance of intensive work upon the land is more realized; but young men and women who aim at a place among the professional gardeners must remember

"Our England is a garden, and such gardens are not made
By singing 'Oh, how beautiful!' and sitting in the shade,
While better men than we go out and start their working lives
At grubbing weeds from gravel-paths with broken dinner knives."

No few weeks' "training," no mere liking for colour in the garden, will make a successful gardener, even of educated men and women. The successful gardener, man or woman, of the future will have not only technical skill but a deep knowledge of living things, such as books alone cannot give, and sympathy with them, and will keep abreast of scientific work in its application to the problems with which he deals.

We cannot, within the limits of this brief notice, discuss the college curriculum of which we get glimpses here and there in the former of the two books, although it strikes us as too full and yet perhaps not full enough; nor can we do more than refer with envy to the happy conditions and the corporate discipline under which the students live at the school which Viscountess Wolseley founded at Glynde in Sussex.

One further word must be said. All through the books the idea of co-operation is kept to the front, and in many directions the means for

bringing in co-operation between workers on the land is given in detail. There can be no doubt that in the main it is along co-operative lines that the chief hope of development lies. Co-operation means opportunity for greater specialization: it enables the producing, distributing, buying and selling departments to work harmoniously, but at the same time under people whose chief work is directed to these branches separately; the grower can grow without the distractions called for in studying markets; the seller can give his time to that study. Those who have had to see to all three know how greatly the one care interferes with the efficiency of the others, and even on these grounds alone co-operation is imperative to secure success.

The books are full of suggestion as to the future of work on the land.

“The Carnation Book.” By H. H. Thomas. Crown 8vo. 150 pp. (Cassell, London, 1916.) 1s. net.

A very handy little book, that will readily go in one's coat pocket, containing practically all one wants to know on the cultivation of Carnations, including those grown under glass and the Border varieties. Not only is the information quite sound, but the printing, index, and illustrations are good.

“Illustrated Garden Guide.” By Walter P. Wright. 8vo. 161 pp. (Headley, London.) 2s. 6d. net.

A well-illustrated and well-printed book, and we cannot do better than use the author's own words in describing it:—“I have stated the cost of everything from a hoe to a greenhouse. I have used tables freely, so that the amateur can get at what he wants by the shortest of cuts. And I have devoted paragraphs to the principal plants in alphabetical order.”

A good index completes the work, but we could not find the date of its issue.

“Flower Culture Month by Month.” By Mary Hampden. 8vo. 300 pp. (Jenkins, London, 1916.) 5s. net.

The author has written this book in a pleasant style, not so dry as so many gardening books are, but full of interest and information from cover to cover.

“Dry-Wall Gardens.” By Thomas Smith. 8vo. 136 pp. (Headley, London.) 2s. 6d.

We congratulate the author on supplying a want, as so many people are now utilizing bare and ugly banks for rock and alpine plants, and, frequently wishing to make the garden themselves, will be glad to have a book so full of instruction, with excellent illustrations of how to do it, and the most suitable plants to use.

A drawback to the book is the lack of an index, and there is no mention of the year of its publication.

“Wild Flowers of the North American Mountains.” By Julia W. Henshaw. 8vo. 383 pp. (McBride, Nast & Co., London, 1916.) 10s. 6d.

A well-arranged guide to the “flora” of North American mountains, often so difficult to identify by the tourist and amateur. The author has separated the flowers into colour categories, as did Miss Parsons in her “Wild Flowers of California,” and this system, though doubtless helpful to the tourist, who can thereby easily trace the flowers he has gathered, is a little tiresome to anyone wishing to follow up a particular family, and who has to turn constantly to the index!

The title is perhaps a little too “wide” for the contents, as many lovely plants are not given which are well known in mountain districts. For instance, the wonderful Giant Lupine found by Douglas, and the “Rocky Mountain Columbine,” *Aquilegia coerulea*, perhaps the most admired of any flower growing in North America.

Nor are *A. canadensis*, and *A. chrysantha*, as known to American nurserymen, given, unless the *A. formosa* described be intended for the one, and *A. flavescens* for the other. *A. Skinneri*, too, is not mentioned.

And why is the lovely little “Shinleaf” *Pyrola picta*, or according to Gray *Pyrola elliptica*, forgotten? The Trillium, too, the “Wake Robin,” that charming and distinctive plant, appealing to all in earliest spring by the purity of its white flowers or the varied purples of some of the varieties—this, which grows particularly freely in the mountainous parts of Northern Vermont, is not given.

Mrs. Henshaw gives the name “Red Cedar” to *Thuja plicata* (*T. Lobbii*)—a very misleading description, for *Juniperus virginiana* is known from end to end of America as “Red Cedar” (see also Mr. W. J. Bean), and it is difficult to understand how this mistake has been allowed to pass.

The book is very well got up—type, paper, and illustrations excellent, with one exception, that of the coloured frontispiece of *Castilleja miniata*, which gives not the faintest idea of the splendid, flame-like colour of the lemon and vermilion bracts of that interesting plant. The index too is good, though “Leptarrhena” should be on p. 128 and is not!

An appreciative preface is written in the form of a letter by Professor John Macoun, who especially praises the English names Mrs. Henshaw has given in some instances.

“Corners of Grey Old Gardens.” 8vo. 151 pp. (Foulis, London, 1914.) 3s. 6d. net.

This collection of essays will bring little that is new to the lover of garden literature, but will be welcome nevertheless, for it comprises much that is best in that literature. It includes “The Praise of Gardens,” by E. V. B. (who, full of years, has just passed away); “The Pleasures of an Orchard,” by William Lawson; a charming chapter

on "Old-Fashioned Gardening," by Mrs. Paul, much of it dug out of Parkinson; the introduction to John Gerarde's Herbal; Harper's "Antiquity, Innocence, and Pleasure of Gardening" and so on, with Richard Le Gallienne's essay on "The Joy of Gardens," from "An Old Country House" at the end. Miss Waterfield's charming sketches add to the book's interest. It is a volume one may take up at any time and read and re-read with pleasure at the expression we find there of our ideas of what a garden should be.

"The Garden Blue Book: A Manual of the Perennial Garden." By L. B. Holland. Large 8vo. 425 pp. (Horace Cox, London, 1916.)

Published in London, but printed in New York, the contents of this book are mainly for American readers, though all the plants mentioned are well known and hardy in this country. Each plant is illustrated with a photograph, and the Latin name and very often synonyms, the "English" name, habitat, effective period, and notes on appearance and cultivation are given. There is nothing new to English readers in this part of the book except some of the "English" names. (We doubt, *e.g.*, whether *Phlox divaricata* is ever called "Wild Sweet William" in England, or *Physostegia* "Obedient Plant," or *Aster ptarmicoides* "Yarrow-leaved Starwort.") On the page opposite the notes, forms are provided partly for the repetition of some of this information, partly for original notes—and some there may be who will use them.

Much of the information is repeated in a somewhat novel form on the two charts which preface the book, and in addition there are chapters on the arrangement of the garden for giving good effects throughout the year, or at least from May to October.

The title is evidently derived from the colour of the cover.

"Manuring for Higher Crop Production." By E. J. Russell. 8vo. 69 pp. (University Press, Cambridge, 1916.) 3s. net.

The name of Dr. Russell is sufficient guarantee that the contents of this little book will be well digested, will deal with the points of contact between practice and science, and will show how scientific discoveries and observations can be turned to practical use. The subjects dealt with are largely of the farm, but the principles to be applied in manuring the garden are the same as those finding their application on the farm. The increased productiveness of the land depends upon improved methods of management and the better feeding of the plants. Methods of management of garden land are different from those of farm land, but methods of feeding crops are the same, and every gardener may read with profit what Dr. Russell has to say upon the subject. Particularly desirable is it that the chapter dealing with the storage of dung should be carefully read, for this useful commodity is rarely stored in gardens in the way it ought to be stored—sheltered from wind and rain as far as possible and well compacted.

“British Forestry: Its Present Position and Outlook after the War.” By E. P. Stebbing. 8vo., 257 pp. (Murray, London, 1916.) 6s. net.

This carefully prepared and illustrated work, which contains some interesting and useful information, is mainly compiled from articles that have been communicated by the author to several of our newspapers and magazines.

The title “British Forestry” is, however, somewhat misleading, as much of the book is devoted to Russian forests and their resources. Though valuable for the purposes of comparison, the information regarding the resources of Finland, Siberia, and Turkestan might well have been greatly shortened and more useful chapters on the subject-matter of the book substituted, such as the management of woodlands, conversion of timber, and other important matters which at the present time appeal directly to the student of British forestry. Of what value to those interested in home woods and the production of timber is the article on the cedar trade of Asiatic Russia? or that on the scrub and swamp-lands of the Siberian regions?

Under Finance and Planting we find some excellent advice, though we question much, judging from the actual outlay on estates in England, Scotland, and Ireland, whether the formation of plantations can be carried out successfully at a less average than £5 an acre. When we consider, too, that the majority of Scotch plantations, which are far and away the most extensive and valuable in Britain, coniferous sections in particular, and from which the Government are at present drawing their main supplies of timber for war purposes, were “notch” planted, it is hard to conceive why the system is condemned in this book.

Mr. Stebbing hits directly at the cause when he says that the finance of the afforestation problem has been the main stumbling-block to progress, plus the ignorance and apathy exhibited on the subject by Government and public alike; and his suggestions regarding renting ground abroad for timber production are well worthy of consideration. With cheaper labour and more simple methods, planting has been carried out at a lower rate in Scotland than in England, where the prices of timber, too, are considerably lower. At present, Scotch pine-wood suitable for packing-cases is selling around London at 10*d.* a cubic foot, while ash has realized as much as 4*s.* and spruce for railway purposes 1*s.* 4*d.* a foot in the woodlands. Poplar realizes fully 1*s.* 2*d.* a foot, and the very finest beech for Government purposes, procured on the Chiltern Hills, averages 1*s.* 4*d.*

There is much of interest in the matter of afforesting and the employment of labour, but, unless for the transplanting of seedlings and light nursery-work, we fear that female labour will not be of much avail in the afforesting of waste lands or timber-felling and conversion.

NOTES ON RECENT RESEARCH
AND
SHORT ABSTRACTS FROM CURRENT PERIODICAL
LITERATURE, BRITISH AND FOREIGN,
AFFECTING
HORTICULTURE & HORTICULTURAL SCIENCE.

THE endeavour commenced in volume xxvi. to enlarge the usefulness of the Society's Journal, by giving an abstract of current Horticultural periodical literature, has met with much appreciation. It has certainly entailed vastly more labour than was anticipated, and should therefore make the Fellows' thanks to those who have helped in the work all the more hearty.

The Editor would be grateful if any who have time at command, and who are willing to help in any special direction in this work, would communicate with him. He desires to express his most grateful thanks to all who co-operate in the work, and he ventures to express the hope that they will all strictly adhere to the general order and scheme of giving references to papers, as the observance of an identical *order* renders subsequent reference to the original easy. The order is as follows :—

1. To place first the name of the plant, disease, pest, &c., being noticed ; and in this, the prominent governing or index word should always have precedence.
2. To place next the name, when given, of the author of the original article.
3. Then, the abbreviated form of the name of the journal, &c., in which the original article appears, taking care to use the abbreviation which will be found on pp. 367, 368.
4. After this, a reference to the number, date, and page of the journal in question.
5. If an illustration be given, to note the fact next, as "fig.," "tab.," or "plate."

6. After these preliminary necessities for making reference to the original possible for the reader, the abstract or digest should follow, ending up with the initials of the contributor affixed at the close of each Abstract or Note.

NAMES OF THOSE WHO HAVE KINDLY CONSENTED TO HELP
IN THIS WORK.

Baker, F. J., A.R.C.Sc., F.R.H.S.
 Ballard, E., F.R.H.S.
 Bowles, E. A., M.A., F.L.S., F.E.S., F.R.H.S.
 Brennan, A., B.Sc., F.R.H.S.
 Bunyard, E. A., F.L.S., F.R.H.S.
 Cavers, Prof. F., D.Sc., F.R.H.S.
 Cayley, D. M., F.R.H.S.
 Chittenden, F. J., F.L.S., F.R.H.S.
 Clayton, C. P., F.R.H.S.
 Darlington, H. R., F.R.H.S.
 Druery, C. T., V.M.H., F.L.S., F.R.H.S.
 Dykes, W. R., M.A., F.R.H.S.
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 Hodgson, M. L., F.R.H.S.
 Hooper, Cecil H., M.R.A.C., F.R.H.S.
 Jeffery, Violet G., F.R.H.S.
 Kerridge, Rev. A. A., M.A., F.R.H.S.
 Masee, Geo., F.L.S., F.R.H.S., V.M.H.
 Newstead, Professor R., A.L.S., F.E.S., F.R.S., F.R.H.S.
 Pethybridge, G. H., B.Sc., Ph.D., F.R.H.S.
 Petts, Alger, F.R.H.S.
 Rendle, A. B., M.A., D.Sc., F.L.S., F.R.S., F.R.H.S.
 Reuthe, G., F.R.H.S.
 Scott Elliot, G. F., M.A., B.Sc., F.L.S., F.R.H.S., F.R.G.S.
 Simmonds, A., F.R.H.S.
 Smith, William G., B.Sc., Ph.D., F.R.H.S.
 Veitch, Sir Harry J., F.L.S., F.Z.S., F.R.H.S.
 Voss, W. A., F.C.S., F.R.H.S.
 Webster, A. D., F.R.H.S.
 Whittles, W., F.R.H.S.
 Williams, S. E., F.R.H.S.
 Wilson, Gurney, F.L.S., F.R.H.S.

JOURNALS, BULLETINS, AND REPORTS

from which Abstracts are made, with the abbreviations used for their titles.

Journals, &c.	Abbreviated title,
Agricultural Gazette of New South Wales	Agr. Gaz. N.S.W.
Agricult. Journal, Cape of Good Hope	Agr. Jour. Cape G.H.
American Journal of Botany	Amer. Jour. Bot.
Annales Agronomiques	Ann. Ag.
Annales de la Soc. d'Hort. et d'Hist. Naturelle de l'Hérault	Ann. Soc. Hé.
Annales de la Soc. Nantaise des Amis de l'Hort.	Ann. Soc. Nant, des Amis Hort.
Annales des Sciences Naturelles	Ann. Sc. Nat.
Annales du Jard. Bot. de Buitenzorg	Ann. Jard. Bot. Buit.
Annals of Applied Biology	Ann. Appl. Biol.
Annals of Botany	Ann. Bot.
Annual Report Agricultural Research Station, Long Ashton	Ann. Rep. Agr. Res. Stn. Long Ashton.
Beihft zum Botanischen Centralblatt	Beih. Bot. Cent.
Boletim da Real Sociedade Nacional de Horticultura	Bol. R. Soc. Nac. Hort.
Boletim da Sociedade Broteriana	Bol. Soc. Brot.
Bollettino della R. Società Toscana d'Orticultura	Boll. R. Soc. Tosc. Ort.
Botanical Gazette	Bot. Gaz.
Botanical Magazine	Bot. Mag.
Bulletin de la Société Botanique de France	Bull. Soc. Bot. Fr.
Bulletin de la Soc. Hort. de Loiret	Bull. Soc. Hort. Loiret,
Bulletin de la Soc. Mycologique de France	Bull. Soc. Myc. Fr.
Bulletin Department of Agricult. Brisbane	Bull. Dep. Agr. Bris.
Bulletin Department of Agricult. Melbourne	Bull. Dep. Agr. Melb.
Bulletin of the Botanical Department, Jamaica	Bull. Bot. Dep. Jam.
Bulletin of Bot. Dep. Trinidad	Bull. Bot. Dep. Trin.
Canadian Reports, Guelph and Ontario Stations	Can. Rep. G. & O. Stat.
Centralblatt für Bacteriologie	Cent. f. Bact.
Chronique Orchidéenne	Chron. Orch.
Comptes Rendus	Comp. Rend.
Contributions from U.S.A. Herbarium	Contr. fr. U.S.A. Herb.
Department of Agriculture, Victoria	Dep. Agr. Vict.
Department of Agriculture Reports, New Zealand	Dep. Agr. N.Z.
Dictionnaire Iconographique des Orchidées	Dict. Icon. Orch.
Die Gartenwelt	Die Gart.
Engler's Botanische Jahrbücher	Eng. Bot. Jah.
Gardeners' Chronicle	Gard. Chron.
Gardeners' Magazine	Gard. Mag.
Gartenflora	Gartenflora.
Journal de la Société Nationale d'Horticulture de France	Jour. Soc. Nat. Hort. Fr.
Journal Dep. Agriculture, Victoria	Jour. Dep. Agr. Vict.
Journal Imperial Department Agriculture, West Indies	Jour. Imp. Dep. Agr. W.I.
Journal of Agricultural Research	Jour. Agr. Res.
Journal of Agricultural Science	Jour. Agr. Sci.
Journal of Botany	Jour. Bot.
Journal of Chemical Society	Jour. Chem. Soc.
Journal of Ecology	Jour. Ecol.
Journal of Economic Biology	Jour. Econ. Biol.
Journal of Economic Entomology	Jour. Econ. Entom.
Journal of Genetics	Jour. Gen.
Journal of the Board of Agriculture	Jour. Bd. Agr.
Journal of the Linnean Society	Jour. Linn. Soc.
Journal of the Royal Agricultural Society	Jour. R.A.S.
Journal of the Society of Chemical Industry	Jour. Soc. Chem. Ind.

Journal S.E. Agricultural College, Wye	Jour. S.E. Agr. Coll,
Kaiserliche Gesundheitsamte	Kais. Ges,
La Pomologie Française	Pom. Franç,
Le Jardin	Le Jard,
Lebensgeschichte der Blütenpflanzen Mitteleuropas	Lebens. d. Blütenpfl,
Mycologia	Mycologia,
Naturwiss. Zeitschrift Land und Forst	Nat. Zeit, Land-Forst,
New Phytologist	New Phyt,
Notizblatt des Königl. Bot. Gart. und Museums zu Berlin	Not. König. Bot. Berlin,
Oesterreichische Garten-Zeitung	Oester. Gart. Zeit,
Orchid Review	Orch. Rev,
Orchis	Orchis,
Phytopathology	Phytopathology,
Proceedings of the American Pomological Society	Am. Pom. Soc.
Quarterly Journal of Forestry	Quart. Jour. of Forestry.
Queensland Agricultural Journal	Qu. Agr. Journ.
Report of the Botanical Office, British Columbia	Rep. Bot. Off. Brit. Col.
Reports of the Missouri Botanical Garden	Rep. Miss. Bot. Gard,
Revue de l'Horticulture Belge	Rev. Hort. Belge,
Revue générale de Botanique	Rev. gén. Bot,
Revue Horticole	Rev. Hort,
The Garden	Garden,
Transactions Bot. Soc. Edinburgh	Trans. Bot. Soc. Edin,
Transactions of the British Mycological Soc.	Trans. Brit. Myc. Soc.
Transactions of the Massachusetts Hort. Soc.	Trans. Mass. Hort. Soc.
Transactions Royal Scot. Arboricultural Soc.	Trans. Roy. Scot. Arbor. Soc.
U.S.A. Department of Agriculture, Bulletins	U.S.A. Dep. Agr.*
U.S.A. Experimental Station Reports	U.S.A. Exp. Stn.†
U.S.A. Horticultural Societies' publications	U.S.A. Hort. Soc.†
U.S.A. State Boards of Agriculture and Horticulture	U.S.A. St. Bd,†
Woburn Experiment Farm Report	Woburn,

* The divisions in which the U.S.A. Government publish Bulletins will be added when necessary.

† The name of the Station or State will in each case be added in full or in its abbreviated form.

NOTES AND ABSTRACTS.

Acer Opalus and Fraxinus Ornus. By W. Somerville (*Quart. Jour. of Forestry*, No. 4, vol. 9, pp. 319-320; October 1915).—Both *Acer Opalus* and *Fraxinus Ornus* are perfectly hardy in most parts of Britain, healthy examples being found even far north in Scotland. *Fraxinus Ornus* is fairly common, often grafted on the stock of the common ash, but *Acer Opalus* is rather rare. "As to why *Acer Opalus* should not be planted more extensively as a substitute for the common sycamore, I may say that the former does not appear to attain to anything like the size of the latter, and it is very doubtful whether the timber is of even approximately equal value. The sycamore, when of large size, commands a price higher than that which applies to any British timber except the cricket-bat willow, trees often realizing £30 and £40 each, and running up to £60 and £80.

"As regards *Quercus Ilex*, I may say that it grows well in the south and south-east of England, especially near the sea, though in Oxford there are some well-grown trees which often produce large quantities of fruit. It is a tree of very slow growth, and does not attain to a great size, but is excellent for shelter and shade. In the summer of 1911 large quantities of seed were produced in Oxford, and I sowed a good deal on my chalk area in Sussex, but after three years' growth the seedlings do not average more than four inches or five inches in height, though I expect they will grow more rapidly now that they are established."—A. D. W.

American Gooseberry Mildew, Summer Sprays against. By B. T. P. Barker and A. H. Lees (*Jour. Bd. Agr.* xxii. No. 12, March 1916).—An account of the testing of a 2 per cent. soft soap and paraffin emulsion containing about 0.35 per cent. of liver of sulphur. This fluid is capable of completely wetting and killing the mildew, and does not cause scorching of the foliage or defoliation. The bushes experimented with were badly attacked and were sprayed about the middle of June, when disease was at its height, and examination a few days later showed that the production of new conidia had ceased. Very few perithecia and apparently no ripe spores were found. The emulsion was tested alone and apparently had fungicidal properties, which, however, were not sufficient to kill the "summer stage" completely.—G. C. G.

Aphides having Alternate Food Habits, Notes on. By C. P. Gillette and L. G. Bragg (*Jour. Econ. Entom.* viii. pp. 97-103; Feb. 1915).—The alternate food plants of a large number of species of green-fly are given; some are British, but most American.—F. J. C.

Aphis, The Status of Spraying Practices for the Control of Plant Lice (Aphis) in Apple Orchards. By P. J. Parrott and N. E. Hodgkiss (*U.S.A. Exp. Stn., Geneva, Bull.* 402, 17 pp.; 5 figs.).—A discussion of experiences in combating *Aphis sorbi* (Kalt), *A. pomi* (De Geer), and *A. avenae* (Fab.). The authors consider the most effective treatment is spraying with soap or nicotine solutions directly the Aphides emerge from the egg and make their way to the buds just about to expand.—E. A. Bd.

Apple Bitter-rot, Sources of Early Infection. By J. W. Roberts (*Jour. Agr. Res.* iv. p. 59, Apr. 1915; pl.).—It has been shown that in America the fungus *Glomerella cingulata*, may pass the winter on mummy apples and in bitter-rot cankers on the apple and possibly on other trees. Where the infection has been severe the author found the fungus on cankers due to *Nummularia discreta*, dead tips of fruit spurs, dead parts of limbs, injured branches, cankers caused by pear blight, and twig cankers due to *Phyllosticta solitaria*. The pruning out of dead parts and cankers materially reduced early infection.—F. J. C.

Apple Orchard, A Comparison of Tillage and Sod Mulch in an.—By U. P. Hedrick (*U.S.A. Exp. Stn., New York, Bull.* 383, April 1914; 5 pl.).—The complete returns of a ten-year series of experiments on the comparative value of tillage in comparison with placing the orchard down to grass.

It is clearly demonstrated that, with the single exception of colour, the turning of orchards down to grass is a failure.

The foliage, growth of trees, and weight of crop under grass were very much inferior to the check orchards in tillage. In fact, in all sections the grass orchards steadily deteriorated almost to the total destruction of the trees, while the tilled sections as steadily improved.

In the case of a tilled orchard set down to grass, the evil effects of grassing plainly showed themselves in the first season.—*C. P. C.*

Apples, Cost of Producing, in Maine, U.S.A. By A. K. Gardner (*U.S.A. Dep. Agr., Bull.* 3, 22 pp.).—A careful examination of the cost of producing Apples in nine orchards on a uniform system. It is concluded that the cost of a barrel is 1 dollar when the crop equals two barrels a tree, and 1½ dollar when the production is one barrel.—*E. A. Bd.*

Aquatic Compositae. By J. Hutchinson (*Gard. Chron.* June 10, 1916, p. 355; with 4 figs.).—Points out that, as aquatic plants of the present day are most probably derived from terrestrial seed-bearing plants, they should represent forms that have been surpassed in the struggle for existence by better equipped rivals, and have escaped destruction by taking to the water. Therefore the more primitive groups of a family should supply the aquatic members. Thus in the Compositae they should show these characters: (1) foliaceous involucre bracts; (2) scaly elongated receptacles; (3) foliaceous calyx (pappus); (4) free anthers.

The curious aquatic Compositae, *Bidens Beckii*, *Cotula myriophylloides*, *Pectis aquatica*, and *Erigeron heteromorphus*, are described and figured.—*E. A. B.*

Arsenate of Lead, The Toxic Values of. By H. V. Tartar and H. F. Wilson (*Jour. Econ. Entom.* viii. Oct. 1915, pp. 481-486).—Two different arsenates of lead are present in the commercial material—lead hydrogen arsenate (acid) and basic lead arsenate (neutral). Careful experiments conducted with both substances in a pure state show the first is quicker-acting and more efficient in strengths containing equal quantities of arsenic than the second. Lead hydrogen arsenate contains approximately 33 per cent. arsenic oxide (As_2O_3), and basic lead arsenic 25 per cent.—*G. W. G.*

Bags, To keep Mice from Eating (*Queensland Agr. Jour.* June 1915, p. 272).—Many farmers experience great difficulty in keeping their wheat bags free from the depredations of mice and rats. A New South Wales farmer states that if each of the bags is rubbed over with a few handfuls of sulphur, mice will never touch them, and the same procedure would probably answer in the case of rats. Bags thus treated have stood from stripping to sowing time without a hole having been made in one of them.—*C. H. H.*

Beneficial Insects in Hawaiian Islands, Some Results of the Introduction of. By Otto H. Swezer (*Jour. Econ. Entom.* viii. Oct. 1915, pp. 450-457).—Attention is drawn to the fact that very few of the native insects of these islands have become injurious to cultivated plants, and that insect pests there are in most cases foreign insects which have arrived through the channels of commerce. In 1890 the Australian lady-beetle (*Novius cardinalis*) was introduced to control the cottony cushion scale with great success, the scale no longer being a menace. About a dozen species of lady-birds were successfully introduced by 1896, mostly from Australia and the Orient. Among these were *Cryptolaemus montrouzieri*, *Rhizobius ventralis*, and *R. toowoombae*, feeding on various mealy bugs; *Coelophora inequalis*, *Platynus lividigaster*, *Scymnus loewii*, and *S. notescens*, feeding on plant lice; *Orcus chalybaeus*, and *Chilocorus circumdatus*, feeding on scale insects.

Among the most valuable of the introduced coccid parasites are *Encyrtus fuscus*, *Blepyrus marsdeni*, *Microterys flavus*, *Apentelicus kotinskyi*, *Adelencyrtus odonaspidis*, *Scutelliota cyanea*, *Tomocera californica*, *T. ceroplastis*, *Aneristus ceroplastae*, *Coccophagus orientalis*, *C. lecanii*, *Aphelinus diaspidis*, and *Aspidiophagus citrinus*. In 1895 Mr. Koebele (Hawaii) introduced from Japan *Chalcis obscurata* and *Macrodyctium omiodivorum*, which are doing much good in killing off the leaf-rollers on sugar-cane and coconut palms. Another phase was the introduction in 1912 of insects to control the spread of *Lantana*. A study of the insects preying exclusively on this plant in Mexico was made, and the most effective checks introduced are the little black seed-fly (*Agromyza* sp.) and two moths (*Platyptilia pusillidactyla* and *Crocidosema lantana*), which feed in the flower clusters. The results were good, but the introduction of insects to feed on weeds seems to be a dangerous experiment. A most notable introduction was

made in 1904-5 from Australia and Fiji to deal with the sugar-cane leaf-hopper (*Perkinsiella saccharicida*).

The egg parasites *Paranagrus optabilis*, *P. perforator*, *Anagrus frequens*, and *Ootetrastichus beatus* were successful in a few years in reducing an estimated loss of \$3,000,000 per annum to a negligible amount. *P. optabilis* has been the most useful one.

Beneficial results are very apparent also from the introduction in 1910 from New Guinea of *Ceramiasia sphenophori*, parasitic on the sugar-cane weevil borer (*Rhabdocnemis obscura*).

It is estimated that many thousands of dollars annually are saved to the sugar industry by this Tachinid. Several species of fruit-fly parasites have been tried, but have not been in operation long enough to enable any definite data to be given.—G. W. G.

Berried Trees and Shrubs. Anon. (*Garden*, Oct. 2, 1915, p. 482).—The best berried trees and shrubs, notably the Holly and Sea Buckthorn, have inconspicuous flowers. The most interesting family is the *Symphoricarpos* or Snow-berry, of which until recently *S. racemosus* was the best, but *S. occidentalis*, shown a year or two ago, has larger berries. Both have glistening white berries, and should be grouped in front of dark evergreen, such as Yew.

Crataegus pyracantha Lelandi, usually grown on a wall, is more effective as a free shrub.

The Sea Buckthorn is beautiful, with semi-transparent pale orange berries; the male and female flowers are borne on different plants, and when planting one male to three female should be included. This also applies to *Skimmias* and *Aucubas*. The *Cotoneasters* are rich in fruiting shrubs. *C. Simmondsi* retains its berries best. *C. frigida* is a tall shrub, 20 feet high. *C. applanata* gives promise of being particularly useful from its freedom in fruiting. Of *Berberis*, *B. vulgaris*, with coral-red berries, is handsome, but *B. Wilsonae* is more charming from its pendulous habit, and the new *B. brevipaniculata* has large clusters of fruit, orange-scarlet and crimson. *Pernettya mucronata* (Prickly Heath) is dwarf, with globular rose-pink berries; and of *Roses* *R. Moyesii* with pear-shaped berries, the *rugosas*, and Sweet Briar are useful for their colour.—H. R. D.

Berried Trees and Shrubs. By R. W. Wallace (*Garden*, Oct. 30, 1915, p. 530).—There are many forms close to *Berberis Wilsonae*, such as *subcaulialata* with glaucous foliage, scarlet stems, and coral-red berries; *B. Corryi* is a tall erect species (close to *brevipaniculata*) of great strength, with orange-scarlet fruits. *B. Stapfiana* is a sturdier edition of *B. Wilsonae*.

Other beautiful *Berberis* are *B. concinna*, with large pear-shaped scarlet berries; *B. verruculosa*, with deep green foliage; *B. aggregata*, of stout growth, smothered with scarlet fruit, the best of its class.

B. Prallii is very distinct; *B. Sargentiana*, of the *Knightii* group, has highly-coloured young growths and formidable spines.

Another brilliant shrub in autumn is *Stranvesia undulata*. After six years it is not more than 18 inches high and covers 2½ square yards, smothered with dull orange-pink clusters of berries.

Of *Cotoneasters* *C. Dammeri* is useful for the rock garden, and may be associated with the grey Spanish Savin.—H. R. D.

Box Leaf Miner, Fumigation for. By E. P. Felt (*Jour. Econ. Entom.* viii. pp. 94-95, Feb. 1915).—Experiments were made for killing the larvæ of *Monarthropalpus buxi* while still in their mines. Spraying with Black Leaf 40 (1 part to 500 of water) and 2 lb. fish-oil soap was quite unsuccessful, but fumigation with carbon bisulphide (2 teaspoonsfuls to a 10-quart jar) for two hours proved quite successful in killing the larvæ without injuring the foliage. Carbon tetrachloride and hydrocyanic acid gas were also used; some of the larvæ were killed by the latter, but not all, while fewer still were killed by the former. F. J. C.

Bud Moth, The Lesser. By E. W. Scott and J. H. Paine (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 113, August 1914; 2 plates).—The larvæ of the bud moth (*Recurvaria nanella*) attack blossoms, buds, and leaves of apple, peas, cherry, plum, and hawthorn in the spring. The pest can be controlled by thoroughly spraying the trees in their dormant state with lime-sulphur solution at 32° Baumé, used at the rate of 1 gallon to 8 gallons of water. The spraying is to be done just before the buds swell, or preferably when they are swelling. This treatment is especially recommended, as it involves no extra application

where it is necessary to spray during the dormant season for other troubles, such as the San Jose oyster-shell and scurfy scales, and blister-mite, also for peach leaf curl.—*V. G. J.*

Cereus with Edible Fruits (*Jour. Soc. Nat. Hort. Fr.* Aug. 1915, p. 116).—A note on two species of *Cereus*—*C. tricostratus* and *C. Queretarensis*—with edible fruits, observed in Mexico by M. Diguët.—*M. L. H.*

Cherry 'Lambert.' By U. P. Hedrick (*U.S.A. Exp. Stn., Geneva, Bull.* 403; col. pl.).—A supposed seedling from 'Bigarreau Napoleon' × 'Black Heart,' raised in Oregon about 1848.—*E. A. Bd.*

Chinese Cabbage, The. By Dr. Trabut (*Rev. Hort. de l'Alg.,* May–June 1915, p. 69; figs.).—The Chinese Cabbage has its reputation still to make in Europe, but it is much prized in China, and even Western writers on the productions of China pronounce it to be "worth more than all other vegetables put together." There are two forms of it grown in China, the Pé-tsaï and the Pak-choï. Some further selection will probably be required to produce a strain which can be relied on to heart in the manner of our Western cabbages, but the writer of this note points out that it is not fair to reject a vegetable because it does not fill the place which we have arbitrarily chosen for it. The Pé-tsaï is not a variety of cabbage so much as a cardoon, a spinach, and a salad. In other words, it is a new vegetable.—*M. L. H.*

Citrus Canker. By C. H. Hasse (*Jour. Agr. Res.* iv. p. 97, Apr. 1915; pl.).—Warty growths on leaves and twigs of Citrus and Grape Fruit, developing rapidly and spreading widely, were found to be associated with a bacterium now called *Pseudomonas Citri*. The organism induced rapid growth of cells in leaf or stem which burst through the epidermis and, at first light green, later turn red-brown. The cells in the canker tissue become suberized.—*F. J. C.*

Citrus Fruit Insects in Mediterranean Countries. By H. J. Quayle (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 134, Oct. 1914; 10 plates, 2 figs.).—This paper contains important information bearing on the subject of the need of regulating the entry of Citrus and other fruits imported from Mediterranean countries, to prevent the entry of the fruit fly into the United States.—*V. G. J.*

Cranberry, Report of the Substation. By H. J. Franklin (*U.S.A. Exp. Stn., Mass., Bull.* 160, 27 pp.).—Deals with the year's investigations at the station, weather observation, frost protection, fungus and other pests, fertilizers &c. The water movement in peat and root development of the Cranberry are also discussed.—*E. A. Bd.*

Cupressus obtusa. By A. Bruce Jackson (*Gard. Chron.* May 27, 1916, p. 278; with fig.).—This is the XIVth of the critical notes on Conifers in this series. This Japanese species and its varieties *filicoides*, *tetragona aurea*, and *lycopodioides* are described.—*E. A. B.*

Daffodil Bulbs, Living Pests of. By the Rev. Joseph Jacob (*Garden.* Jan. 2, 1915, p. 4).—There are five: 1, *Merodon equestris*, the large Daffodil fly; 2, the Swift Moth (*Hepialus rigidus*); 3, *Eumerus*, the small Daffodil fly; 4, the mite; 5, the eel-worm (*Tylenchus devastatrix*). The last two are best got rid of by soaking the bulbs for twenty-four hours in a 5 per cent. solution of copper sulphate. The flies are best caught in nets, and the grubs sought for in the bulbs before planting.—*H. R. D.*

Daffodils, Technical Terms used in Descriptions. By the Rev. Joseph Jacob (*Garden.* March 13, 1915, p. 125).—A convenient list of words used in describing florists' Daffodils, with their meanings, is given.—*H. R. D.*

Dried-Fruit Insects in California, Control of. By W. B. Parker (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 235, June 1915; 7 plates, 4 figs.).—The most common insects attacking dried fruit on the Pacific coast are the Indian-meal moth and the dried-fruit beetle. Infestation takes place in the packing-house, the warehouse, and the grocery store, the insects finding their way through cracks in the boxes and folds of the paper.

The secret of preparing an insect-free package of dried fruit is to sterilize it at a temperature of 180° F. and protect it from future attacks by the use of the insect-free packing-room, and sealing it in sterile cartons and packages.—*V. G. J.*

Drug and Dye Plants, Report on Cultivation of (*Jour. N. York Bot. Gard.*, Aug. 1915, p. 155).—A list of important drug and dye plants which the Committee appointed for the investigation of the question consider should be cultivated for the American market, with notes on the desirability or otherwise of extensive cultivation and a list of pamphlets on the subject.—*F. J. C.*

Drug Plants under Cultivation. By W. W. Stockberger (*U.S.A. Dep. Agr., Bur. Pl. Ind., Farm. Bull.* 663, June 5, 1915; figs.).—There are a number of valuable native American drug plants which are threatened with extermination by the clearing of forests, the extension of the areas of land under tillage, and the activities of drug collectors. On the other hand, attention is now being turned to the cultivation of drug plants in the United States as a means of lessening the importance of the supply of imported crude drugs. The problems are the same as those which confront the cultivator of any other crop. The soil, climate, and situation suitable to each variety must be considered, the cost of production and marketing must be calculated, the value of land, cost and availability of labour inquired into; and it must be taken into account that whereas some plants, not well suited to cultivation on a large scale, may be found profitable grown on small areas as a side line, others will be produced more cheaply and more profitably when grown on a scale large enough to warrant the use of labour-saving appliances.

Lists are here given of the drug-plants known to flourish in different parts of North America, and information is given concerning the cultivation of the following species:—

Aconite.	Coriander.	Pennyroyal.
Aletris.	Dandelion.	Peppermint.
Althaea.	Digitalis.	Pinkroot.
Angelica.	Dill.	Pokeweed.
Anise.	Echinacea.	Pyrethrum.
Arnica.	Elecampane.	Safflower.
Belladonna.	Fennel.	Saffron.
Blue Flag.	Gentian.	Sage.
Boneset.	Ginseng.	Seneca Snakeroot.
Burdock.	Goldenseal.	Serpentaria.
Calamus.	Henbane.	Spearmint.
Calendula.	Horehound.	Stramonium.
Camphor.	Larkspur.	Tansy.
Cannabis.	Lavender.	Thyme.
Caraway.	Licorice.	Valerian.
Cascara Sagrada.	Lobelia.	Vetiver.
Catnip.	Lovage.	Wintergreen.
Chamomile (German).	Melissa.	Wormseed.
„ (Roman).	Orris.	Wormwood.
Conium.	Parsley.	

M. L. H.

Egg Plant Lace Bug, The. By E. Fink (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 239, June 1915; 5 plates).—A spray consisting of 8 lb. fish oil soap to 50 gallons of water, well covering the under-sides of the leaves, will kill 100 per cent. nymphs and 95 per cent. adults.—*V. G. J.*

Employment in Forestry for Women and Disabled Soldiers (*Quart. Jour. of Forestry*, No. 4, vol. 9, p. 346; October 1915).—A Committee of the Council of the Royal Scottish Arboricultural Society has for some time past been co-operating with the Scottish Committee on Women's Employment in securing employment for women whose ordinary occupations have been interfered with by the war, and already a considerable number of women have been suitably placed on estates in various districts throughout the country. Encouraged by the success which has so far attended the Committee's efforts, the Council has now decided that the Committee should also try to find light work for soldiers who, owing to partial disablement, are unable to undertake work of a heavy nature. The work which men who have lost an arm or a leg could do would naturally be somewhat limited in variety, but many other kinds of partial disablement would not present such difficulties, and there are many forms of light work associated with forestry which can be quite efficiently done by women and partially disabled men, such as the following:—

1. Bracken cutting and switching on land to be cleared for planting.
2. Planting, or carrying plants to planter.
3. Cleaning young plantations: *e.g.*, cutting out rank weed growth or weed tree species.

4. Gathering and burning brushwood on felling areas.
5. Cutting and bundling birch twigs.
6. Cutting and bundling hazel rods.
7. Cutting, bundling, and peeling willows.
8. Seed collection.
9. Barking and stacking pit props.
10. Nursery work :
 - (a) Seed cleaning and preparation for sowing.
 - (b) Weeding and hoeing.
 - (c) Lining out.
 - (d) Lifting and sizing plants.

In addition to the above, other departments of estate work of a light nature would be suitable, and under present circumstances might otherwise be neglected, such as the keeping in order of drives, walks, paths, borders, lawns, parks, and policies. There should also be suitable work in the gardens of places with small or depleted staffs.—*A. D. W.*

Eucalyptus for English Gardens. By E. A. Bowles (*Garden*, Oct. 9, 1915, p. 496).—Several species are worth a trial. *E. viminalis*, 20 feet high, rising out of a group of hardy Palm, backed by Oak and Pine, looks like a column of blue smoke. The Brightlingsea form of *E. Gunnii* appears to be as hardy as any. *E. pulverulenta* is the bluest that is sufficiently hardy to stand our winters. *E. cordata* comes next in blueness and may survive when *E. pulverulenta* is killed. When too tall for staking, cutting out the heavy tops in autumn is recommended. The cuttings are wonderfully graceful for large vases in the house.

The following are recommended :—

Hardest.—*E. Gunnii*, *E. coccifera*, *E. Stuartiana*, *E. cordata*, and *E. urnigera*.
Bluest.—*E. pulverulenta*, *E. cordata*, *E. viminalis*, and *E. coccifera*.
Deep green, leathery leaves.—*E. obliqua*, *E. coriacea*, *E. robusta*.
Pale green.—*E. resinifera*.

E. Globulus, the most generally known, is less hardy than any of these except *E. viminalis*.

E. Beauchampiana made a fine specimen, 15 feet high. *E. ficifolia* is the most gorgeous when in flower; but it will not stand any frost.—*H. R. D.*

Eucalyptus for English Gardens. By W. A. Battersby (*Garden*, Dec. 4, 1915, p. 588).—There is a tendency in the spring to throw out blue, rounded leaves, which change as the summer goes on, especially in young trees, into sickle-shaped and harder leaves. The tree grows more in September, if the weather is favourable, than in any other month in the year. Round leaves will appear each spring-time on an old tree quite high up. A tree of *E. Globulus* that had its head blown off in the previous autumn has round leaves with few sickle-shaped, while another of the same variety growing 2 yards away had from its earliest growth few round leaves. Mr. E. A. Bowles (*ib.* p. 589) points out that the mature often sickle-shaped leaves are produced from flowering branches, while the juvenile or miniature forms with rounded leaves come from unflowering shoots. The bluer and rounder leaves of *E. Globulus* are so much more beautiful than the dull-coloured sickle-shaped ones that where several trees are grown it is worth while to prune one back every spring, so as to obtain the blue leaves in abundance.—*H. R. D.*

Evaporation of Water from Soil. By B. A. Keen (*Jour. Agr. Sci.* vi. pp. 456–475, Dec. 1914).—The author found that the rate of evaporation from soil differs from that found in sand, silt, china clay, and ignited soil. This difference is not due to the organic matter contained in the soil, but probably to the colloidal properties of the clay. The curves given show that the relationship of water to soil is quite different from that to sand; but there is also some other factor at work, probably the effect of the decreasing water surface in the soil as evaporation goes on.—*F. J. C.*

Fly Larvæ in Horse Manure, Experiments in the Destruction of. By F. C. COCK, R. H. HUTCHISON, and F. M. SCALES (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 118, July 1914; 4 plates).—The recognition of the fly as a disease-carrier has created a wide-spread demand for some means of destroying it, and investigations have been undertaken to discover a chemical which would destroy the pest in its principal breeding-place without injuring the bacteria or reducing the fertilizing value of the manure. By far the most satisfactory substance experimented

with has proved to be borax. It is economical, effective, and increases the water-soluble nitrogen, ammonia, and alkalinity of manure, and apparently does not permanently injure the bacterial flora. An application of 0.62 lb. borax to every 10 cubic feet (8 bushels) of fresh manure is necessary. The borax to be sifted over the pile and particularly round the edges, and then 2 or 3 gallons of water sprinkled over it. The effect of borax-treated manure has not been studied in connexion with the growth of *all* crops, nor has its cumulative effect been determined. It is therefore recommended that not more than 15 tons an acre of the treated manure be used.—*V. G. J.*

Formaldehyde Gas, The Injurious Effects on Seed Potatoes. Formaldehyde for the Treatment of Seed Potatoes against Rhizoctonia, The Efficiency of. By F. C. Stewart and W. O. Gloyer (*U.S.A. Exp. Stn., New York, Bulls.* 369-370, Dec. 1913; 3 plates; 5 tables).—The injury of seed potatoes when treated by formaldehyde gas was very marked, the damage being in the form of sunken brown spots surrounding the lenticels and eyes.

It was found that the injury was due to an insufficient number of tubers to the cubic foot being present, sprouted tubers suffering most.

The authors recommend 3 pints of formaldehyde to 23 oz. permanganate to 167 bushels of potatoes in 1,000 cubic feet of space as being quite safe.

Formaldehyde, either as gas or solution, was not found satisfactory when used against Rhizoctonia, the only effective remedy being the standard solution, 1 to 1,000 solution of mercury bichloride.—*C. P. C.*

Fruit Juices, Studies on. By H. C. Gore (*U.S.A. Dep. Agr., Bur. Chem., Bull.* 241, June 14, 1915).—Experiments have been carried out during the past four years with the view of finding satisfactory methods for the preparation and preservation of juices from surplus fruit. The experiments were tried with fruits such as are not generally used in this way, but which are often grown in larger quantities than can be consumed fresh. The conclusions arrived at are that the juices of red and black currants, blackberries, black raspberries, sour cherries, and peaches may be successfully treated on a large scale by the usual methods of heating and sterilizing. Strawberry juice and red raspberry juice are not suitable for this purpose, as it will be found impracticable to retain their distinctive colour and flavour. Huckleberry juice is somewhat characterless. Pine-apple juice requires special treatment, but may quite possibly prove to possess high commercial value. The future of prepared orange juice is also not without promise. It is not unlikely that highly specialized methods, in which cold storage will play a prominent if not dominating part, will be required.—*M. L. H.*

Fruit Tree Leaf-roller in the Hood River Valley, Spraying Notes on the Control of. By Leroy Childs (*Jour. Econ. Entom.* viii. Oct. 1915, pp. 457-466).—Lead arsenate sprays were tried to kill the worms on hatching, but with poor results. (Even at the rate of 6 lb. to 50 gallons, which was used in the two early sprays, and 3 to 50 in two later ones, 11 per cent. of the fruit counted was found to be affected.)

Kerosene emulsion, distillate emulsion, and crude oil emulsion were not found satisfactory, but Miscible Oil No. 1 (Balfour Guthrie & Co.) was a very efficient agent in killing the leaf-roller eggs. Five gallons to 100 resulted in 92.1 per cent. of the eggs failing to hatch, and at the rate of 8 gallons to 100 gallons as great a proportion as 99.6 per cent. were killed and only .8 per cent. fruit was injured against 18 per cent. in the check rows. The spraying should be done just before growth commences.—*G. W. G.*

Fruiting of Trees in Consecutive Seasons, The. By the Duke of Bedford and S. U. Pickering (*Woburn, 15th Rep.* 1916, pp. 1-19).—The results of some inquiries as to the tendency of fruit trees to crop in alternate years were given in the Second and Fifth Reports, and these have now been amplified and brought up to date. Ignoring cases in which the cropping has been so heavy as to seriously impair the vigour of the tree—a state of things which becomes more common as trees get old—the conclusion is arrived at that the tendency towards alternate cropping is very feeble, and that there is at the same time an equally potent tendency towards consecutive cropping: that is, that a tree bearing particularly well or badly during one season will probably do the same in the succeeding season. Atmospheric conditions, and not the innate tendency of an individual tree, constitute the principal factor in determining good or poor bearing. Only one experiment, that with the precocious 'Stirling Castle,' favoured the theory of alternate cropping; some of the trees, which were prevented from bearing fruit for two years after the others were allowed to bear, afterwards producing crops far in excess of their fellows.—*A. P.*

Fumes, Damage by. (*U.S.A. State Com. Hort. Cal.* vol. iv. Nos. 5 and 6, May and June 1915; 19 figs.)—Contains an account of injury caused to trees and plants by smelter fumes (sulphur-dioxide gas liberated in the process of smelting ores).

This injury is far-reaching in its effect, as in most cases smelters are located in mountainous regions where the timber and grazing interests are very great. It is to be hoped that science will come to the aid of both smelters and agriculturists and give them something that will eliminate all deleterious gases.—*V. G. J.*

Fumigant, Para-dichlorobenzene as an Insect. By A. B. Duckett (*U.S.A. Dep. Agr., Bur. Ent., Bull.* 167, Feb. 1915).—Para-dichlorobenzene is highly recommended as a fumigant against all sorts of stored product insects, clothes moths, ants, &c., and it can be used instead of potassium cyanide in collecting-bottles.

It seems to be non-poisonous to higher animals, but deadly to soil insects. The author recommends 1 lb. to the 100 cubic feet for fumigation. This is effective against insects in thirty-six hours at a temperature of 75° F., but twenty-four hours is sufficient at temperatures above 85° F.—*C. P. C.*

Fumigating Seed, A Method of. By E. R. Sasser and Lon A. Hawkins (*U.S.A. Dep. Agr., Bull.* 186, Feb. 27, 1915; fig., tab., pp. 1-516).—The ordinary methods of destroying insects in stored seeds having been found unsatisfactory, it occurred to the writers to create a partial vacuum in the container in which the seeds had been placed, and fill the chamber with some gaseous insecticide, such as carbon bisulphide or hydrocyanic acid. It was thought that a much larger amount of gas might thus be forced into the crevices of the seeds and into the insect galleries than would be possible if the entrance of the gas were dependent upon diffusion under normal atmospheric pressure. This method was successfully used with a number of different kinds of seeds and insects, and a convenient chamber for fumigation under reduced pressure was devised.

The results given in the table indicate that the fumigation of seeds by the introduction of hydrocyanic acid into an air-tight chamber, from which the air has been practically exhausted, is effective, provided the exposure is not less than half an hour. An exposure of one-fourth hour is effective with the apparatus employed in these experiments if four or more grains of cyanide are used.

Fumigation by this method was found to kill insects without injury to the seed, and with a considerably shorter exposure than is necessary in the usual method of seed fumigation.—*A. A. K.*

Fungicide, A New, for use against American Gooseberry Mildew. By J. Vargas Eyre and E. S. Salmon (*Jour. Bd. Agr.* xxii. No. 11, Feb. 1916).—A diffuse article suggesting the use on an experimental scale of a solution of ammonium sulphide containing 18 per cent. of sulphur for protecting the fruit of gooseberries from mildew. It is claimed that lime-sulphur is effective for this purpose, but has the disadvantage of leaving a deposit which has to be removed before marketing the fruit, while liver of sulphur, so frequently recommended, is useless.

As regards the new fungicide, most of the experiments were conducted with the hop mildew, but the work was extended to include American gooseberry mildew. An extremely fine spray is necessary, a hand atomizer being used, and it was noted that the mycelium was reduced to a barren and dying condition, later drying up and becoming disintegrated. No stain was left on the fruit. The fungicidal action is slow, and it has happened that as long as the eighteenth day after spraying the mycelium may still be white although unable to recover.

A full description is given of the preparation of the solution, but it is stated that it is obvious that the stock solution is not one that can be prepared by the grower himself.—*G. C. G.*

Garlic, Wild, Methods of Extermination of. By H. R. Cox (*U.S.A. Dep. Agr., Bur. Pl. Ind., Farm. Bull.* 610, Sept. 9, 1914; figs.).

Garlic, Wild, and its Eradication. By F. J. Pinal (*U.S.A. Exp. Stn., Purdue, Bull.* 176, vol. xviii., Aug. 1914; pl.).—The wild garlic or wild onion (*Allium vineale*) was introduced into the United States from Western Europe probably in the seventeenth or early eighteenth century, and has spread until it has become a serious pest in many States. The cows eat the plant, with the result that their milk becomes tainted with its flavour; the farmer harvests the onion bulblets with his wheat, which is thereby reduced in selling value, while bread made from garlicky flour has a pronounced flavour and odour.

These two bulletins give directions for practically eradicating the pest, or as an alternative suggest remedial measures such as late ploughing and the sowing of uninfested wheat.—*M. L. H.*

Glandina guttata. By Dr. Trabut (*Rev. Hort. de l'Alg.*, March–April 1915, p. 41; figs.).—The writer is engaged in cultivating a form of *Glandina* sent to him originally from Puebla, which may prove to be a useful auxiliary in Algerian gardens, as it apparently feeds on the garden snail.—*M. L. H.*

Glasnevin, Plants at. Anon. (*Irish Gard.* xi. p. 88).—Notes on new plants at Glasnevin include the form of *Primula obconica* called *P. werringtonensis*, with rosy-red flowers, from high elevations; *P. silvicola* (which was shown at Vincent Square in 1915); *P. rufa*, allied to *F. Forrestii*, from which it is said to differ in habit though its flowers are similar; *Gaultheria Veitchiana*, a low-growing species from China with stiff leaves 2 or 3 inches long and 1 to 1½ inch broad; *Saxifraga cernua*, a British wild plant with white flowers and tiny red bulbs in the axils of the stem-leaves; *S. diapiensoides* (of which a figure is given); and *Lithospermum Gastoni*, less showy than *L. prostratum*, but with pretty clear blue flowers with white centres, said to be a lime-lover, but thriving in peaty soil at base of rock.—*F. J. C.*

Grape Culture, with Special Reference to Irrigation. By R. W. Allen (*Oregon Exp. Stn.*, Bull. 126, 30 pp.; 12 figs.).—Deals with the establishment of a vineyard and its cultivation, with a list of varieties recommended.—*E. A. Bd.*

Grape 'Muscat Hamburg.' By U. P. Hedrick (*U.S.A. Exp. Stn., Geneva, Bull.* 403; col. pl.).—Grafted upon Phylloxera-resistant varieties, this well-known European variety does well in the open at Geneva, N. Y. The canes are protected in winter by burying under a covering of soil.—*E. A. Bd.*

Holly. By W. Dallimore (*Garden*, May 15, 1915, p. 239).—The common kind is the most conspicuous. The bright red berries ripen early, usually in August or September, and may often be found on the bushes in March. There are now about one hundred sorts to select from, and the following are recommended:—

Ilex Aquifolium cameliaefolia, with dark-coloured leaves and a few spines.

I. A. ciliata major, a green-leaved sort, the leaf edges having fine teeth.

I. A. integrifolia has many of its leaves quite spineless.

I. A. Marmockii, a large-leaved form.

I. A. pendula is distinguished from the type by its weeping branches, and *I. A. lutea* by its yellow berries. It is to be remembered that certain trees bear male blossoms only, and some female; occasionally male and female flowers may be found on the same tree, but it is a rare occurrence. Useful male flowering varieties are Silver Queen, Golden Queen, *donningtonensis*, *ovata*, and *laurifolia*. Of the larger-leaved kinds *I. platyphylla* fruits freely, while *I. Wilsonii* has handsome foliage and bright red berries, and *nigricans*, *atlaclarensis*, and *Shepherdii* have male flowers.—*H. R. D.*

Horticulture and Agriculture, Work of Educated Women in. By Mrs. Roland Wilkins (*Jour. Bd. Agr.*, Sept. and Oct. 1915).—A marked change in the position which women hold in the professions of agriculture and horticulture is noticeable since the Great War commenced, and perhaps nothing goes to prove this more than that the Board of Agriculture has allowed the above report to be made by a woman. A few years ago such a thing would not have occurred, and moreover no one would have been interested in hearing about the educational centres that exist in England and Wales for training women as gardeners, farm superintendents, or to help at dairy work. The pity is that most of these colleges and schools receive no support and but very sparing recognition from Government, for it is almost entirely due to the activity and energy of voluntary workers or private individuals that we are, at a moment of crisis, able to turn out even the small number of professional workers for the land that we are now sending to farms and gardens. Consequently hurriedly trained recruits are being enlisted for this work, and so once again we find that other countries are far ahead of us in this matter of establishing State-aided and amply-sufficing educational facilities, whereby not alone educated women are fitted for high supervisory posts, but the peasant class is trained and thereby the rural exodus is checked. Mrs. Wilkins has brought to bear upon her work much patient investigation, and her unbiassed summary of existing training centres should greatly assist the Agricultural Education Conference in formulating a new scheme for women's work, whereby

a great Empire like ours will, it is hoped, at length, spare no pains or money to train its women to be helpful and useful in farms and gardens. Thereby alone, when the war is ended, can we hope to form happy and prosperous settlements for the ex-soldiers who, it is suggested, will have homesteads both in England and in our Dominions. Mrs. Wilkins shows in a masterly way the distinctive branches of these two professions which are held by (1) educated women and (2) village women, for it is most important that the two should be considered in their respective departments. If the servant class or village girl is encouraged to become a gardener we shall be steering toward great future difficulties, whereas if she is well trained to work on a farm she will be preparing for her future life-work of becoming the useful helpmate of the small farmer or grower. It is for this that the following sentence from Mr. De Vuyst's "L'Enseignement agricole" is worth recalling. He says: "Le soin du ménage, la culture des plantes, les soins à donner aux petits animaux etc. sont les occupations naturelles de toutes les jeunes filles. L'éducation moderne les en détournées. L'éducation future les y ramenera." Let us hope that ere long we shall have ample educational openings for them, and that never again will it be possible for an Agricultural Education Conference to report, as it has done in 1915, that, "broadly speaking, there is no definite instruction in agriculture for girls and women. The question has not been thought out from the woman's point of view."—W.

Insecticide, Quassia as a Contact. By W. B. Parker (*U.S.A. Dep. Agr., Bur. Ent., Bull.* 165, Dec. 31, 1914).—It has been generally supposed that quassia does not kill by contact, its insecticidal value being rather one of prevention than cure.

In these experiments this popular belief is dispelled, for it is demonstrated that 6½ oz. of a 40 per cent. solution of quassia in 100 gallons of water will prove nearly as effective as a similar solution of nicotine sulphate, while double the amount is slightly more effective. This equals the extract from 3 lb. of quassia chips.

The killing power of the lesser strength on hop aphid (*Phorodon humuli* Schrank) and prune aphid (*Hyalopterus pruni* Fab.) was 93.02 per cent., against 96.9 per cent. for nicotine, while the greater strength of solution killed 99.2 per cent.

The addition of whale-oil soap assisted the spreading action and increased the mortality slightly.

Suggested formula: Quassia chips 3 lb., whale-oil soap 3 lb., to 100 gallons water.—C. P. C.

Iris Bakeriana melaina. By W. R. Dykes (*Gard. Chron.* March 18, 1916, p. 155; with fig.).—Evidence that this form is of hybrid origin, the parents being *I. reticulata* and *I. Bakeriana*.—E. A. B.

Iris Species collected by Mr. Farrer in Chinese Tibet. By W. R. Dykes (*Gard. Chron.* April 8, 1916, p. 194; with 3 figs.).—*I. ensata* and a variety with purple flowers, *v. tibetica*, *I. tenuifolia*, *I. Potaninii*, *I. Tigridia*, *I. Bungei*, and *I. goniocarpa*.—E. A. B.

Kelps, The Economic Value of Pacific Coast. By John S. Burd (*U.S.A. Exp. Stn., Berkeley, California, Bull.* 248, Feb. 1915; tabs.).—Results presented in this paper furnish the following general conclusions:—

1. The giant kelps contain potassium, iodine, and nitrogen in amounts which will possibly justify commercial recovery.
2. Estimates of potash yields based on analyses of leaves and stems without taking account of the larger proportion of leaf to stem in the growing plant are likely to be higher than can be expected in the average run of commercial recovery.
3. Exact determinations of the moisture content of the more common of the giant kelps show that weight for weight of fresh kelp *Macrocystis pyrifera* contains more of each important constituent than does *Nereocystis Luetkeana*.
4. The efflorescence of potash salts when kelps are slowly dried cannot be utilized to advantage in the commercial preparation of potash if a large yield of high-grade salts is desired.
5. No technological difficulties are involved in preparing high-grade potash salts and iodine from kelp, but exact costs of production can only be arrived at from data obtained on a large scale, as in actual factory practice. Apparently, however, extraordinary profits are not to be expected, owing to the limited value of the product and the large amount of manipulation involved in the various methods of recovery.

6. Air-dried kelp will furnish a low-grade potash fertilizer comparable to kainit, and containing in addition over 1 per cent. of nitrogen and 50 per cent. of organic matter capable of furnishing humus to the soil.

7. Objections to the use of dried kelp because of the presence of sodium and chlorine are untenable, because this material contains less sodium and chlorine than most of the commercial potash salts now being used, and is but little inferior in this respect to the highest grades of muriate.—A. A. K.

Lead Arsenates, The. By H. B. Robinson and H. V. Tartar (*U.S.A. Exp. Stn., Oregon, Bull.*: 128, May 1915).—The authors have prepared a reliable method for the preparation of lead hydrogen arsenate ($PbHAsO_4$).

It is claimed that this material does not settle at anything like the rate of the basic arsenates; in the test a certain portion of the former was in suspension after one hour, while the latter had practically all settled in two minutes. This is a great advantage in field spray work.

Lead hydrogen arsenate will also kill quicker than basic arsenate. It will not, however, safely mix with lime-sulphur, too much soluble calcium arsenate, as well as lead sulphite, being formed. On the other hand, the reaction between basic lead arsenate and lime-sulphur is comparatively slight.—C. P. C.

Lilies, Some Hardy. By Sir Herbert Maxwell (*Garden*, Jan. 2, 1915, p. 3; *ib.* Jan. 9, p. 15; *ib.* Jan. 16, p. 27; *ib.* Jan. 23, p. 39; *ib.* Jan. 30, p. 51; *ib.* Feb. 6, p. 63; *ib.* Feb. 13, p. 76).—Difficulties in cultivating lilies arise mainly from two sources: (1) The species exist in a natural state under widely different conditions; (2) the majority of bulbs offered for sale have been imported from distant lands, and arrive in such a condition of impaired vitality as to render them vulnerable to disease. Imported bulbs should be treated as invalids and kept in hospital for six months to a year after arrival, and not planted in the open at once. They should be dipped in a 1 per cent. solution of salicylic acid, dusted with sulphur, and potted in 6- or 8-inch pots. Base-rooting lilies so treated which send up a strong shoot in May if the pots are full of roots may be then planted out. With stem-rooting lilies the appearance of a strong shoot is no proof that the plant can take a permanent place in the garden; the pots should be plunged outside and the flower-buds removed as they form.

The author proceeds to treat in detail of the following, giving the special treatment required in each case:—*L. Browni* and its var. *colchesterense*, *L. candidum*, *L. japonicum* (*Kramerii*), *L. longiflorum*, *L. regale*, *L. rubellum*, *L. Sargentiae*, *L. auratum*, *L. Henryi*, *L. speciosum*, *L. tigrinum*, *L. bulbiferum*, *L. concolor*, *L. croceum*, *L. davaricum*, *L. elegans*, *L. philadelphicum*, *L. canadense*, *L. chalconicum*, *L. Colchicum*, *L. Humboldtii*, *L. Kelloggi*, *L. × Marhan*, *L. Martagon*, *L. pardalinum*, *L. Parryi*, *L. pyrenaicum*, *L. pomponium*, *L. superbium*, *L. tenuifolium*, *L. testaceum*, *L. giganteum*. Perhaps these may be considered the author's list of hardy lilies.—H. R. D.

Lilium testaceum, Early History of. By H. P. (*Garden*, Feb. 27, 1915, p. 100).—A complete account of this lily is found in the "Monographie Historique et Littéraire des Lis," by Fr. de Cannart d'Hamale, Malines, 1870. It was first found by F. Ad. Haage, jun., of Erfurt, accidentally, in a consignment of Martagon bulbs from Holland. In 1840 or 1841 it was introduced into Belgium by L. van Houtte, of Ghent, who received a case from M. von Weissenborn, of Erfurt, in exchange for four fuchsias. Thence it came to England, where it was figured by Lindley as *L. testaceum* in the Bot. Reg. in 1843. It was also described by Dr. Kimtze, of Halle, as *L. isabellinum*, and has been known under the name *L. excelsum*. The question was raised whether it may not be the product of *L. candidum* with one of the Pomponium section.—H. R. D.

Lime-sulphur Spray, A Report of Chemical Investigations on the. By H. V. Tartar (*U.S.A. Exp. Stn., Oregon, Res. Bull.* 3, March 1914).—The author gives various analytical methods of determining the composition of the spray; he incidentally shows that it is the calcium polysulphides which are the active agents in the lime-sulphur solution, and advances the opinion that this is largely due to their great power of absorbing oxygen.

The detrimental effect of magnesia in the lime is also clearly demonstrated.
C. P. C.

Lime Washes, Notes on. By J. C. F. Fryer and G. P. Berry (*Jour. Bd. Agr.* xxii. No. 11, Feb. 1916).—These notes were prepared by the Entomologist and Horticulturist to the Board of Agriculture, and deal with certain aspects of the insecticidal action of lime washes. In their simplest form they are essentially

"cover washes," imprisoning or impeding the movements of insects, but frequently their action is complicated by the addition of substances likely to have specific insecticidal power, so that it is difficult to decide to which action good results are due.

Three cases are reported on:—

(1) A large apple orchard was sprayed very late in winter with lime wash, an adjacent orchard being left unsprayed. The former was remarkably free from aphides and apple sucker, which were present abundantly in the latter.

(2) Another large orchard was sprayed in sections with self-boiled lime-sulphur. The last section to be sprayed was done when blossom was nearly open. This was freest from aphides and suckers and bore the heaviest crop of fruit, while the first sprayed section was severely attacked by these insects and early lost its foliage.

(3) A damson orchard sprayed in sections with a lime wash containing water-glass. Here again the last sprayed section, done so late that injury to the blossom was feared, gave a good crop, the trees being free from aphides, while the first sprayed section was badly attacked by aphides and bore little fruit.

These results are discussed, and it is pointed out that the best results were due to the late application and that "it appears evident that their insecticidal action must have been due primarily to their mechanical or covering properties."

G. C. G.

Manganese, Its Action in Soils. By J. J. Skinner and M. X. Sullivan (*U.S.A. Dep. Agr., Bull. 42, Apr. 1914*).—The authors studied the effect of manganese chloride, sulphate, nitrate, carbonate, and dioxide on poor and good soils. All these salts, when applied in amounts from 5 to 50 parts of manganese to the million of poor soil, had a stimulative effect which was not seen when larger quantities were applied (when indeed it was even harmful) nor on productive loam. They increased growth and the oxidation power of the roots in extremely poor soils, but only oxidation was increased in good soils while growth was decreased. They consider the good effects produced in poor soil are due to the promotion of oxidation both in plant and soil. Manganese does not produce good effects in acid soils, which are unfavourable to oxidation processes, and the authors consider that manganese is unlikely to prove profitable in soil in need of liming. (See *Journ. R.H.S.* xl. p. 94).—F. J. C.

Marguerite Fly, The. By M. T. Smulyan, B.S. (*U.S.A. Exp. Stn. Mass., Bull. 157, Nov. 1914; 3 plates*).—The marguerite fly or chrysanthemum leaf miner (*Phytomyza chrysanthemi* Kowarz) is, as far as is known, a native insect and is essentially a greenhouse pest. It may be controlled by spraying with the nicotine solutions "Black-leaf 40," "Nicofume" liquid, and "Nicoticide," diluted from 400 to 450 times in water and applied at intervals of eleven or twelve days, or oftener if the temperature in the greenhouse is higher than that at which marguerites are usually kept.—V. G. J.

Mediterranean Fruit Fly in Bermuda, The. By E. A. Back (*U.S.A. Dep. Agr., Bur. Entom., Bull. 161, Dec. 1914*).—This bulletin discusses the history of the fruit fly in Bermuda, the life-history, and the possibility of eradicating it from Bermuda by strict quarantine regulations.—V. G. J.

Melon Aphid (Aphis gossypii) Glover, A Method of Controlling. By C. E. Durst (*Illinois Exp. Stn., Bull. 174, 7 pp.; 3 figs.*).—A preparation known as "Black Leaf 40" (nicotine sulphate) proved "thoroughly" successful in controlling the pest.—E. A. Bd.

Mode of Infection of Larch Canker. By Sir John Stirling-Maxwell, Bt. (*Trans. Roy. Scot. Arbor. Soc. xxix. pt. 2, pp. 131-133; 1915*).—Mr. Hiley starts with the assumption (which he undertakes to prove in a future article, but which few foresters will dispute) that the young shoots are not liable to attack until the first year's growth is complete. Next he discusses the various methods of infection to which the shoots may fall victims in their second year, but dismisses such attacks as relatively unimportant, since the side branches of the larch die quickly, and the main shoot, if affected early, is usually killed and replaced by a lateral. He then turns to the really important part of his subject, namely the origin of the more destructive cankers on the main stem.—A. D. W.

Nitrate Content of a Soil subjected to Temporary Drying Increased. By W. Buddin (*Jour. Agr. Sci.* vi. pp. 452-455).—Soil spread out and dried in the laboratory for twenty-four hours was found to contain more nitrogen than the same soil not dried. No satisfactory explanation of this difference has yet been found. Twenty-four parts in the million of soil in the unspread were raised to twenty-six and thirty, and the increase was augmented after re-moistening, while the numbers of bacteria were not increased.—*F. J. C.*

Nitric Nitrogen Content in the Country Rock. By R. Stewart and W. Petersen (*U.S.A. Exp. Stn., Utah, Bull.* 134, June 1914; 16 tables).—Some further studies on the cause of the excessive nitrogen found in certain agricultural soils in the States of Colorado, Utah, and Wyoming.

It is found that the country rocks contributing to the formation of the soils are heavily impregnated with nitrogen, some of them being much richer than the Chile sodium nitrate deposits.

These nitrogenous soils are also found to be exceedingly rich in alkali salts. The richest deposits are found in the cretaceous shales, and it is estimated that these shales contain 90,000,000 tons of sodium nitrates.

Thus in the dry States irrigation from these sections has not only increased bacterial activity but is also adding nitric nitrogen by depositing same from the water.—*C. P. C.*

North American Forest Trees in Britain. By Prof. A. Henry (*Trans. Roy. Scot. Arbor. Soc.* xxix. pt. 2, pp. 156-164; 1915).—Exotic trees are absolutely necessary for the economic production of timber in the British Isles. This is admitted in practice, and is sound in theory. Our native species are few in number, all being late immigrants from the continent of Europe after the glacial epoch, and are by no means those that are most suitable to the climatic conditions of the present day, or that are most fit for producing, as quickly as possible, valuable timber.

The Scots pine, our solitary forestry conifer, was widely spread over the British Isles in the dry, warm continental climate that prevailed at the beginning of the neolithic period; but it has, with the advent of our present humid, cool climate, gradually disappeared from all parts of the islands, except in the great mountain massif of the Scottish Highlands. It is at the present time distinctly a tree for use in certain districts only, characterized by a low annual rainfall and much sun in late summer and autumn, as in Speyside and Deeside in the north, and in the sandy heaths of the south and east of England. In such districts it regenerates freely, and attains a great height, producing a satisfactory volume of timber of good quality.—*A. D. W.*

Orchard Experiments in Pennsylvania. By J. P. Stewart (*Exp. Stn. Pennsylvania, U.S., Bull.* 134, 20 pp.; 3 figs.).—A summary of various experiments. Various methods of root grafting show no practical difference. The selection of grafts from superior individual trees so far fails to show any advantage, as has been demonstrated elsewhere. Experiments in top grafting are interesting, but the varieties used are not commercial sorts of this country. Dynamiting the soil before planting gave no definite results as against normal planting. Manurial and cover-crop experiments are also reported.—*E. A. Bd.*

Pea Aphis in 1914, Control of Green. By L. B. Smith (*Exp. Stn. Virginia, Bull.* 13, Oct. 1914; 1 fig.).—This aphis (*Macrosiphum pisi* Kalténbach) is one of the most troublesome and destructive insects with which growers of market-garden crops in Virginia have to contend. It passes about eight months of the year on clover (especially red). The varieties of peas grown for conducting the spraying experiments were 'Gradus,' 'Thomas Laxton,' 'Nonpareil,' and 'Pilot.' The plants became infested with the aphids during the last week in April, coming from a field of crimson clover lying next the peas. The most satisfactory sprays were:

No. 1. "Black-leaf 40" (nicotine-sulphate)	. 10 ounces
whale-oil soap	. 4 lb.
water . . . . .	. 50 gallons
No. 2. Whale-oil soap	. 5 lb.
water . . . . .	. 50 gallons

It is necessary to spray within a day or two after the aphids first appear on the pea vines. Two or three sprayings may be required, especially in bad cases, the second application to come about a week after the first.—*V. G. J.*

Peach 'Niagara.' By U. P. Hedrick (*U.S.A. Exp. Stn., Geneva, Bull.* 403; col. pl.)—A handsome seedling from the well-known 'Crawford,' ripening a little later; probably raised in Maryland.—*E. A. Bd.*

Peaches, Varieties and Classification. By H. P. Gould (*U.S. Dep. Agr., Farmers' Bull.* 650, 13 pp.)—Lists of peaches for various States in the U.S.A., times of ripening &c., with a short scheme of classification upon geographical lines.—*E. A. Bd.*

Pear Psylla, Adults and Eggs, Susceptibility to Spraying Mixtures of Hibernating. By H. E. Hodgkiss (*U.S.A. Exp. Stn. New York, Bull.* 378, May 1914; 3 plates, 2 figs.)—Investigations show that the best means of killing the "flies" is spraying during a period of warm weather, preferably in November or December, or during March or early April.

The most satisfactory mixture is $\frac{3}{4}$ of a pint of tobacco extract (40 per cent. nicotine), in 100 gallons of water, to which are added 3 to 5 lb. of soap.—*V. G. J.*

Pear Stock. (*U.S.A. State Com. Hort. Cal.* vol. iv. No. 7, July 1915; 10 figs.)—Contains an account of the blight- and insect-resisting qualities of the Chinese wild pear, and the suggestion that it might be very useful for stock purposes in California.—*V. G. J.*

Phlox Drummondii, Heredity of Flower Colour in. By A. W. Gilbert (*Jour. Agr. Res.* iv. p. 293-302, July 1915; plates)—True types were selected by breeding for three years, and crossings were made with the usual precautions. The unit characters concerned in producing colour are described as (1) a dark eye factor producing dense colouration at the centre of the flower. This was dominant over its absence, the white eye, which was exhibited in more or less of a definite pattern. (2) A blue factor. (3) A red factor. (4) An intensifying factor which determines the degree of pigmentation of the reds. (5) A yellow factor which acts only in the presence of the eye factor.

The reds and blues are cell-sap colours, and the yellow is due to yellow chromoplasts.—*F. J. C.*

Phytophthora infestans, Perennial Mycelium in Related Species. By I. E. Melhus (*Jour. Agr. Res.* v. pp. 59-70, Oct. 1915; pl.)—The author shows that many of the species of parasitic fungi related to the potato-disease fungus, *Phytophthora infestans*, live over winter in the tissues of their host as well as in the form of resting spores. This is the case in *Phytophthora cactorum* (in *Panax quinquefolium*), *Cystopus candidus* (in *Capsella* and *Lepidium*), *Plasmodiopsis viticola* (in the vine), *P. pygmaea* (in *Hepatica acutiloba*), *P. Halstedii* (in *Helianthus diversicatus*), *Peronospora Dipsaci* (in *Dipsacus Fullonum*), *P. Schachtii* (in beet), *P. alsinearum* (in chickweed), *P. grisea* (in *Veronica hederaefolia*), *P. effusa* (in spinach and orach), *P. Ficariae* (in *Ranunculus Ficaria* and *R. fascicularis*), *P. parasitica* (in cress), *P. Viciae* (in *Vicia sepium*), and *P. rumicis* (in sorrel). The presence of living mycelium of *Phytophthora infestans* in the potato tuber is therefore by no means a unique phenomenon among its allies.
F. J. C.

Pine, Canker of the Scots, caused by Dasyscypha subtilissima, Cooke. By A. W. Borthwick, D.Sc., and Malcolm Wilson, D.Sc., F.L.S. (*Trans. Roy. Scot. Arbor. Soc.* xxix. pt. 2, pp. 184-187; 1915).—During recent years several accounts have been given of the occurrence of the larch canker on various species of *Pinus*. Hopkinson has recorded its occurrence on *Pinus Laricio*, and points out that it may also be found on *P. sylvestris* and *P. austriaca*. Massee has also recorded its occurrence on the Scots and Austrian pines as well as on the silver fir.

Our present knowledge goes to show that the fungus is not of infrequent occurrence on the above-mentioned species. It must, however, be borne in mind that *Dasyscypha Wilkommii* is not by any means the only species of the genus which produces canker on these trees, and it is possible that some confusion has arisen owing to the great resemblance which exists between the fructifications of the several species which cause disease in conifers.—*A. D. W.*

Pine Shoot Moth, The European. A Serious Menace to Pine Timber in America. By August Busck (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 170, Feb. 1915; 6 plates).—This moth, known scientifically as *Evetria buoliana* Schiffermiller, has been recently introduced from Europe on imported pine seedlings and has become established in widely-separated localities in the Western and middle States. Its attacks are confined to all species of pine; it does not touch any other conifer.

The larvæ are so well protected within the buds that no spray will touch them, and the only method of combating it is that used in Europe for over 100 years, viz. the pruning and destruction of infested buds and twigs.—V. G. J.

Planting Fruit Trees. By the Duke of Bedford and S. U. Pickering (*Woburn, 15th Rep.* 1916, pp. 20-66).—In their Ninth Report the writers describe how trees planted in ways contrary to all accepted practice gave as good results as those carefully planted, and in some cases better. This Report gives the results of further observation on abnormally planted trees, and describes experiments supporting their explanation of the results. Efforts were made to ascertain the distribution of new rootlets formed after transplanting (pp. 20-34). In the case of apples it was found that less than half of the rootlets originated within the last half-inch of the old roots (which had been trimmed before planting), whereas with currants and gooseberries more than half originated from this half-inch. The stoutness of the roots originating from the stems was found to be on an average 20 per cent. greater than that of roots forming elsewhere. Trimming the roots before planting is regarded as altogether unimportant (p. 32). Observations made in the case of over a thousand trees in a great diversity of soils proved that the results of ramming the soil on planting are beneficial, the greatest benefit being on heavy soil, except in the case of some trees on a London clay, where the results were harmful (p. 36). Experiments were undertaken to ascertain whether apple trees in a heavy soil suffered less from canker if they were planted higher than usual. Varieties specially liable to this disease were planted with their roots flush with the surface of the ground, and they suffered less than other trees of the same varieties planted in the ordinary way, but the difference was not very great (pp. 42-7). As regards cutting back on transplanting, the authors still strongly favour the practice, though they admit that the bad effect of delaying the cutting, from a fruiting standpoint, may be partially counterbalanced, as far as the growth of the trees is concerned, by the extra growth which follows cutting back when this is finally performed.—A. P.

Plum 'Late Muscatelle.' By U. P. Hedrick (*U.S.A. Exp. Stn., Geneva, Bull.* 403).—A German variety which has proved valuable at the Geneva station, being esteemed one of the best of late Plums. As a dessert fruit its very free stone is a recommendation.—E. A. Bd.

Plums derived from Native American Species. By W. F. Wight (*U.S.A. Dep. Agr., Bull.* 172, 44 pp.).—A list of Plums of American origin, giving probable parentage and origin. *Prunus americana* is responsible for the majority cited, but none of these equal those of the old world. The native species were fully described in a previous bulletin.—E. A. Bd.

Plums, Varietal Resistance to Brown Rot. By W. D. Valleau (*Jour. Agr. Res.* v. pp. 365-396, Nov. 1915; pl.).—The brown rot in question is caused by the fungus *Sclerotinia cinerea*. The ascospore stage is apparently only produced after the sclerotium in the mummy fruit has been buried in the ground for two years; the mummies may have hung for one year. Infection, which occurs through stomata and lenticels, may occur at any stage of fruit development, but varieties differ much in the structure of these organs, and plugs and cork layers produced beneath or in them materially affect the ease of infection. Varieties also show differences in resistance to rot after infection, those which remain firm on ripening being resistant to brown rot. The varieties experimented with are little known in England, and the paper should be consulted on this and other points.—F. J. C.

Poisoning Trees with Arsenic and Soda. (*Queensland Agr. Jour.* May 1915, p. 225).—Trees may be killed by ring barking when in full growth and applying to the ringed portion a solution made of 2 lb. arsenic and 1 lb. soda to 2 gallons of water. Keep all animals away from utensils containing same, and no animals should be allowed access to portions of the paddock dealt with in this way for some weeks afterwards.—C. H. H.

Poplar and Willow Borer (*Cryptorhynchus lapathi* Linn.), Experiments in the Control of the. By Robert Matheson (*Jour. Econ. Entom.* viii. Dec. 1915, pp. 522-525).—Carbolineum emulsion applied to the trunks from the ground level up to the growth, during the period the grub of the borer hibernates below the surface of the outer bark, was found to be an effective control.

The emulsion was prepared as follows: 1 lb. sodium carbonate, 1 quart hot water, 1 quart carbolineum avenarius. The sodium carbonate was dissolved in hot water and the carbolineum then added, stirring vigorously.—G. W. G.

Poplars, New Balsam. By A. Henry (*Gard. Chron.* April 29, 1916, p. 230; with 2 figs.).—These are *Populus balsamifera* var. *Michauxii*, and a hybrid of *P. deltoides*, L., var. *monilifera*, A. Henry, and *P. balsamifera*, L., named *P. Baileyana*, but corrected on p. 274 (May 20) to *P. Jackii*, Sargent, an older name.—E. A. B.

Potato Canker, A Contribution to the Life-history of Spongospora subterranea. By L. O. Kunkel (*Jour. Agr. Res.* iv. pp. 265–278; pl.).—The author is led by his observations to conclude that not single cells but a plasmodium invades the healthy tissue of the potato tuber, pushing down between the cells and finally infecting them. The invaded cells are stimulated to abnormal growth and division. Tubers affected by canker or corky scab and stored are apt to spread the disease to others, for the spores germinate and produce amoebae which form plasmodia which cause secondary infections. The plasmodia feed on the tissue around the old canker spot. The author has observed the germination of the spores and believes he has obtained plasmodia on culture media.—F. J. C.

Potato, Late, and Blight Fungus, Persistence in the Soil. By F. C. Stewart (*U.S.A. Exp. Stn., New York, Bull.* 367, Oct. 1913).—Boxes of soil containing potato haulms and tubers attacked by *Phytophthora infestans* were left in the field until January 20, when they were brought into a house and planted with potatoes. Some of the plants raised were sprinkled with an infusion of the soil containing decaying tubers and stems, the air in the chamber being kept saturated with water. No infection with *Phytophthora* resulted, and the author concludes that the presence of diseased tubers in the soil does not increase the risk of an outbreak of the disease.—F. J. C.

Potato, Phytophthora infestans in. By I. E. Melhus (*Jour. Agr. Res.* v. pp. 71–102, Oct. 1915; pl.).—The author's experiments lead him to conclude that the mycelium of the potato disease fungus, *Phytophthora infestans*, grows in potato tubers and finally reaches the sprouts. Its growth is retarded below 5°C. and in dry soil, but infected tubers rot rapidly in warm wet soil. A temperature of 23°–27°C. and a well-watered soil are most favourable to the spread of the fungus in the tuber and its growth into the sprouts. The mycelium grows from the tuber into the stem, where it travels up to the surface of the soil and then forms spores. The planting of diseased tubers may thus cause an outbreak of the disease. Such outbreaks may start from single infected shoots.—F. J. C.

Potato Scab and Sulphur Disinfection. By C. D. Sherbakoff (*U.S.A. Exp. Stn., Cornell, Bull.* 350, Aug. 1914; figs.).—The scab referred to is that produced by *Actinomyces chromogenus* (*Oospora scabies*). The experiments show that heavy dressings (350–400 lb.) of sulphur incorporated with the soil reduce the amount of scab to a marked extent, but do not completely eliminate it. Such dressings are likely to reduce yield, while light dressings, e.g. 100 lb. to the acre, may have a fertilizing effect, but are far less effective checks upon scab. [It may be added that land which received a medium dressing of sulphur in 1914 produced scabby potatoes at Wisley in 1915 in varieties in which the seed tubers were scabby.]—F. J. C.

Potatoes, Bordeaux Mixture versus Lime-sulphur as a Spray for. By M. T. Munn (*U.S.A. Exp. Stn., New York, Bull.* 397, Feb. 1915).—This bulletin describes the continuation of experiments carried out in 1911–1912, *Bulletins* 347–352.

The results were exactly the same, and go to confirm previous results, that lime-sulphur should not be used as a potato spray.—C. P. C.

Pot-bound Plants, Danger in Planting. By Alex. M. Wilson (*Garden*, Feb. 20, 1915, p. 87).—This danger is illustrated by two photographs of a plant, *Pitosporum Colensoi*, which was planted five years previously. The roots, following the curvature of the pot, had gradually strangled and constricted the stem to such an extent that it had only required an extra puff of wind to effect complete severance.—H. R. D.

Primulas, Some New, from China (*Jour. Soc. Nat. Hort. Fr.* April 1915, p. 50).—Mgr. Leveillé, in *Le Monde des Plantes*, March 1915, has described six new species of *Primula* discovered by E. Maire in Yunnan, a district known to be particularly rich in varieties of this plant.

These six are: *C. virginis* Leveillé, growing at a height of from 3,300 to 3,400 mètres, bearing 2–4 bright-blue flowers; *P. pirolaefolia* Lev.—flowers blue or

violet, growing at a height of 800-1,000 mètres; *P. racemosa* Lev., growing at 600 mètres, violet-mauve flowers; *P. Mairei* Lev., 3,300 mètres up, flowers dark blue or dark violet; *P. Blinii* Lev., 3,400 mètres up, pink-flowered; *P. Ragotiana* Lev., 3,000 mètres, violet-flowered.—*M. L. H.*

Pruning Fruit Trees. By the Duke of Bedford and S. U. Pickering (*Woburn, 15th Rep.* 1916, pp. 67-76).—The conclusions detailed in the Seventh Report have been substantiated by further experiments. In one series the omission of all pruning increased the blossoming nearly fourfold (average of six years), whilst the substitution of hard for moderate pruning reduced it to about one-half. Pruning in summer on dates varying from July 15 to September 1 produced more blossom than pruning in winter, and the benefit increased regularly the later it was performed within these limits. Further experiments on these lines are in progress.—*A. P.*

Quince, Hybrid (*Pyronia* × *Veitchi* Trab.) (*Rev. Hort. de l'Alg.*, July-Dec. 1914, p. 248, and March-April 1915, p. 49).—For the first time a hybrid pear-quince has fruited at the Botanical Station in Algeria, and the fruit proved to be delicious when cooked. It had the skin and flesh of the pear, with a strong flavour of quince. The name of *Pyronia* × *Veitchi* has been given to this hybrid, sowings from which have resulted in plants of three different types, showing traces of their hybrid origin in varying proportions.

These varieties will be described and named when their fruits are more known. Grafts of the original cross are ready for distribution. (See *JOURNAL R.H.S.* 1910.)
M. L. H.

Radio-active Ores and Residues, The Effects of. By M. H. F. Sutton (*Messrs. Sutton's Bull.* 6, 1914; figs.).—Radish, lettuce, and pea crops dressed with radio-active ore showed considerable superiority over those grown in plain soil, but the cost of the ore far outweighed the value of the increase. No material difference was apparent between trials with ore incorporated with the soil and those where it was placed at the bottom of the box or pot. Acceleration of germination was shown in rape, but not more by high than by low-grade residues.
F. J. C.

Radishes and Sugar Beets, A New Fungus Parasite of. By H. A. Edson (*Jour. Agr. Res.* iv. p. 279-292, July 1915; plates).—The fungus now described for the first time, and named *Rheosporangium Aphanidermatus*, is closely allied to *Pythium Debaryanum* and produced disease similar to that caused by the ordinary damping-off fungus. The present paper describes the fungus in detail.—*F. J. C.*

Railway Rates on Timber. By J. W. Mackay (*Quart. Jour. of Forestry*, No. 4, vol. 9, pp. 283-298; October 1915).—Alleged preferential rates on foreign timber.—The alleged preferential rates on foreign timber are, in many cases, only a preference given to sawn timber as compared with round. A preferential rate given for timber merely on account of its being of foreign origin would be illegal. The railway companies can and do charge very low rates, for instance, on pitwood from ports to mines, but this may be only for the purpose of diverting steamer traffic to ports in which they are interested, which in its turn induces other and possibly more profitable traffic, and a rate open to one is open to all.

Railway rates in War-time.—With the purpose of enabling firms to keep their works going, English railway companies are now quoting specially low rates of carriage on home-grown pitwood, but these are confined to timber not exceeding fourteen feet in length, consigned direct to a mine, at actual machine weight, and the rates will not apply after the termination of the war.

The Scottish railway companies have agreed to charge a maximum rate of 10s. a ton on pit timber for any distance during the war, the existing rates below that figure being unchanged.—*A. D. W.*

Raspberry 'Black Pearl.' By U. P. Hedrick (*U.S.A. Exp. Stn., Geneva, Bull.* 403).—A seedling raised in Missouri in 1915. Its hardiness and resistance to drought make it suitable for districts where raspberries do not usually flourish.—*E. A. Bd.*

Raspberry 'Marldon.' By U. P. Hedrick (*U.S.A. Exp. Stn., Geneva, Bull.* 403, col. pl.).—A new variety, first distributed in 1908 from the Geneva station, where it was selected from over one thousand seedlings. Of the Marlboro' style, it is more vigorous, stocky, and of good flavour.—*E. A. Bd.*

Resin Spray for Vegetables. (*Queensland Agr. Jour.* June 1915, p. 276.)—The trouble with Paris green and some other sprays is that they will not stick to the glossy leaves of cabbages and cauliflowers, but collect at the base of the stalk and at the junction of the stalk and leaves. The following wash, however, will stick like varnish, and in an instant destroy all insect life on the plants:—Take 20 lb. of resin, 4 lb. caustic soda (98 per cent.) (or 6 lb. 70 per cent.), 3 pints of fish oil or 2½ lb. whale-oil soap, and 140 to 150 lb. of water. Place all the above ingredients in a boiler with 20 gallons of the water, and let the whole simmer for three hours. Then add hot water slowly, and stir well till there are at least 40 gallons of solution. Then add cold water to make up the quantity to 140 or 150 gallons. Never add cold water when cooking.—C. H. H.

Rhododendrons, Good Garden. By H. (*Garden*, April 10, 1915, p. 172.)—Much attention has recently been given to hardy Rhododendrons, and numerous seedlings have been raised from seeds sent home by collectors. The author makes the following selection:—

'Alice,' rich clear pink, one of the Rhododendrons of the future.

'Countess of Clancarty,' with large trusses of light rosy-crimson flowers.

Cinnabarinum, an upright bush with curious pendulous bell-shaped flowers, orange red or crimson.

Compactum multiflorum, often under 2 feet high, with white pink-flushed flowers, borne in profusion in April and May.

'Cornubia,' a new hybrid that is being largely planted, but is more suited for warm districts; flowers glowing scarlet-crimson, habit very erect.

'Fortunei,' a Chinese species with large, delicate pink, fragrant blossoms, distinguished from other kinds by their greater number of petals. Hybrids of this are 'Miss E. A. Boulton,' 'Mrs. Thiselton Dyer,' and 'Duchess of York.'

Caucasicum, an early-flowering species, of compact habit; flowers white, or flushed pink.

'Doncaster,' a compact plant, flowering abundantly; blossoms scarlet-crimson.

'Gomer Waterer,' white, tinged pink.

'John Waterer,' intense carmine.

'Lady Clementina Mitford,' trusses large and shapely, a charming shade of peach, but some have found it difficult to cultivate.

'Mrs. E. C. Sterling,' a new variety of great promise and compact habit, with medium-sized trusses of delicate pink flowers free from spots.

Nobleanum, the most interesting of outdoor Rhododendrons, often in flower at Christmas. A tall bush with bright red flowers, often damaged by frost; the best for forcing.

'Pink Pearl,' more grown than any variety. The flowers are a delicate flesh pink, but the habit is not all that one would desire.

Racemosum, a very beautiful species from Western China; it is so dwarf that it takes many years to attain 3 feet. The small rose-flushed flowers are produced in axillary as well as in terminal clusters.

Campylocarpum, a Himalayan species with large yellow flowers, tall growing. Though considered tender, it will grow in sheltered positions in the London neighbourhood.—H. R. D.

Rhododendron lacteum. By I. B. B. (*Gard. Chron.* March 25, 1916, p. 168; with 3 figs.)—Shows that the plant cultivated under this name with white flowers marked with crimson is not the true *lacteum*, in which the flowers are cream or yellow. The name *R. fictolacteum* is therefore proposed for it.—E. A. B.

Rose Chafer, The Poisonous Effects of the, upon Chickens. By G. H. Lamson, junr. (*Jour. Econ. Entom.* viii. Dec. 1915, pp. 547-548).—Serious losses of chickens have occurred from time to time through the eating of the rose chafers (*Macrodactylus subspinosus*).

Experiments conducted by the writer confirmed his belief that death was due to a poison as well as to mechanical injury of the crop. As near as can be determined, the rose chafers contain a neuro-toxin that has a direct effect upon the heart action of both chickens and rabbits. Mature hens did not die from the poison.—G. W. G.

Soil Fertility, Nitrogenous Soil Constituents and their bearing on. By O. Schreiner and J. J. Skinner (*U.S.A. Dep. Agr., Bur. Soil, Bull.* 87; 11 plates; 32 tables).—The effect of various nitrogenous compounds found in soils is herein discussed.

The general trend of the evidence proves that plants can make use of many of the organic compounds direct, and that such compounds are able to replace nitrates as plant foods.

Certain of the organic compounds, notably guanidine and solanine, have decidedly harmful effects on plant life.

The value of this work to soil investigators and students is great, for a knowledge of the beneficial and harmful compounds is of very great importance, and may prove to be the first step towards the solving of many now obscure problems.

C. P. C.

Soil Protozoa, Activity of. By G. P. Koch (*Jour. Agr. Res.* v. pp. 477-488, Dec. 1915).—Many encysted protozoa exist in soils, but it is only when in the active condition that they can destroy bacteria. The author concludes that under ordinary greenhouse conditions small protozoa of various types are active in some soils, but their presence is limited; that active protozoa do not appear to be present in field soils, and therefore cannot limit the number of bacteria; they are present in the encysted form and may become active when standing water accumulates, moisture being the principal influencing factor, organic matter, temperature, and the physical properties of the soil being secondary ones. One or two hours are sufficient to wake the small protozoa to an active from an encysted condition, while forty hours may be required by larger forms.

F. J. C.

Soil Sterilization, Partial, by Antiseptics. By W. Buddin (*Jour. Agr. Sci.* vi. pp. 417-451, Dec. 1914).—Treatment of soil by means of antiseptics is followed by an initial decrease in numbers of bacteria, followed by a large sustained rise; protozoa and nitrifying organisms are killed; an initial increase in ammonia content followed by a considerable rise, and in productiveness of the soil. No increase in the dose causes any change in the results when once partial sterilization is effected. True partial sterilization has been obtained only with easily volatile and removable antiseptics, while substances not completely removable have a lasting influence on the micro-flora. Benzene, toluene, phenol, cresol, cyclohexane, pentane, hexane, heptane, chloroform, ether, acetone, formaldehyde brought about partial sterilization. These have proved to increase the productive capacity of the soil in pot cultivations, but are unsuitable for application on a larger scale.—F. J. C.

Soils, Effect of Heat on Hawaiian. By W. P. Kelley and W. McGeorge (*U.S.A. Exp. Stn., Hawaii, Bull.* 30, Dec. 1913).—Heating to 100°C. was found in nearly all cases to bring about an increase in the water-soluble mineral constituents of the soil, with the exception of iron, also an increase in ammonification. Much the same results were observed at 200°C., but there was a loss of 25 per cent. of the total nitrogen content.

Treating the soil with a temperature of 250°C. showed the same effects, but much intensified. Igniting the soils, however, decreased the solubility of the lime and magnesia.

Treatment at 200°C. stimulated ammonification in the field, but caused cessation of nitrification for two months.—C. P. C.

Strawberry 'Amanda.' By U. P. Hedrick (*U.S.A. Exp. Stn., Geneva, Bull.* 403).—A mid-season fruit of promise, standing the rough usages of market transport. Originated in Ohio in 1904.—E. A. Bd.

Strawberry-growing. By J. G. Moore (*U.S.A. Exp. Stn., Wisconsin, Bull.* 248, March 1915; figs.).—Detailed instructions on the whole art and craft of strawberry-growing as practised in Wisconsin.—M. L. H.

Strawberry-varieties. By O. M. Taylor (*U.S.A. Exp. Stn., Geneva, Bull.* 401, 28 pp.).—A useful report of a trial of a large number of varieties tested at the Geneva Station. Varieties are first grouped as to different characters, such as season of flower, vigour of plant, susceptibility to disease &c., and are afterwards described in full botanical detail with historical notes. Few European varieties are recorded.—E. A. Bd.

Sunflower Growing for Seed. (*Queensland Agr. Jour.* April 1915, p. 137).—Tall mammoth Russian sunflower yields 50 bushels of seed from an acre, the head being 15 inches in diameter and bearing 2,000 seeds; 4 to 6 lb. of seed are sown to the acre, in drills 5 feet apart; the seed is dibbled at intervals of 3 feet; the plants may be thinned afterwards to ensure full exposure to the sun. When the plants are 12 inches high a slight earthing up is beneficial.

The leaves of the sunflower, when sun-dried, pounded, and mixed with meal or bran, make good fodder for milch cows. The oil expressed is almost equal to olive oil, and was worth before the war £12 a ton. The seed yields 15 to 20 per cent. of oil. The price of sunflower seed is about £15 a ton; a 40-bushel crop at 30 lb. a bushel would be worth about £7 10s.—C. H. H.

Thrips as Pollinators of Beet Flowers. By Harry B. Shaw (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 104, July 1914; 3 plates, 5 figs.).—From experiments conducted it is seen that numerous species of Thysanoptera, some of which more or less injuriously infest all our plants, are also active agents in pollination. Among beet flowers they are usually very numerous indeed, effecting both close and cross pollination upon them. But, taking into account the various forms of injury they do, it is doubtful whether the balance remains in their favour in regard even to beets.

The author suggests that certain supposed mutations may really have been the result of unsuspected cross-pollination by means of one or other species of thrips.—V. G. J.

Timber-growing for Profit. By G. Mowat (*Trans. Roy. Scot. Arbor. Soc.* xxix. pt. 2, pp. 210-211; 1915).—If all landowners went in for timber-growing with the same method and enthusiasm as they give to the raising of agricultural crops, there is no reason why it should not become equally if not more profitable. The great trouble is, they do not or will not regard trees as a crop, but rather look upon them as useful or ornamental objects. The rule is to go into the wood and cut down the tree most suitable for the purpose in hand, regardless of the effect that the removal of the said tree may have on its neighbours.—A. D. W.

Tomato Insects, Root-knot and "White Mold." By J. R. Watson (*U.S.A. Exp. Stn. Florida, Bull.* 125, Dec. 1914; 13 figs.).—There are in Florida many insects that attack the tomato, the most serious being boll-worm or tomato fruit worm (*Heliothis obsoleta*); it is also found in ears of sweet corn, and attacks green peas, beans, cotton, and other plants. In the case of the tomato, the eggs are laid on the leaves in early spring; the young larvæ feed on the leaves for a few days and then bore into the stems. Directly the fruit is set they bore into the inside and feed on the pulp. They wander from one fruit to another, and a single caterpillar can spoil several tomatos in a day. Spraying with lead arsenate at the rate of 2 or 3 lb. to 50 gallons of water during the time the larvæ are feeding will destroy them. The spraying must be discontinued a week before picking.
V. G. J.

Tomato, *Phoma destructiva* causing Fruit Rot. By C. O. Jamieson (*Jour. Agr. Res.* iv. p. 1, Apr. 1915; 6 pl.).—Inoculation experiments show that *Phoma destructiva* is an active wound parasite upon green and ripe tomatos, forming brown to black spots in the middle of sunken areas, on which the fungus fruits are produced especially near the centre of the spot. Leaf-spotting (the spots being black) also occurs, and the potato is liable to attack in the same way. A full description of the fungus is given, and literature cited.—F. J. C.

Transpiration Rate on Clear Days. By L. J. Briggs and H. L. Shantz (*Jour. Agr. Res.* v. pp. 583-650, Jan. 1916).—The authors carried out a long series of experiments with various plants in order to ascertain the effect of cyclic environmental factors upon the rate of water loss on clear days. The measures and rate curves of transpiration and evaporation are given and the full results (which are too lengthy to quote) are discussed. Some differences were found in the behaviour of different plants towards external conditions, e.g. the transpiration curve for cereals rises steadily but not uniformly on clear days from sunrise to a maximum usually reached between 2 and 4 P.M., after which it rapidly falls; the transpiration graphs for broad-leaved plants used show more symmetrical curves, reaching a maximum between twelve and two and falling approximately with the radiation. The general conclusion that plants under conditions favouring high evaporation do not respond wholly as free evaporating systems, even if bountifully supplied with water, and no visible wilting occurs, is in agreement with the findings of other experimenters.—F. J. C.

***Ulmus minor*.** (*Quart. Jour. of Forestry*, No. 4, vol. 9, pp. 332; October 1915.)—This elm is what I consider to be *Ulmus minor*, Miller. It is identical with the elm first described by Goodyer in Johnson's edition of Gerard's Herbal in 1633, as *Ulmus minor folio angusto scabro*. Goodyer found it growing in hedgerows between Lymington and Christchurch. The specimen sent is from

that locality. It is usually very peculiar in appearance, having a stem curved at the summit and with few short branches, forming a very narrow crown. It is common near Cambridge in hedgerows, and has been seen in Lincolnshire, Norfolk, Suffolk, Essex, Northampton, Bedford, Oxfordshire, and Hampshire. It is closely allied to the Cornish elm, *Ulmus stricta*, wild in Cornwall, but has a different habit and a distinct distribution. See "Trees of Great Britain," vol. 7, p. 1901.—A. D. W.

Violas, Dwarf, for Rockery. Anon. (*Irish Gard.* xi. p. 81).—Deals with the cultivation and use in the rock garden of *Viola gracilis*, *V. arenaria rosea*, *V. bosniaca* and some of its forms, *V. calcarata*, *V. cenisia*, *V. cornuta* and the var. *Papilio*, *V. cucullata*, *V. glabella*, *V. hederacea*, *V. Munbyana*, *V. olympica*, *V. pedata* (a difficult plant), *V. rothomagensis*, and *V. Rydbergi*. *V. gracilis* and its forms, of which 'Golden Fleece,' 'Blue Jay,' and *eburnea* are good, is apt to "flower itself to death," and should be cut over before all the flowers are dead to induce it to break out at the base.—F. J. C.

Water, Hot, against Plant Pests. By Achille Magnieu (*Jour. Soc. Nat. Hort. Fr.* July 1915, p. 104).—An article pointing out the great additional efficacy of spraying mixtures, both against insect and fungoid pests, when applied hot. The winter has proved by experiment that with vines and fruit-trees the fully-grown leaves are not permanently injured by a spraying with liquid at 75°C., continued for a few seconds. Young immature growth will stand spraying in the same way at a temperature of 70°C., and flower-buds, flowers, stamens, &c., can bear it up to 65°C.

The hotter the mixture the greater seems to be its moistening power, and one or two sprayings carefully and thoroughly carried out at suitable times will serve to destroy both the insects and their eggs.

For fungus diseases hot solutions are also useful, though of course their action is curative, not preventive, and they must not be expected to destroy mycelium in the interior tissues. There exists at present no apparatus specially designed for applying hot solutions, but they may be quite successfully managed with the help of a portable iron copper.—M. L. H.

Water of the Soil, Studies on the Relation of the Available, to the Hygroscopic Coefficient of the. By F. J. Alway (*U.S.A. Exp. Stn., Nebraska, Res. Bull.* 3, June 1913; 122 pp.; 37 ill.; 36 tables).—Contains the results of a four-year series of experiments carried out to determine the amount of water available to the plant as compared with its total available water and hygroscopic coefficient.

For these experiments a number of cylinders, 6 feet long, 6 inches diameter, were used, holding about 100 lb. of soil. To this soil was added the requisite amount of water, and various plants were grown without any further addition of water until the plants died.

The total and free water was then determined, and the distribution of roots observed.

It was shown that the amount of soil water available to plants was approximately equal to the free water, viz. the difference between the hygroscopic coefficient and the total water available to and occupied by roots.—C. P. C.

White-Fly Control, 1914. By J. R. Watson (*U.S.A. Exp. Stn. Florida, Bull.* 123, Sept. 1914; 5 figs.).—"The ideal method of controlling the white fly is to spread parasitic fungus during the rainy season and to spray with miscible oil emulsion in spring and fall."—V. G. J.

White-Fly, The Woolly. By J. R. Watson (*U.S.A. Exp. Stn. Florida, Bull.* 126, March 1915; 9 figs.).—The woolly white-fly (*Aleurothrixus Howardi* Quaintance) is rapidly spreading; it usually does little damage, but is certainly capable of causing great harm unless preventive measures are taken. It is heavily parasitized by a minute wasp-like fly, which sooner or later controls an outbreak. Because of this it will probably never develop into as serious a pest as the common Citrus white-fly.—V. G. J.

Windbreaks and Ornamental Planting. By R. W. Allen (*U.S.A. Exp. Stn., Oregon, Bull.* 125, Feb. 1915; figs.).—Gives many hints on the formation of windbreaks and on ornamental planting, suggests reasons for the selection of certain trees, and advises what to do and what to avoid in the method of planting. It condemns the planting of tall-growing trees in such a way as to interfere with air drainage. Such barriers to the movement of the air become

a strong factor in creating local frost areas. Open spaces should always be left through windbreaks in depressions and on the lower sides of partly enclosed fields, so as not to hinder the movement of cold heavy air from high to low elevations.—*M. L. H.*

Wood-boring Insects, A New Mixture for Controlling: Sodium Arsenate Kerosene Emulsion. By F. C. Craighead (*Jour. Econ. Entom.* viii. Dec. 1915, p. 513).—Tests made on *Goes* (work similar to *Prinoxystus* and *Cyllene pictus*) showed that whilst kerosene emulsion penetrated the wood and galleries it was seldom in sufficient quantity to kill the larvæ.

The result of trials with the addition of a 5 per cent. to 10 per cent. arsenical solution were, however, highly successful. The mixture is applied to the holes where the boring dust exudes, and the solution quickly ascends along the sides of the burrow and through the frass, often to a distance of 10 or 12 inches, killing the larvæ in a few days. The remedial measure is equally efficacious on seasoned wood as when applied to living trees.—*G. W. G.*

Woolly Aphis. By E. N. Cory (*Jour. Econ. Entom.* viii. p. 186, Apr. 1915).—Experiments were made to exterminate the woolly aphis by soil treatment with soluble oil (1 : 15), scalecide (1 : 15), Electro Insecticide soap (1 lb. to 4 gallons water), lemon oil (1 : 24), Nico-sul (1 : 240), lime sulphur (1 : 9), undiluted pine tar creosote (1½, 2, or 3 quarts to a tree), kerosene emulsion (10 per cent.), tobacco dust (1½ to 3 lb. to a tree), apterite (1 lb. 3 oz., 2 lb. 6 oz., and 4 lb. 12 oz. to a tree). Only the pine-tar creosote treatment was successful. Undiluted all the aphides were killed; in 6 per cent. emulsion most were killed. All the materials used were applied in a trench dug round the roots of the affected tree. The creosote had a remarkably persistent odour, its smell being apparent 21 months after its application. The author noticed the ant, *Lasius interjectus*, in close connexion with the aphis and suspects it to be instrumental in spreading it.

F. J. C.





FIG. 35.—THE LATE MR. JOSEPH GURNEY FOWLER.

[To face p. 209.]

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JOSEPH GURNEY FOWLER.

Born at Woodford, Essex, December 5, 1855.

Died at Pembury, Kent, April 24, 1916.

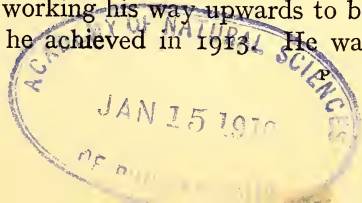
Treasurer of the Society, 1899-1916.

Chairman of the Orchid Committee, 1905-1916.

FAR and wide wherever British Horticulture flourishes, and universally among the ranks of the Royal Horticultural Society, the profoundest consternation and regret were felt on the first hearing of the sad news of Mr. Gurney Fowler's death—a regret which time only fixes more deeply in the hearts and minds of all true gardeners.

Mr. Gurney Fowler was a twin, and the two boys were so much alike as to be continually mistaken one for the other, a condition of affairs which continued all through their lives. The brother, Mr. J. W. Fowler, died in July 1915, so that they were not long divided.

Mr. Gurney Fowler received the first part of his education at Grove House School, Tottenham—an institution long since swept away by the encroachments of the builder—and on leaving school in 1872 he and his brother, with a tutor, went to Göttingen, and thence to Geneva and afterwards to Paris, in order to obtain facility with the German and French languages. His first start in business life was at Messrs. Sharples' bank at Luton, where he remained two years before joining the firm of Messrs. Price, Waterhouse & Co., accountants, with whom he spent the remainder of his life, beginning quite at the beginning and gradually step by step working his way upwards to be senior partner, which proud position he achieved in 1913. He was



well known and much respected among his professional brethren and in commercial circles, and was recently appointed advisory accountant to the Government in connexion with the compensation due to railways taken under State control, and also a member of the Board of Referees for the assessment of excess profits. He acted as auditor to many of the principal financial organizations in this country, including the largest railways and insurance companies. In the United States, which he frequently visited on professional business, he was one of the pioneers in the establishment of the Accountancy Profession. He was active in the founding of branch offices of his firm in America, which have since extended over both the North and South American Continents and elsewhere.

He was a good all-round sportsman—a good shot and a keen golfer, but his chief hobby was horticulture—not by any means Orchids only, as anyone who saw his garden and wood at Pembury could testify. Orchids, however, were his special interest, an interest aroused about 1884, when he went on a business visit to Buenos Ayres, whence, without knowing anything much about them, he brought back in his cabin two sacks full of “dried sticks,” as one member of the family called the dry and shrunken *Cattleya* bulbs. These ‘dry sticks’ he hung up in a damp and steamy glasshouse and watched eagerly for the first signs of growth. Then he began to read about them and study them. Other Orchids followed, and then better houses for them, and from that time onward Orchids were irresistible. In his model range of Orchid-houses he possessed some of the finest gems of the Orchid world; in fact, so choice was his collection and his judgment so keen that only those of the very highest quality were retained; all inferior varieties, whether hybrids or species, being discarded after once flowering. Under these conditions the standard naturally became very high. He took a keen interest in the cultivation of his plants, and most of his time when at home was spent in their midst.

No amateur was more successful than Mr. Gurney Fowler in the raising of hybrids; he had thousands of beautiful little seedlings raised at Brockenhurst, which, no doubt, had he been spared to see flower, would have given him the greatest of pleasure; with his Orchids, as with all his other undertakings, thoroughness was his motto. He was very fond of Nature in any shape or form, but was not a botanist; indeed, he was often somewhat impatient of the minutiae of detail and microscopic differences observed by the scientific botanist.

In 1905 he was appointed Chairman of the Orchid Committee of the Society, a post he filled most worthily to the day of his death, and in which his passion for accuracy and uniformity had the happiest outlet. First, he instituted a revision of the list of awards, in which the names of many plants formerly used had proved to be incorrect. Then he separated the species from the hybrids, and by other minor changes arrived at the perfectly arranged list we have to-day, thanks to his periodical and annual revisions: a list which one of our foremost

orchidists declares "will form the basis for other workers for all time." No one would have any idea of the labour and attention which went to the making of this book : every dot or hyphen must be exact, every smallest irregularity in the type must be put right ; his thoroughness was almost unbelievable !

Feeling that it was unsafe to rely entirely and solely on the memory of past exhibits when estimating the merits of so-called New Varieties brought before the Committee, he induced the Council to have coloured paintings made of all Orchids obtaining a First-class Certificate or an Award of Merit. This has proved a most beneficial step for securing the accuracy of Awards, and at the present moment there are 2,300 valuable paintings from which selections are used for comparison at every meeting of the Committee.

And many other things he did for the Society. The last was to initiate a new Gold Medal for Orchids, somewhat smaller than the existing one, to be called the Williams Medal ; but this, though well in hand, was not quite completed when he was taken from us.

Nor must we omit to mention his work as Chairman of the Directors of the International Horticultural Exhibition of 1912, the success of which was very largely due not simply to his initiative and direction, but to his personal oversight and unremitting labour—work which "would have overtaxed the powers and outworn the patience of most men."

On the death of Mr. Philip Crowley in 1899 Mr. Fowler was appointed Treasurer of the Society, and a better appointment it would be difficult to imagine and impossible to have made. One who knew him well says of him : "On the subject of finance he could read through a brick wall. When I took him some perplexing document or deep enigma he would look at it for a moment, ask some question, and then give the solution in an astonishing, almost miraculous, manner." The Society owes him an endless debt of gratitude for the masterly manner in which he handled its finances, and for the clear and lucid style in which he always explained them at the annual meeting.

This short and inadequate notice may aptly conclude with the personal note so felicitously struck by the *Gardeners' Chronicle* on the Saturday after Mr. Fowler's death (the extracts are almost but not quite verbatim).*

In the prime of life one of the most conspicuous personalities in the world of horticulture and one of its truest and wisest friends has been taken from us. Tall and burly of figure, with a very deep and sonorous bass voice ; direct, and at times almost brusque of speech, Mr. Fowler was a tower of strength to the Society, and that strength was founded, as all moral strength is founded, on character. Direct, downright, and possessed of the simple clarity of mind that ever accompanies high character, he had the Englishman's impatience of mere words and the Englishman's love of action.

* *Gardeners' Chronicle*, April 29, 1916, p. 2401

Cautious, as becomes a man of high position in the financial world, he had that finest and most fertile kind of wisdom which springs no less from the heart than from the brain. Fairness of mind was so characteristic of him as to appear to be instinctive ; and never was that fairness shown more conspicuously than on those occasions when good arguments were urged against some course of action to which he was inclined. On such occasions he would sweep aside his own proposals with scarcely any ceremony.

He was buried with simple ceremonial in the graveyard at Pembury in Kent, the Vicar of the Parish conducting the funeral.

One by one the great figures in the horticultural world are passing. To them, and to the fine work they have done, the younger men owe it to emulate their example, and to see to it that the progress of British Horticulture, which we owe in great measure to men such as Mr. Gurney Fowler, shall be maintained and carried forward during the difficult years that lie before us.

SOME ASPECTS OF SPRAYING AGAINST PESTS.

By A. H. LEES, M.A.

[Read May 2, 1916; Dr. F. KEEBLE, F.R.S., in the Chair.]

ONE is sometimes asked by somewhat irritated inquirers why "all these pests" which attack crops grown by man are so abundant, the implication being that in the good old days no such unpleasantnesses had to be faced. The question is an interesting one, and leads one to ask why there has been such an apparent increase in the number of enemies attacking horticultural crops. No doubt, crops had their enemies in bygone days, for who has not heard of the canker-worm and the palmer-worm of Biblical history? In those days, however, "murrains" and similar visitations were looked upon as events altogether outside man's control, and as such to be accepted with as much equanimity as possible. At any rate, one may be sure that insect pests were present when there were no commercial plantations of fruit. Nevertheless it is obvious that not only has the number of kinds increased, but many kinds are found now in far greater numbers. There are several causes for this. The most important probably is the great increase of land planted with fruit. It is natural that where a district is found to suit fruit there fruit is planted, with the result that one may find in certain parts of England hundreds of acres where fruit plantations are practically contiguous. Under these conditions an insect living on fruit trees naturally flourishes. Food is abundant and easily accessible, so that such an insect, if occurring at first but on a single tree, will, in course of a few years, if unchecked, soon extend over the whole fruit area. Such a process can often be seen in action. The smaller winter moth, *Cheimatobia brumata*, has been known in the Evesham district for well over fifty years. It is present everywhere in that district, usually in great numbers. Suppose, however, one looked for this insect in a district where fruit-growing on a large scale was comparatively new. Should not one find a different state of things? Seven years ago I was in the Wisbech district, where the spread of the winter moth could be observed. The moth was abundant in the gardens close to the town, but as one went farther out it became scarcer and scarcer as the gardens tended to become more and more scattered, till at a radius of five miles it was difficult to find.

That was a case of an insect increasing owing to the increase in the density of fruit plantations. There is, however, another cause for the spread of insect pests, and that is through the transference of nursery stock from one district to another. I am aware that

nurserymen nowadays are fully alive to this danger and do their utmost to check it. Many cases have nevertheless occurred in the past. One of the most conspicuous is that of the disease known as Big Bud in black currants, caused by the presence of the mite *Eriophyes ribis*. Before the nature of the disease was known the swollen buds due to it were thought to indicate especially healthy bushes, and were propagated and distributed under that idea. Even now that the disease is known, I do not believe that many nurserymen would dare to guarantee their stock free from it, so difficult is it to detect if present in only small quantity.

There is a third cause that may or may not have had influence on the growth of insect pests, and that is man's interference with natural agents. When man starts cultivating land that was previously under natural vegetation he immediately begins to disturb the balance of Nature. Perhaps he cuts down trees and so disturbs the nesting-places of insectivorous birds, or perhaps he deliberately kills certain birds which he considers harmful to himself, but which may be at the same time of use in keeping down noxious insects.

So, too, when he plants acres and acres of fruit he alters the balance of Nature, which had previously existed under purely agricultural conditions. But little is known of this complicated and interesting subject, and I do no more than suggest it tentatively as a third cause of increase of insect pests.

Whatever the causes, the fact remains that insect pests have greatly increased in the last few decades, and that, were no control measures put in force, crops would be reduced to a minimum. Up to now, chemical methods, and especially spraying, have proved themselves the most efficient. They are, perhaps, the most direct in action, and usually give the quickest results. One must remember, however, that the whole question of insect control is in its infancy; and, because spraying is the best means available at present, it by no means follows that no other methods will subsequently prove of greater avail. Already the interesting work done on parasites of economic insects in America, and the success that has been obtained by the use of bacterial diseases of the locust, indicate other and possibly more far-reaching means of control. At present, however, spraying undoubtedly holds the field, and it may be well to consider the question from as broad a point of view as possible.

One frequently meets people who seem to think that spraying is a necessary thing in itself in fruit-growing. They appear to regard it in much the same way as many people regard patent medicines, with the eye of faith. They read, in the advertisements of proprietary spray-fluids, that such and such a one will kill every egg, insect, and fungus spore that is present on a tree, and with touching faith they apply it without troubling to notice whether their trees happen to be afflicted with these same diseases or not. I do not mean to say that all proprietary spray fluids are useless, but I do insist strongly that much blind and unprofitable spraying is done.

For successful spraying, therefore, the first essential is to know what pest the plant is suffering from ; the second is a knowledge of the life-history of the pest. To illustrate the importance of this knowledge I will briefly give the life-history of one of the common apple pests, *Aphis sorbi*, or the rosy-apple aphid. In the winter it exists on the apple as little black shining eggs, laid chiefly on or near the leaf scars of the fruit spurs. Towards the end of April it hatches, and a purplish-green larva comes out, which immediately begins to feed on the under-side of the leaves. At first it does nothing but feed and moult and grow, but after a varying number of days it becomes fully grown, and is then purplish, mealy, and rather globular in form, and is known as a queen mother. At this point it begins to bud off little pinkish larvæ, which immediately insert their probosces into the under-side of the leaves, causing extensive curling. This production of young takes place without the intervention of a male. The young, when fully grown, repeat the process, and so it goes on through several generations. Towards the end of June, winged individuals appear, and these no longer feed on the apple, but fly to another host-plant, so that towards the end of July the apple is free from this insect. In September, winged migrants from the second host-plant fly back to the apple and produce a generation of winged males and wingless females. These females soon begin to lay their eggs on the apple twigs, and the life-history is thus completed.

When one considers this life-history it is clear that from a spraying point of view one may divide it into four periods :

- (1) The egg stage.
- (2) The young larval stage, before there is much leaf-curling and before the queen mother has commenced to bud off young.
- (3) The viviparous stage, when the leaves are curled and active reproduction is going on.
- (4) The autumn stage, when males and females are present, but no leaf-curling is caused.

Of these stages (1) and (3) do not lend themselves to treatment. No wash has yet been produced that will kill aphid eggs, so that spraying in the winter against this pest has so far been a failure. The viviparous stage is equally difficult, owing to the excessive leaf-curl preventing penetration by a spray. This leaves two other stages in which the aphid is comparatively vulnerable. I do not propose to enter into a discussion here as to the relative advantages of spring and autumn spraying. There are difficulties in both, but the point I wish to bring out is that they both present a vulnerable stage in the insect's life-history, and that this knowledge enables us to attack it with the greatest prospect of success. The knowledge of an insect's life-history is thus an essential for success in its control.

So far two essentials for successful spraying have been considered, namely identification of the pest and knowledge of its life-history. There is in addition a third, and that is a knowledge of the action

of the spray-fluid to be employed. It is of little use, for instance, treating an aphid attack by the application of lead arsenate, since this insect feeds, not on the leaf, but in it, so that stomach poisons on the surface of the leaf fail to act.

Having thus discussed the conditions for successful spraying, the spray-fluids themselves may be considered in rather more detail.

In order to avoid confusion of treatment in this rather diffuse subject, it is well, if possible, to introduce some kind of classification. While I have never seen any definite system set forth by any writer on spraying, there is or was a more or less definite inclination to divide the subject into winter and summer treatments. Winter spray-fluids may be divided into those meant purely for cleansing the tree and those that are supposed to have a definite lethal action on insects or insect eggs. Summer spray-fluids are divided into :

- (1) Contact washes.
- (2) Stomach poisons.

Into this system the comparatively modern practice of lime-spraying against such pests as apple-sucker fits badly, and I propose to adopt a rather different method, which has merits from the point of view of convenience, though it does not pretend to be a natural classification. It has been remarked previously that the life-history of an insect is highly important, since a knowledge of it enables one to pick out that stage which is most vulnerable. This is true enough, but it is not the only essential. The condition of the host plant must also be considered, since this has much to do with ultimate success in insect control. It is possible, and indeed often happens, that when an insect is in the most vulnerable stage the host plant is also most sensitive to damage or is in some other way unsuitable for spraying. Thus the host plant, the apple, is in flower at a stage in the life-history of the apple-sucker when its eggs have hatched and the larvæ are still fairly young and vulnerable, but the tree cannot then be sprayed with most spray-fluids owing to the likelihood of damage. Or again, at the viviparous stage of the apple aphid the insect is very easy to kill if only one can reach it with the fluid, but this is then almost impossible owing to excessive leaf-curl.

I propose, therefore, to make the basis of the classification a temporal one, and to divide spray fluids according to whether they are applied in :

- (1) The active season.
- (2) The semi-dormant season.
- (3) The dormant season.

By the active season is meant the time when the tree is nearly or quite in full leaf, which thus extends from late spring till late autumn. The dormant season indicates that period when the buds are resting and there is no foliage present—that is, during the winter. Semi-dormant is a clumsy term, used for the want of a better. By it is meant that period from the time when the buds just begin to burst

until the flowers begin to unfold. Strictly speaking, it should be included in the "active season," but there are certain peculiarities which justify its being put in a separate class. It is obvious that one kind of tree, say a pear, may pass out of the dormant state into the semi-dormant at an earlier period than another kind of tree, such as the apple, so that it is possible for a pear to be in the semi-dormant state while an apple is still in the dormant. These terms, therefore, do not apply to particular times of the annual cycle, but to the state of the trees under consideration. This thus brings the condition of the trees into proper relationship with the question of spray-fluids, so that one would not say, for example, that 2 per cent. caustic soda is a suitable winter spray so much as that it is a suitable spray for trees in the dormant condition. If one calls it a winter spray it should mean that one might apply it with safety in winter. One would certainly call January a winter month, and yet certain pears may begin to open their flower buds as early as that month in a year such as 1916, but spraying with 2 per cent. caustic soda would be a dangerous operation. Following this preliminary classification, it is now proposed to consider some of the more commonly used fluids.

Spray-fluids applied during the Active Season.

During this season insects are generally, if not always, in a more vulnerable condition than in the dormant, and therefore spray fluids used are comparatively weak.

They may be divided into two classes :

- (1) Stomach poisons.
- (2) Contact insecticides.

Stomach Poisons.—The principle of the action of stomach poisons is simple. The material is sprayed on the leaves of the tree, and any insect feeding on these leaves absorbs a certain amount of poison and dies. It is necessary, of course, for the poison to be insoluble in water, since soluble poisons are nearly always harmful to the tree. At the same time they must be of such a nature that they will be acted upon by the insect's digestive juices and brought into a soluble form. The earliest of these stomach poisons to be used on a commercial scale was Paris green. Its use started some time between 1860 and 1870, when the Colorado beetle was ravaging the potato lands in America. Shortly afterwards the substance known as London purple was introduced, but never gave such reliable results owing to the frequent variation in its composition. For many years, despite its tendency to burn, Paris green held the field, and it was not till somewhere about 1906 or 1907 that lead arsenate was introduced. This substance at once proved its worth, owing to its freedom from burning, its effectiveness, and to the fact that it could be prepared in the form of a paste. So far it is still the most commonly used stomach poison, though both in England and in America other bodies have been suggested and tried. I do not, however, propose to discuss these here.

Contact Insecticides.—Where an insect feeds by sucking the juices from a plant instead of biting it, it is clearly impossible to poison it through the stomach. Many of the most important pests of fruit trees belong to the sucking type. One only need mention aphis, Psylla, red spider, and plant bugs to indicate how important it is to possess a means of controlling them. A considerable number of such contact insecticides exist. There is room for much work on the precise nature of their action, but they all agree in acting on the insect either through the skin or through the breathing tubes.

The question naturally arises as to what are the essentials for an effective contact insecticide. The very name supplies the answer. Firstly, it must make contact, and, secondly, it must be insect-killing. At first sight this appears to be a truism. It is quite possible, however, to have a fluid that makes contact, namely wets an insect, without being insecticidal, and it is also possible to have a fluid that would be insecticidal if only it made contact with the insect. The first condition is therefore wetting power. Within the last two or three years the importance of wetting power has begun to be realized, but as its importance is not so widely recognized as it should be I propose to go into the question briefly. As the subject involves rather abstruse physical questions, the full discussion here would be out of place, and indeed the conditions on which wetting depends have not yet been thoroughly investigated. The question has been discussed by LEFROY* and by COOPER and NUTTALL.†

Looked at from a purely practical point of view, however, the problem may be stated thus :—Pure water when sprayed on to insects has very little wetting power; that is, instead of spreading evenly over the surface it tends to collect into relatively large drops. How, therefore, may one alter its nature in such a way that it shall spread evenly over the insect sprayed and really make contact?

There exist, fortunately, certain substances which, when dissolved in water, give to the solution the desired property. Chief among these and the longest known is soap. The potassium compound or soft soap is the most serviceable and the most commonly used. It is cheap and effective up to a certain point, but its value is limited by two factors. Firstly, it can only be used in mixtures which do not contain any soluble salts of metals or bases except those of sodium, potassium, and ammonium, since soluble metallic salts act on the potassium stearate of the soap with precipitation of metallic stearates, which not only destroy the wetting properties of the soap, but in addition clog up the spraying nozzles.

Secondly, the wetting power of even strong solutions is not great enough to wet such resistant surfaces as that of the waxy coat of the woolly apple aphis, or, amongst fungi, the felted mass formed by the conidial stage of American gooseberry mildew. It is possible, however,

* "Insecticides," *Journal of Applied Biology*, vol. i. Nos. 3 and 4.

† "The Theory of Wetting," *Journal of Agricultural Science*, vol. vii. part 2.

to overcome the second difficulty by the introduction of paraffin to form an emulsion with the soap. Suitable emulsions have greatly enhanced wetting powers, and by that means it is possible to wet with ease even the most resistant surfaces.

It is undoubtedly true that paraffin emulsions have earned for themselves a bad name owing to the tendency of some of them to produce burning of the foliage. When one examines some of the many formulæ that have been advocated, one is struck by two facts: firstly, the great variation in the ratio of soap to paraffin, and secondly, the relatively high proportion of paraffin used in many of them. The great amounts of paraffin and the small amounts of soap used where the paraffin content is low constitute one of the reasons for liability to burn. Another reason may be found in the imperfect making of these emulsions. The errors in making may be best understood after a consideration of the structure of emulsions.

A perfect emulsion of paraffin in soap solution consists of numerous minute drops of paraffin, each surrounded by a film of soap. It is this film of soap which prevents any one paraffin droplet from touching and coalescing with its neighbour. As long as the soap solution is strong enough to prevent this tendency the paraffin remains in proper emulsion, but as soon as it becomes so diluted that one paraffin drop can join its neighbour de-emulsification sets in and free paraffin rises to the surface. It is therefore clear that if the soap be not present in sufficient quantity the emulsion is unstable and therefore dangerous to use. This condition may arise either through insufficient soap being present in the first instance or through dilution of an otherwise stable emulsion. It is also clear from what has been said that the efficiency and freedom from burning will depend on the smallness of the paraffin drops. It is important, therefore, to see to it that in the first instance the paraffin shall be well broken up. This is best effected on a small scale by violently syringing the paraffin into a hot soap solution, using an ordinary garden syringe with a rose attached for the purpose. On the large scale an emulsion may be best obtained by placing the mixture of paraffin and soft soap solution in the container of a spraying machine and pumping it with violence through the pump back into the container through a narrow jet. If made by simply stirring or agitating paraffin with soap solution, an imperfect emulsion is obtained and the resulting mixture is almost sure to scorch. It is unnecessary to go into details here, as it is hoped shortly to publish a paper on the subject. It will be sufficient to summarize the results. With water of moderate hardness, such as is represented by the figure 12¹ of the hardness scale, it is possible to divide the various emulsions into three classes. These are:

- (1) The unstable and dangerous.
- (2) The risky.
- (3) The safe.

The first class, or unstable, consists of those which contain so little soap that free paraffin soon appears on the surface of the liquid. An

example of such may be found in an emulsion where soft soap is present only to the extent of $\frac{1}{2}$ per cent. and the paraffin to the extent of 5 per cent. Such an emulsion is almost bound to scorch, and should be discarded.

The second class, or risky emulsions, consists of those which, although reasonably stable when kept unagitated in a vessel, are liable to partial de-emulsification when sprayed forcibly on to a plant. In this class the amount of soap is so reduced that, though in a quiescent state it is sufficient to prevent the paraffin globules uniting with each other, yet, when subjected to mechanical shocks as in the act of spraying, it is not sufficient, and a certain amount of free paraffin is received by the plants sprayed. An emulsion containing 1 per cent. of soap and 2 per cent. of paraffin is an example of this class. Such emulsions should not be used in practice, and indeed their use is not necessary, as full wetting power may be obtained by the safe formulæ.

The third class is stable even when sprayed. A higher proportion of soap is present and a lower one of paraffin than in many spray-fluids commonly advocated. The most satisfactory of this class, regarded from the point of view of great wetting power and absence of scorching, is found in the formula 2 per cent. soap, 2 per cent. paraffin. This mixture is capable of wetting woolly aphids of apples or the conidial stage of American gooseberry mildew.

Besides soap and paraffin emulsion there are certain other substances that have been advocated for their wetting powers, such as saponin, casein, and gelatine. Saponin is rather an expensive substance, but casein and gelatine are used in such small quantities that their cost is negligible. Casein is suitable for alkaline solutions, and gelatine for neutral or acid ones. The strengths advised vary between one in a thousand and one in ten thousand. In the following table the wetting power of casein, gelatine, soft soap, and paraffin emulsions are compared.

COMPARATIVE WETTING POWER OF VARIOUS SUBSTANCES.

Surface	Gooseberry Leaf	Sea-kale Leaf	American Gooseberry Mildew
Substance			
Water	Nearly complete	None	None
Gelatine, 1 in 1,000	Complete	Very slight	"
" " 1 in 10,000	"	"	"
Casein, 1 in 1000	"	"	"
" " 1 in 10,000	"	"	"
Soft Soap $\frac{1}{2}$ %	"	Slight	"
" " 1%	"	Nearly complete	Very slight
" " 2%	"	"	"
Paraffin Emulsion			
" " 1% , 1%	"	"	Moderate
" " 1 $\frac{1}{2}$ % , 1 $\frac{1}{2}$ %	"	Complete	Nearly complete
" " 2% , 2%	"	"	Complete
" " 1% , 5%	"	Wets by oil, not by water	Wets by oil, not by water
" " 2% , 1%	"	Complete	Moderate

Three different surfaces were used for the trial: an easily wetted one, the gooseberry leaf; one wetted with moderate difficulty, the sea-kale leaf; and one wetted with great difficulty, the summer stage of American gooseberry mildew. From the table one may see that gelatine and casein slightly increase the wetting power, while the stronger soap solutions still further increase it, but only by the 2 per cent. 2 per cent. paraffin emulsion, by which is meant one containing 2 per cent. soap and 2 per cent. paraffin, is complete wetting of the mildew achieved.

Having considered the necessity of wetting power in a contact insecticide, the lethal power remains to be discussed. Soap by itself and paraffin emulsions are to a certain extent lethal and may suffice by themselves in certain cases, but for the more resistant insects a more powerful poison is required. Of these the more commonly used up to now have been nicotine in some form and quassia. Were it not for its expense, nicotine would be an almost ideal insecticide, since it acts to a certain extent as a stomach poison as well. Quassia is an old-established substance, but suffers from the fact that to prepare it much boiling is needed. Certain of the coal-tar derivatives are frequently used in proprietary washes, but are often dangerous to foliage. Perhaps the only other contact insecticide in common use is lime-sulphur. Conflicting claims have been advanced for it, but the most recent experience seems to prove that its use is limited to the control of scale insects and that it has not much effect on others. There is in fact a decided dearth of suitable simple substances having an insecticidal value, and there is much room for chemical research in this direction.

Spray-fluids Applied in the Semi-dormant State.

There are certain advantages to be obtained by using a spray-fluid at this period instead of during the active season. The buds are just bursting, and there is thus a minimum of foliage, so that the tree can not only be far more effectively sprayed but much less spray fluid need be used. At the same time this very young foliage is surprisingly resistant to spray damage. Spraying during the active season usually means a certain interference with other operations of fruit culture, owing to withdrawal of the necessary labour, while in the spring labour can usually be more easily spared. The most important spray fluid employed at this time is the cover wash of lime, first introduced by Mr. HOWARD CHAPMAN. Like many good inventions, it proved its value before its method of action was explained. It was originally used as a control measure for apple-sucker, and its use has been subsequently extended to the control of aphids. Considerable doubt existed at first as to the exact manner in which it acted. Many growers asserted that it was necessary to use the mixture as hot as possible, and urged that its good results were due to the causticity of the lime; others suggested that the coat simply sealed in the eggs

and prevented the escape of the larvæ. Now chitin, the substance of which the egg-shell consists, is a very resistant body, being quite unaffected by treatment with as strong an alkali as 10 per cent. caustic soda for a considerable period. It did not appear likely, therefore, that so weak an alkali as lime would have any appreciable effect. It was also found that the thicker the coat and the later it was applied the more effective it was. These facts clearly pointed to the sealing-in explanation as the correct one. In order to try to settle this point, twigs on which the eggs of apple-suckers were laid were brought into the laboratory and treated with various lime mixtures. Among these were lime wash in proportion of 1 lb. of lime to 1 gallon of water, 2 lb. to 1 gallon of water—the latter being applied both freshly slaked and in the cold well slaked condition—and a whiting-glue mixture, which gave a particularly firm coat.

When the eggs on the control twig hatched, the results on the coated twigs were noted. It was found that on the one coated with the thinner lime wash, a considerable number of suckers had reached the buds. On both the twigs coated with the thicker lime mixture only very few were found in the buds, while the whiting-glue mixture had prevented the hatching of all but two. If now the action had been due to the causticity of the lime, one would not have expected many to hatch on the twig coated with the weaker but hot lime mixture, while one would have expected them to hatch in abundance on the twig treated with the thicker but well slaked and presumably non-caustic lime.

The contrary was, however, the case.

To make certain of what had happened the cover coat was in each case carefully dissolved off by dilute acid. It was then found that the apple-sucker eggs under the thicker coats had tried to hatch, nearly every egg being split. The dead larvæ were found in all stages, some outside the egg under the lime coat, some half-way out, and some still inside. Anyone seeing these results could have no doubt that the action of lime was a mechanical one.

If then the action is for the most part at any rate mechanical, it is most important to obtain the firmest and most resisting coat possible. The thickness of the coat at the time of hatching of the eggs will obviously depend on two factors :

- (1) The nature of the coat.
- (2) The time of its application.

A very short experience of lime-spraying is enough to show that an ordinary lime coat leaves much to be desired. It is liable to flake and does not resist rain and wind well.

In the winter of 1912-13 experiments were begun at Long Ashton in order to find some more effective coat than the ordinary lime spray. A large number of mixtures were tried,* and after two years a fairly

* Lees, "Winter Cover Washes," *Ann. App. Biol.*, vol. i, nos. 3 and 4, and vol. ii, no. 4.

satisfactory mixture was found, which has since given good results. Summarizing the experience obtained, one may say that for ordinary lime wash the following conditions apply :

(1) The lime should be good white lump lime of 98 per cent. purity.

(2) It should be freshly burnt and not air slaked.

(3) It should not be overburnt.

(4) Twenty pounds should be used to ten gallons of water.

(5) The best results are obtained by allowing it to slake for at least six hours, if possible until it is quite cold.

(6) It should be strained through a sieve with sixteen meshes to the inch, and applied by means of a machine and nozzle especially adapted for lime spraying.

(7) It must have time to dry on the tree before rain falls.

With regard to lime mixtures the most noticeable thing is that the addition of nearly every substance injures the resulting coat. An improvement was found, however, in the following formula, which was the most satisfactory mixture obtained :

Lime 25 to 30 lb. (depending on its freshness).

Hide glue 2 lb.

Potassium dichromate $\frac{3}{8}$ oz.

Water 10 gallons.

It is essential for the success of this mixture that the lime should be thoroughly slaked and cold, since hot or partly slaked lime renders glue immediately insoluble. The crux of the mixture was the potassium dichromate. This salt, under the influence of light, has the property of rendering gelatine, the essential body in glue, insoluble. It should be weighed out fairly accurately, as a moderate excess renders the glue insoluble before the spray is applied and a slight excess causes a very hard but too brittle coat. Recent experience has shown that this mixture is not very successful if applied during very dull weather. This is explained by the action of the dichromate. In sunny weather the glue is in a soluble state until it is sprayed on to the tree, when, under the influence of light, it becomes insoluble as the spray dries. If the weather is dull this does not happen. It is possible that by increasing the amount of potassium dichromate a better result might be obtained, but this has not yet been tested.

The other factor which influences success in lime spraying is the time of application. When first this treatment was advocated the time to spray was said to be as late as possible, just before the buds started, but recent experience from growers and experimenters alike has shown that it may with advantage be done very much later than this. How late has not yet been exactly determined, but experiments are now in progress at Long Ashton to throw some light on this point. Trees are being sprayed with various cover washes at various stages, and the results are being noted. As it is difficult to describe in words

the exact state of the tree at the time of spraying, photographic records are being made. It is hoped shortly to publish these results.

The first thing one notices is the extraordinary resistance to spray damage shown by the young growths, so that at first sight, at any rate, it does not appear that the time of spraying need be influenced by fear of damage to the tree. These results agree with those found by BARKER and GIMINGHAM* in their work on Bordeaux spray injury. In their experiments they found that, so long as the cuticle of the leaf was uninjured mechanically previously to spraying, no damage followed; but where such injury had occurred, whatever its cause, scorching of the leaf ensued.

One may assume, therefore, that lime wash may be applied any time before the flowers actually open. If that proves to be the case the question arises at what precise period should lime spraying be done. The pests against which it is used are apple-sucker, apple aphid, and plum aphid. In average years the apple-sucker begins to hatch early in April, and continues to do so for a period of three weeks or so. Of the three apple aphids, *Aphis fitchii*, the stem and blossom aphid, and *A. sorbi*, the rosy aphid, usually give the most trouble.

A. fitchii hatches early in April, attacks the flower buds, and does not cause leaf-curling, while *A. sorbi* hatches late in April and very soon causes leaf-curling. Now, if spraying is done at the beginning of April, so as to stop *A. fitchii*, it is very likely that there will not be a thick enough coat remaining on the tree to stop the hatching of *A. sorbi*, while if it is done towards the end of April to stop *A. sorbi*, *A. fitchii* will have already hatched and reached the flower buds, where the probability is that it will escape the effects of the spray. Where both forms are present, therefore, the position is difficult, and it is further complicated if apple-sucker is also present.

Only experience can show the best time, though it is probable that the middle of April will prove most suitable. Similarly, the best time for plum-spraying will probably be just as the white of the flowers is beginning to show.

Sprays Applied during the Dormant Season.

Under this head come all those fluids which serve mainly for cleansing the tree from growth of lichens, moss, and algæ. The practice of lime-washing trunks of fruit trees is an old one, and undoubtedly serves a useful purpose so far as it goes.

One feels instinctively that a tree with a clean smooth bark should be a healthy tree, but instinct is not always a safe guide. One is perhaps too prone to look at the condition of the tree from the purely anthropomorphic view instead of from the point of view of the tree. Cleanliness in man is said to be next to godliness, and too often it is regarded as being next to fruitfulness in a tree, with a result that all kinds of caustic mixtures are used until the bark is smooth and

* Barker and Gimingham, "The Action of Bordeaux Mixture on Plants" *Ann. App. Biol.* vol. i. no. 1.

clean, but at the same time becomes what is known as hidebound. The bark, even in winter, is not dead, and an annual winter washing is liable to cause a certain amount of injury. There are, however, certain circumstances in which a winter cleansing is fully justified. If codling moth or apple-blossom weevil be present it is necessary to destroy their winter quarters as thoroughly as possible, and under such conditions the practice is warranted; but when spraying is employed merely to make the trees look nice, frequently more harm than good is done.

Amongst the cleansing washes by far the most effective is 2 per cent. caustic soda. The older formulæ included potassium carbonate, but subsequent experience has shown that it is of no particular advantage, merely adding to the expense without increasing the efficiency.

Next to caustic soda in cleansing power comes lime wash. Unless trees are in a very rough state this is usually sufficient, and when it is used in spring against apple-sucker and aphid the trees never require any winter washing.

At the bottom of the list comes lime-sulphur, though some growers contend that it has as great cleansing power as lime. It is sufficient to remove the green coat caused by the alga *Pleurococcus*, but not rough bark or thick moss.

While cleansing washes have established their position as sprays to be applied during the dormant season, I venture to think and hope that a far greater field of usefulness exists for winter spraying. Of old we were told that winter spraying would kill insect eggs and fungus spores, and would act like a magic charm against all pests. Apparently no one took the trouble to make exact experiments to see whether eggs really were killed, or what was the effect of such winter spraying on them. Gradually, however, bitter experience discredited the wild statements that had been circulated by makers of proprietary washes and others, and the contrary position was taken up that winter washes could not possibly kill winter eggs.

Before discussing the question it would be as well to examine what advantages would accrue supposing the practice were possible.

When considering the question of lime-spraying, it was found difficult to determine the exact time at which this should be done. If done too early some insects would hatch, if too late some would already have hatched. The winter, however, allows of many weeks when the work could be done. It may be objected that the weather is bad in winter and good in spring. As a general proposition that is undoubtedly true, but it must be remembered that spring spraying has to be done within a period of one or two weeks if possible, and effective work is usually limited to three or four at the utmost. How often spring weather is boisterous and windy, when spraying is well-nigh impossible! In winter, however, spraying can be done any time from November to February, thus allowing a period of three or four

months instead of three or four weeks. That is the first advantage. The second is that in winter labour is abundant, while in spring, and still more in summer, ordinary cultural operations are quite enough to employ all the labour available. A third advantage is the thoroughness with which it is possible to cover a tree in the dormant stage. There are no leaves to take the fluid, so that less may be used, nor do they afford the twigs protection from the fluid by lying close against them under the impact of the fluid, as so often happens in summer spraying. A fourth advantage is that, given an effective spray, no further spraying need be done during the summer. There are thus four distinct advantages, namely :

- (1) Choice of time for spraying.
- (2) Availability of suitable labour.
- (3) Thoroughness in application and absence of waste of material.
- (4) Freedom from further treatment.

While these advantages are sufficiently obvious, it is not pretended that there are no difficulties. The chief is of course that of finding any substance that will really kill insect eggs. It is not indeed likely that, after Nature has been experimenting untold years in producing eggs that shall resist winter conditions, man should immediately find some means of destroying them. The insect egg-shell is of a very resistant nature, being composed of a substance called "chitin," which is allied to hair, horn, hoof, and similar bodies. Nearly all chemical reagents are without action on it. Only the strongest, like certain concentrated acids, attack it, and these naturally are not adapted for spraying purposes.

The chief pests which exist in the egg stage on fruit trees include many kinds of aphis, apple-sucker, mussel scale, red spider; certain moths, such as winter, lackey, and vapourer moths; and last, but by no means least, capsid bugs.

This is a formidable list, and includes some of the most serious fruit pests. The possible means of attack may be considered under three headings :

- (1) Mechanical.
- (2) Physical.
- (3) Chemical.

Most of the eggs in the above list are laid simply on the bark, being usually fastened by a thin layer of cementing material. Apple-sucker and capsid bugs are exceptions to this. The former possesses a process which extends some way into the cortex and serves as an anchor; while capsids' eggs are often partly or wholly embedded in the cortex. With these two exceptions it would appear theoretically possible to apply a thick cementing coat which, when dry, would tear off the enclosed eggs. An ordinary lime wash is not strong enough to effect this, though it is possible that where such a coat flakes off, and is not washed off, some eggs are detached. All attempts to prepare a cover wash that would have these desirable properties failed.

Under "physical means" comes the application of hot water. It appears that certain French authors have obtained a measure of success in controlling pests of the vine. Experiments were started at Long Ashton to see how far this method was applicable as a winter treatment. At once difficulties were met with. It was found that in order to coagulate the egg contents as high a temperature as 158° F. was needed. This, of course, is some way below boiling-point, and at first sight would appear obtainable in practice. The French authors above referred to, however, found that there was a considerable reduction of temperature when hot water was sprayed through the nozzle of a spraying machine. With the finer nozzles and higher pressures the reduction was greatest, though even with coarse nozzles using low pressure the drop was considerable. It was found at Long Ashton, using a knapsack machine and a coarse nozzle at a distance of about 10 inches, that the following fall of temperature occurred:

Temperature of water in machine.	Issuing water.
185° F.	131° F.
149° F.	112° F.
132° F.	104° F.
117° F.	94° F.

Under outdoor conditions, therefore, with possibly a cold wind blowing, the outlook did not look hopeful. In addition, the probable expense and inconvenience of the method were enough to cause its abandonment. There thus remained only chemical means to try.

As stated previously, chitin is extremely resistant to chemical treatment, but it was thought possible that eggs might be attacked by such oily bodies as nitrobenzine or paraffin, owing to their penetrative power. It was soon found, however, that if used at a strength sufficient to kill the eggs extensive damage was done to the buds. This treatment, therefore, proved a failure. There are certain bodies, namely, hypochlorites, which are used in laboratory practice for dissolving chitin in the preparation of insect eggs for microscopic examination. In such cases, of course, the solution is concentrated and often used hot, being then unsuitable for spraying work. Nevertheless it was thought possible to adapt the idea, and experiments were started with these substances. The most convenient to use on a commercial scale is bleaching-powder, which is an impure hypochlorite of calcium. Eggs were placed in solutions of bleaching-powder, but were unaffected by even the strongest solutions. But when the sodium salt was used, and especially if caustic soda was present as well, it was found possible to attack the chitinous coat. From 10 to 40 minutes were required for visible action, the time depending on the strength of the solution.

Even under these conditions of strong solutions the time required was relatively long, whereas in practice a spray-fluid will often dry on the tree in ten minutes. It was found that if weaker solutions were used, such as could be employed on the large scale, as much as three-quarters of an hour must be allowed for effective action. This difficulty was

overcome by using a lime wash as a base, so to speak. By its aid the requisite mixture of bleaching-powder solution and caustic soda could be kept in contact with the eggs for the necessary period.

Aphis-egg-infested shoots were treated by these means, and it was found that after allowing the coat to dry on and its removal by dilute acid the eggs were all in a shrunken and obviously dead condition.

The point then arose as to whether a mixture of bleaching-powder and lime or caustic soda and lime would not give as good results. These proved, however, to have no lethal effect, and it was clearly necessary to have all three substances together before success could be obtained.

Different eggs were found to differ in the ease with which they could be attacked by this mixture. Of those experimented upon, it was found that moth eggs were the easiest attacked, then apple-sucker, then aphis, and lastly red spider eggs, which seemed totally unaffected.

Having attained success so far, experiments were next tried outside. As was to be expected, results were not nearly so good. Mixtures that were successful in the laboratory had only a partial action outside, and in some cases appeared to have failed altogether. In one case, when examined the day after application, complete failure was feared, but subsequent examination after a month's interval showed that every egg that could be seen was shrivelled.

It is therefore possible that these mixtures go on acting for some time after they are applied and have dried. Rain falling on them would doubtless dissolve out some of the soluble substances and thus cause a continued though possibly feebler action. This action I believe to be as follows:—The sodium hypochlorite first attacks the chitin of the egg-shell, rendering it more porous than before, and the excess of alkali then penetrates to the egg contents, causing coagulation of the albumen.

The hypochlorite is, so to speak, the artillery preparation, and the alkali is the infantry attack. Both are necessary for success, and neither is effective without the other.

It is too soon at present to offer any decided opinion as to the success or failure of these bleaching-powder mixtures. Trials are in progress at Long Ashton, and it is hoped to obtain further information after another season.

DAFFODIL DEVELOPMENTS.

By Rev. J. JACOB, F.R.H.S.

[Read May 16, 1916; Mr. W. B. CRANFIELD in the Chair.]

WERE both the lecturer and his audience botanically inclined, it would be impossible to fix any limitation, other than the beginning of time, to the period from which Daffodil development might have taken place. However, as we are met together as gardeners, we need not spend time in going back to the days of the Ark to inquire what were the daffodils Mrs. Noah had upon her table during her long period of incarceration; or even to the times of the ancient Greeks, who made funeral wreaths for their dead of bunch-flowered Daffodils (*Narcissus Tazetta*) in the century before the Christian Era; nor yet to Mohammed, who later still said "He that hath two cakes of bread, let him sell one of them, for bread is only food for the body, but *Narcissus* is food for the soul."

As gardeners—as British gardeners, as practical people—who have the decoration of our homes and borders "back and behind" our coming here this afternoon, we do not want to hear too much of either the scientific or the historical sides of our flower, and yet one feels that, if nothing is placed before you which can be compared with the beautiful forms and varieties with which most of us are nowadays more or less familiar, there are few, except those who are conversant with old gardening books, who would appreciate the enormous changes that have taken place in the shape, size, and colouring of the Daffodil within the past ninety years.

It so happens that by a happy chain of circumstances there seems to be a natural date which one not only may, but which one is practically compelled to take as the starting-point or period when the Daffodil became recognized in a very special way as a denizen of English gardens.

I allude to the era of JOHN PARKINSON (1567 to about 1650), who is best known to fame as the author of the "Paradisus," or, to give the book its English title, "A Garden of all sorts of Pleasant Flowers." This man was a distinguished horticulturist and looked upon a garden with the eyes of a garden lover, and not, as his profession of apothecary in those days might lead us to suppose, as being *primâ facie* a home for medicinal herbs. He made a speciality of the Daffodil, and in forty odd pages of his folio tells us how he collected them from different parts of Europe and elsewhere; how he cultivated them; and how he raised his own seedlings. This book was published in the year 1629,

and is a halfway house between the "Herbal" of GERARD (1597) and the "Flora" of JOHN REA (1665). It is profusely illustrated.

As may be gleaned from the letterpress, some of the plants illustrated are species, some wild hybrids, and some garden hybrids. The species and wild hybrids have probably remained much as they were in the time of PARKINSON. The wild forms collected within the last three years in the Pyrenees by Sir ARTHUR HORT can pretty well be matched in the pages of the "Paradisus," where some of them might almost have served as his originals. Special mention must be made of one very strange-looking species, *N. cyclamineus*, which undoubtedly existed in PARKINSON'S time although he does not figure it, and although the learned Dean HERBERT, in his famous book on the Amaryllidaceae, said the figure of this variety in the "Theatrum Florae" (1622) was an "absurdity, which will never be found to exist." Events have proved this surmise to be incorrect, for after being lost to cultivation for nearly three hundred years *cyclamineus* was rediscovered in Portugal in the year of the first Jubilee of Queen Victoria, just as if the little fellow would not be behind in his shouts of joy for the great good Queen.

PARKINSON died before the year 1656.

From this time until we come to the end of the first quarter of the nineteenth century the Daffodil never seems to have "caught on" in English gardens. It is true that between the years 1740 to 1760 and thereabouts bunch-flowered varieties (our *Polyanthus Narcissi* or Tazettas, like 'Soleil d'Or' and 'Paper White') were taken in hand by the Dutch and many new seedlings were raised and put into commerce under the head of *Oriental Narcissus* or *Polyanthos Narcissus*. One doubts if they can ever have been very popular for out-of-door cultivation, for JUSTICE, in "The British Gardener's Director," gives so many and such minute instructions about their management that we may well suppose that only those with an infinite capacity of taking pains would attempt to grow them. They were, however, in demand for growing in pots in soil and in glasses in water. In 1788 the firm of VOORHELM-SCHNEEVOOGT offered to the public no fewer than 155 kinds, not one of which was priced at more than one and eightpence a bulb. Some of those which appeared in this list are with us still, e.g. 'Étoile d'Or,' 'Grand Soleil d'Or,' 'Bazelman major,' and 'Bazelman minor.' A very great change which has taken place in this type is the introduction of the Poetaz varieties by the firm of VAN DER SCHOOT about twenty years ago.

In all the other sections, although it must have been known that many of the *Narcissus* family were free seeders, no attempt to get fresh varieties by raising seedlings seems to have been made, except, as before stated, by the Dutch with the Tazettas. Cross-fertilization was unknown or unpractised, and doubtless if any seed was collected and sown the results would have been very disappointing and not worth the long five years' wait without which no one can look for results. It remained for Dean HERBERT (c. 1830) to be attracted by certain

illustrations in old flower books, such as the anonymous "Theatrum Florae," and "Le Jardin du Roi très Chrestien Henri IV" (1608) by Pierre Vallet, and to make experiments to see if he could not produce by designed cross-fertilization similar types of Daffodils to what he saw in these books and in PARKINSON. The plate in the twenty-ninth volume of Edwards' "Botanical Register" (plate 38) is extremely interesting. The date is 1843, and the six flowers there depicted are the first hybrid Daffodils which are known to have been produced by human design. They are (1) *N. Diomedes* var. *Crichtoni*, in which the seed-bearer was the tiny *minimus* and the pollen parent some form of *Polyanthus Narcissus*. It features a type which we now call *tridymus*. (2) *N. pallidus*, which had *minor*, a small yellow trumpet form, as the female, and *N. moschatus*, a small white trumpet, as the male parent. (3) *N. Spofforthiae*—the seed-bearer was an *incomparabilis* and the pollen parent *N. poeticus stellaris*. This is what used to be called a *Burbidgei*—'Little Dick' has been suggested as being somewhat similar. (4) *N. Spofforthiae* var. *spurius*. This came from the same seed-pod as the last and represents a poor example of a *Barrii*. (5) *N. incomparabilis aurantius*. This showy white-perianthed flower with its orange-rimmed cup came from crossing a form of the wild *pseudo-Narcissus* with *N. poeticus stellaris*. (6) *N. sub-concolor*, a seedling from *minimus* crossed with *poeticus stellaris*. It resembles No. 4, but has a better perianth. For the purposes of this lecture this plate is extremely valuable, as it illustrates the start that was made by the very first of that ever-increasing army of seedling raisers who are now, and who probably ever have been, sustained in their endless quest of obtaining some better or more striking form or colour than their fellows, by yearly seeing displayed in all their glory at the shows wonderful new flowers such as the twelve home-made seedlings which won for Mr. P. D. WILLIAMS, of St. Keverne, Cornwall, the Engleheart Cup at the last London Show (1916); or those truly superb examples of Giant Leedsis which the Rev. G. H. ENGLEHEART sent to Birmingham as his representatives at the last show there (1916), when unfortunately, through ill-health, he was unable to be present in person. The bloom of one was of the purest white, of excellent form and substance, and nearly five inches in diameter.

The work of HERBERT was first of all carried on by EDWARD LEEDS, a stockbroker, of Longford Bridge, near Manchester; and then by WILLIAM BACKHOUSE, a banker, who, after he retired from business, lived on his property at St. John's, Wolsingham, Durham, where in 1856 he began to hybridize. We have, as far as I am aware, no coloured prints or in fact any pictures of BACKHOUSE'S hybrids, but in a way this need cause no deep regrets, since we have in 'Emperor' and 'Empress,' which bloomed for the first time about the year 1864, visible results of his earlier crossings, and in 'Gloria Mundi,' 'Barrii conspicuus,' 'Mrs. Langtry,' and 'Weardale Perfection,' visible results of his later ones (the last-named did not bloom till after Mr. BACKHOUSE'S death in 1869). All these are still features of an English garden

in spring. In the case of Mr. LEEDS we are more fortunate, for we have two coloured plates of his seedlings in the "Gardeners' Magazine of Botany" (vol. iii. pp. 169 and 289, 1853). In the former we have (1) *N. poculiformis elegans*, which is now called *Leedsii elegans*; (2) *N. Leedsii*, which is now *incomparabilis* 'Figaro'; and (3) *N. major superbis*, which never seems to have got into commerce. In the latter we have (1) *N. aureo-tinctus*, which obtained a **F.C.C.** from the Royal Horticultural Society in 1878 when exhibited by Messrs. BARR and SUGDEN; (2) *N. incomparabilis expansus*, which was awarded the same honour in 1879; and (3) *N. bicolor maximus*, which is now the well-known and valuable late bicolor trumpet 'Grandee.' An additional point of interest in connexion with these plates is the fact that appended to them as part of the text are some hints on raising seedlings and their treatment contributed by the raiser himself.

The most famous flower raised by Mr. LEEDS is, I think, 'Princess Mary,' as it has entered so very largely into modern cross-fertilization. Almost every seedling-raiser at one time must have included it in his stock of trade. Other well-known flowers that we owe to him are 'Frank Miles,' 'Katherine Spurrell,' '*Nelsoni major*,' 'Captain Nelson,' and 'William Goldring.'

Mr. LEEDS died in 1877. A few years before his death, as he was in extremely poor health, he decided to sell his collection and wrote to Mr. PETER BARR, to whom he offered it for £100. How the money was found by Mr. BARR, the Rev. J. NELSON, Mr. W. B. HUME, Mr. H. J. ADAMS, and Mr. G. J. BRAIKENRIDGE, and the entire collection saved is one of the heroics of Daffodil History. Saved, however, it was, and the varieties which it embraced were one of the foundation-stones of the marvellous collection got together by the Daffodil King, old Mr. PETER BARR. He worked long and lovingly amongst the gardens of Britain (as WILLIAM BAYLOR HARTLAND did among the gardens of Ireland), and by about the year 1890 he had got together a very complete assemblage of all the best garden and wild varieties that were to be had.

The coloured plate of 'Seagull,' 'Albatross,' and an unnamed Poet in *The Garden* newspaper for April 21, 1893, marks the commencement of what may be called the present-day era of seedling-raising. These flowers were the bell-wethers of the mighty host of wonderful seedlings which year by year have followed one another in unbroken succession from the Daffodil manufactories (to give his gardens a name which I have often heard him use) of the Rev. G. H. ENGLEHEART. The advent upon the scene of all the beautiful novelties which have come from Appleshaw and Dinton has quite altered our views about Daffodils, and insensibly our standard of excellence has been raised. A sentence in a letter recently received from one of our best-known raisers of seedlings exactly hits the nail upon the head and expresses what all who in any way count themselves as Daffodil people feel. "One simply has to be hard-hearted. I am this year intending to burn many hundreds of bulbs of my seedlings, which I thought good two or three years back."

It is alike true of seedlings that are putting forth their first flower and of old varieties :

“ The harp that once through Tara’s halls
 The soul of music shed
 Now hangs as mute on Tara’s walls
 As if that soul were fled.
 So sleeps the pride of former days,
 So glory’s thrill is o’er,
 And hearts that once beat high for praise
 Now feel that pulse no more.”

No words can more truly express the feelings of the raiser and the buyer whose end is the show-tier. ‘ Lucifer ’ is out-classed by ‘ Marsh-light,’ ‘ Madame de Graaff ’ has given place to ‘ Vestal Virgin,’ and ‘ Homer ’ to ‘ Matthew Arnold.’ It is only once (as the expression is) in a blue moon that a ‘ Bernardino ’ or a ‘ White Knight ’ appears that can laugh at time. Broader perianths, deeper colouring, more refined and solid substance, more elegant trumpets or cups, flatter segments, greater size and more uncommon shapes are ever being bred for and are ever being obtained.

For garden purposes it is much the same, but the requirements are a little different ; for example, strength and length of stem, lasting qualities and distinctness assume here a greater value ; and then there is the question of pots. But, and it is a very consoling “ but ” for the buyer, old favourites for these purposes are far less easily displaced, and a purchase of a really good variety may be more confidently made because its position is far less assailable. ‘ Emperor ’ and ‘ Barrii conspicuus ’ have been with us for half a century, and they are still, to use the words of a popular advertisement, “ going strong.”

We may now review some of the latest developments in the Daffodil family in the ordered sequence of the R.H.S. Classification, which is the one generally adopted for all purposes.

Trumpets.—The corona is as long or longer than the perianth segments. Three typical all yellow forms are : ‘ Olympia,’ a fine garden plant ; *maximus*, noted for its deep colour ; and ‘ Cornelia,’ a show type with smooth petals. WILLIAMS’ 510 gives a good idea of a show bloom in this class, while GUY WILSON’S ‘ Madame de Graaff ’ hybrids show the immense variation that comes from one pod of seed. One of the most refined white trumpets is ‘ White Emperor.’ This is in the front rank for showing ; ‘ Henri Vilmorin,’ a fine garden white, is greatly admired at Wisley, while ‘ White Knight ’ is ideal for showing. Two bicolor trumpets illustrate the dark (‘ Victoria ’) and the pale (‘ Creusa ’) types.

‘ Ixion ’ is an example of an *incomparabilis* with a yellow perianth and a large red cup. ‘ Helios ’ and ‘ Fortune,’ which created a sensation at Birmingham this year, are two more of the same type. In an *incomparabilis* the cup is larger in proportion to the length of the perianth segments than in a *Barrii*. ‘ Mozart ’ is another *incomparabilis*, but here the cup is much flatter than in ‘ Ixion.’ ‘ Blackwell ’ is an excellent early variety for

pots. It is one of the best red cups for keeping its colour in the sun. 'Fleetwing' belongs to the same group, and has a white perianth and a yellow cup. It is a good show bloom. 'Rochester Quinton' is another of the same type, but here the cup is coloured. It was first shown at Birmingham in 1915. Five varieties with coloured cups are 'Isis' and 'Jaspar,' yellow-perianthed *Barriis*, 'Firebrand' and 'Incognita,' white-perianthed *Barriis*, and 'Salmonetta,' a salmon-coloured *Leedsii*. All these coloured varieties need protection from sun and weather when opening, or the colour will soon go. They make good pot plants, especially 'Firebrand,' as the sun at the latter end of February and early in March affects them very little under glass. 'Jaspar' is notable for the deep red of its cup. 'Sunrise' is a very popular flower, and although it breaks the unwritten canons of the show tiers, inasmuch as it has a very considerable amount of yellow in its perianth segments, it is frequently seen at exhibitions. It makes a beautiful cut bloom for vases. 'Sealing Wax' is a *Barrii* with white petals and an all-red eye. It very much resembles some of the Poet varieties; in fact, the time has come when it is a question if the difference should any longer be kept up. It entirely depends upon parentage.

'The Honourable Mrs. Francklin' and the three following varieties are examples of *Leedsii*s. By a *Leedsii* is meant a flower in which the perianth is white and the corona or cup "white, cream, or pale citron, sometimes tinged with pink or apricot."

The dividing line between a giant *Leedsii* and a *bicolor* is a very fine one, and in the case of a few varieties it is six for one and half a dozen for the other. The type is quite a new one, and from a garden standpoint is of great value, the plants being tall and as a rule in the best kinds, good increasers and free flowerers. 'Thora' is of particular value under glass, as then its cup takes on a warm buff. White King' is an ideal show bloom. It received an Award of Merit in 1915. 'White Mere' is a particularly refined flower and quite in the front rank for showing. It resembles the old *Nelsoni* type with its long narrow cup. The owner of the stock bought it because it was so much admired by the Rev. W. WILKS.

One of the lovely white *triandrus* hybrids is 'Venetia.' These hybrids are obtained by crossing such a variety as 'Mrs. Langtry' or 'Minnie Hume' with *triandrus calathinus*. The old 'Queen of Spain' is a natural hybrid, probably between *triandrus* and a yellow trumpet.

Cyclamineus hybrids often have but short lives, and it is a real find to get one like 'Golden Arrow,' which has a constitution. Some very beautiful varieties have been raised by using the pollen of the small sweet-scented Jonquil (*Jonquilla simplex*) with yellow trumpets and various other varieties as seed parents. 'Cicely' is very remarkable and uncommon, as the flower is made up of two shades of apricot or deep buff. 'Flattery' is a fine specimen of the more usual deep yellow type. 'Buttercup' is the oldest one on the market and the best known. The scent of these hybrids is delicious.

We now come to the Poet section, which many consider to be the most charming of all. Mr. ENGLEHEART has made a speciality of them, and could anyone see the varieties which LEEDS and BACKHOUSE worked with and then compare them with the newer forms they would be amazed at the change that has taken place, although one is bound to acknowledge that the old *recurvus* has never been surpassed for beauty of colour and outline. 'Alpha' is a beautiful rim-eyed variety; 'Martial' is an example of an all-red eye; 'Bridget' of one with a good deal of green in the centre of the eye; 'Pinkie' is one of the new pink-edged varieties, which are exceedingly dainty and always attract attention.

We now turn to the modern doubles. The change has not been so marked in this section as in others: still new colouring has been introduced in some of the later hybrids. 'Argent' is an example, which is quite A1 for the garden and equally useful for pots.

Lastly we may note a flower which shows something of what the future may have in store, for there is a most decided red tinge in the perianth. Who knows what surprises may be in store for us? Miss SILBERRAD, in her most interesting novel of Dutch life in the bulb-field regions, hypothecated a blue Daffodil. We in England formulate a red trumpet. Just imagine not only a red trumpet but a red perianth as well, and the butter-yellow Sweet Pea and the blue Rose sink into insignificance as future wonders in the vegetable world. However, without going so far as to wish or expect such a break from the ordinary, perhaps enough of the beautiful creations of our present-day seedling raisers have been mentioned to show the prizes which fall to the patient and methodical hybridizer and the many beauties, some of which in time are bound to find their way to the gardens of the world.

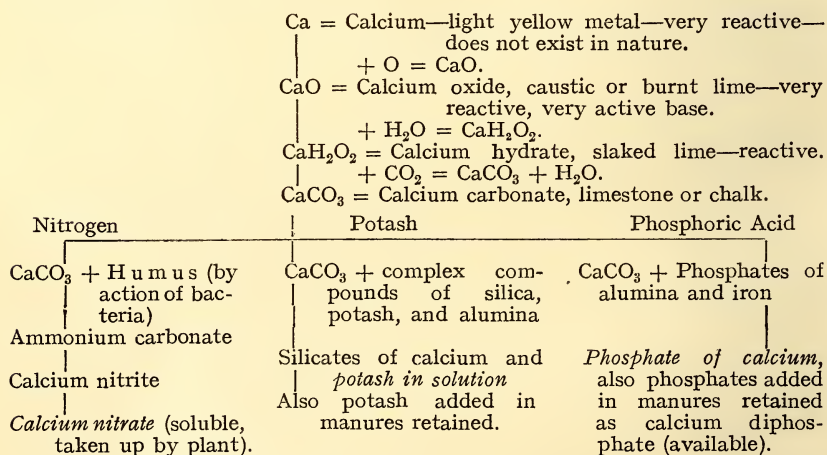
THE USES OF LIME IN AGRICULTURE AND HORTICULTURE.

By H. E. P. HODSOLL, F.C.S., M.S.E.A.C.

[Read July 18, 1916; Mr. W. HALES, A.L.S., in the Chair.]

At the present time, when the need of obtaining the utmost from the soil of our gardens as well as our fields is imperative in the national interest, it is particularly important that we should not forget the valuable assistance that lime can render us in attaining this object. Liming is the cheapest of all horticultural "improvements," both from the point of view of cost of application and from the measure of results obtained. The importance of the part played by lime in the soil is far greater than is generally realized; without it the land is sterile; with it, it becomes fertile, because, as we shall see, all the processes of plant nutrition depend upon it.

Origin and Composition.—First let us examine the origin and composition of lime. What, in its ultimate nature, is lime? How does it occur, what is the relation of the various types of lime on the market, how are they produced, and what is their chemical composition? These questions are perhaps most easily answered by an examination of the chart given below.



It will be seen that the basic metal is calcium, and that the various forms of lime as we know them commercially are compounds of calcium. At the head of the chart, therefore, we have the metal calcium, which is very reactive and does not exist as such in nature—there is no such thing as free calcium. It can, of course, be isolated in the laboratory, but immediately it comes

in contact with the air it combines with oxygen and becomes calcium oxide (CaO). This is the caustic or burnt lime of commerce; it is still very reactive, or, as the chemist expresses it, a "very active base," and when exposed to the air absorbs water, or "slakes," as it is termed, and becomes CaH_2O_2 —that is, calcium hydrate or slaked lime. This again is still a reactive compound, and under the influence of the atmosphere will absorb carbonic acid gas (CO_2), forming, as is shown on the chart, CaCO_3 : that is, calcium carbonate, limestone, or chalk. This description of the chemical processes leading from the metal calcium to the chalk or limestone with which we are all familiar is not intended to be taken as chemically exact, as the processes are not as simple as they are therein shown, but it is sufficiently accurate for our purpose. Thus it is only as calcium carbonate (CaCO_3) that lime exists in nature, forming whole mountain-chains of limestone, chalk, marble, &c., and comprising altogether approximately one-sixth of the earth's crust. We are therefore not dealing with a rare or unobtainable substance, but one that occurs in large and well distributed quantities in the British Isles. Many of these deposits, such as the latest (geologically) and purest soft chalks, are made up of the microscopic remains of minute animals; the harder limestones, such as the siliceous and argillaceous deposits, are of older formation.

Lime is the chief constituent of coral, and of the shells of birds' eggs, and of molluscs, and is also found in bones.

Commercial Preparation.—Let us now turn to the commercial preparation of lime. As it occurs only in the form of calcium carbonate, or limestone, it is obvious that the other forms in which we are accustomed to use it must be obtained from this. We must mention in passing that lime is now freely used in its natural form, being merely ground to a fine powder and put on the market as "ground carbonate of lime."

The preparation of the other forms of lime consists in the first place of burning the natural stone in kilns by means of coal fuel; as a result of this process carbonic acid gas is driven off and the caustic or burnt lime (CaO) is formed. This is commonly known as lump, agricultural, or "through" lime, and is generally put on the market in three grades, viz. :—

(1) *Hand-picked lime*, which is composed of a selection of lumps of the pure burnt lime, and consequently attains a high percentage of purity.

(2) *Nutty small lime*, which is the screenings from the hand-picked; and

(3) *Lime ashes*, the residue from the burning, which is cleared from the bottom of the kilns.

It is obvious that (1) is the purest, that obtained from the best deposits sometimes containing as much as 98 per cent. CaO; (2) is not quite so valuable, as it will contain a certain proportion of the natural impurities of the original stone; and (3) will often contain about 30 per cent. of ashes. Burnt lime is also ground and sent out as ground

caustic lime, generally in two grades, according to the quality of the stone so burnt and ground. Another form of lime on the market is a finely-powdered calcium hydrate or slaked lime, which, owing to its very fine state of subdivision, is very suitable for dry spraying.

It will be seen from the foregoing review of the various forms of lime on the market that care should be exercised in their selection. Not only should the grower be sure that he gets the right form, but also that the stone from which it is made is suitable for agricultural purposes. The fat limes (from white chalk or mountain limestone) are preferable to the thin grey or stone limes, which are made from less pure and more argillaceous limestones; fat limes slake better—thin limes are apt to set. Magnesian limestones should be avoided, as, although they make the best building limes, they contain from 4 to 40 per cent. of magnesia, which is often considered harmful to plant life. *It is therefore always advisable to buy lime by analysis*, which should show at least 80 per cent. pure lime and not more than 2 per cent. of magnesia.

Action of Lime on the Soil.—We may now consider the action of lime on the soil, in order that we may be able to judge which form is the best to use for any particular purpose we have in mind. Liming is a very old practice, having been handed down to us from the Ancients; our forefathers used it too heavily, our fathers too sparingly. Experience of these extremes is teaching the present generation to use it in the most effective and economical quantities.

First we must mention that lime is in itself a plant food, calcium being one of the essentials to plant life; it is, however, very seldom that a soil is encountered that does not contain a sufficient supply for the very small needs of most plants, and it is chiefly for what may be called its indirect action on plant nutrition that it is of value in horticulture. This indirect action may probably best be considered from three aspects, viz. (1) the mechanical, (2) the chemical, and (3) the biological. Let us first consider its mechanical action on the soil. *Lime produces a different effect upon different soils.* It is often said that lime makes heavy soils lighter and light soils heavier, an apparent contradiction which, as will be seen, is true at all events as far as it applies to heavy soils. On clay soils the adhesive property and tendency to puddle is lessened by the application of lime—such a soil is made more friable when dry, since lime, unlike clay, does not shrink in the process of drying, and therefore the mixture dries off in smaller particles instead of contracting into the hard lumps so familiar to the agriculturist. In order to understand clearly this action of lime on clay soils, it will be necessary to examine into the cause of the well-known adhesive and plastic properties of clay.

The difference between a heavy and a light soil, as shown by mechanical analysis, is that the former contains a preponderance of very fine particles, some of them so fine as to assume an almost gelatinous nature when separated from the coarser particles, whereas

the latter contains a preponderance of larger particles, the finer above-mentioned gelatinous substances being almost absent.

When lime is added to a clay soil it collects together these gelatinous or "colloid" substances, as they are technically called, forming them into loosely-bound particles; that is to say, it coagulates the finer particles into coarser grains and automatically frees the larger particles from the adhesive action of the colloids. This action is technically known as flocculation. A simple illustration of it is easily afforded by the addition of a little lime to a glass vessel containing muddy water from a clay soil. It will be seen that the lime immediately flocculates the fine particles held in solution and precipitates them to the bottom of the vessel, leaving a perfectly clear fluid. The practical result of this flocculation of the fine particles of clay is to give the effect of a coarser-grained soil. Under these circumstances not only is the soil more friable when dry but it is also less retentive of moisture when wet; it therefore becomes permanently drier and warmer and permits of earlier cultivation, a matter of the utmost importance on heavy soils.

The disintegrating effect of lime upon a heavy soil is also due to the chemical change of the oxide CaO to the carbonate CaCO_3 . On light soils it is generally claimed that lime acts as a binding agent in the same way as it does in mortar, and enables them to obtain moisture from the subsoil by capillary attraction, at the same time increasing their retentive powers—in short, making a sandy soil more like a sponge and less like a sieve. A good example of the cementing power of lime on light soils is afforded by the lime pan, frequently found in such soils rich in lime; and also in the practice, frequently adopted, of liming sandy roads to make them bind. It should be added, however, that it is doubtful whether this action of lime on light soils is as beneficial as is sometimes claimed; in any case it is not so definite and valuable as is the case with heavy soils.

Chemical Action of Lime on Soils.—The value of lime lies in the fact that it is an "active base"; it is what is known to chemists as a powerful alkali, and as such combines with and neutralizes any acid with which it may come in contact. This action is the first and most important that we have to consider under this heading. Acids are continually being formed in the soil by the decay of organic matter in the form of stems, roots, and other plant residues of previous crops which are periodically ploughed or dug in. These acids of decay (known as "humic" acids) are also produced when dung or other organic manures are applied to the soil. Other and stronger acids are introduced into the soil by such manures as superphosphate and sulphate of ammonia. It is one of the most important functions of lime to neutralize these acids and render them harmless to plant life. The experiments at Rothamsted and Woburn afford good examples of the results of the lack of lime, especially when ammonium salts have been used year after year. The Rothamsted soils only become

workable after heavy liming, and it was found there by careful estimations that the application of 200 lb. of ammonium salts caused the removal of 120 lb. of calcium carbonate.

Lime has a further and more complicated chemical action which is indicated by the chart on page 236. From this it will be seen that lime plays an important part in rendering the three chief ingredients of the soil (nitrogen, potash, and phosphates) available for plant nutrition and retaining them in this form. Nitrogen, as is well known, is chiefly obtained by the plant in the form of nitrates, which are produced from humus and ammonia by a process of decay carried on by a group of micro-organisms known as the nitrifying bacteria. The first product of this decay is ammonium carbonate. The ammonia is then attacked by another group of bacteria, and *nitrites* are formed, this process requiring the presence of lime. A third group of bacteria then attacks the nitrites and converts them into nitrates, which ally themselves with lime, forming calcium nitrate, a soluble neutral salt that can be taken up by the plant. It will be seen later that none of these beneficent bacteria can work in an acid medium. The action of lime on the potash in the soil is purely chemical. This important plant-food is present in all soils, especially those of a clayey nature but in a very insoluble form, generally as a complex compound of potash and alumina; when lime comes in contact with such a compound, being an active base, it will take the place of potash, which, being thus liberated, goes into solution and becomes available for the plant. By the activity that lime possesses as a base it also assists in retaining in the soil in an available form the potash added in manures. The chemical action of lime on the phosphoric acid in the soil is perhaps equally important. The store of phosphates in the soil is largely composed of phosphates of alumina and iron; on these lime acts in the same way, namely as an active base, taking the place of the alumina and iron and forming phosphates of calcium, which easily become available as plant-food. Again, the phosphates added in manures, especially those applied in an acid form, such as superphosphate, are retained in the soil as calcium diphosphate, which easily becomes soluble.

Biological Action of Lime on the Soil.—Recent investigation has shown that the soil is not merely a storehouse for the food materials necessary to the plant, but that it is a factory peopled by millions of minute organisms on whose activities we depend for the conversion of the food materials present in the soil, or added in the form of manures, into the soluble state in which the delicate root hairs of the plant can absorb them. It is impossible in the scope of this paper to deal with this fascinating subject. We have already seen the important function played by the nitrifying bacteria in rendering available the ammonia present in the soil. Besides the nitrifying bacteria, there are many other beneficial bacteria whose work is of the utmost importance to the fertility of the soil. Two of the best-known instances are the *Azotobacter*, which has the power of fixing in the soil the free nitrogen

of the air, and the Nodule Bacterium, which has the same power, but works in conjunction with the host plant in the nodules so familiar on the roots of Leguminosae. All plants of this important Family are therefore, with a few exceptions (*e.g.* lupines, seradella, and gorse), greatly dependent on a supply of lime in the soil. All the beneficial bacteria can work only when the soil is neutral or slightly alkaline ; as soon as the soil becomes acid, bacterial action is suspended and moulds and microfungi take their places. Lime is the cheapest and most suitable alkali we can use to maintain this neutrality.

The foregoing facts abundantly prove that no cultivator of the soil can afford to ignore the important and economical improvements that can be effected by the application of lime. It has been already shown how the texture of a soil may be changed by its use, and it is also true that a startling improvement may at the same time be effected in the character of the vegetation. The best instance of this is the effect of liming sour and coarse pastures, on which it will give rise to the fine grasses and clovers eagerly sought after by stock, in place of bents and other rough grasses traditionally known to be of small feeding value and distasteful to all stock. Given then that it is imperative for every cultivator to ascertain whether his soil is lacking in lime, the next point is that he should know how to obtain the information.

In the first place, much may be learnt by a careful examination of the plants and weeds naturally supported by the soil. On arable land sheep-sorrel, corn marigold, and spurrey are almost certain indications of a deficiency of lime ; in waste places the growth of foxglove and bracken are significant of the same need, and in pastures an absence of leguminous plants is the surest guide. The greatest deficiency is found in peaty soils and old permanent pastures, and on very heavy and very light soils. In the case of such heavy soils a black acid peat will accumulate, particularly if the lack of lime is accompanied, as is frequently the case, by waterlogging. Iron pans composed of oxide of iron will form below the surface, and the soil water will contain soluble iron salts, whose presence is indicated by a characteristic iridescent scum that forms on the water in the ditches. Fungus diseases will also be prevalent. In the case of light soils, a black humus will accumulate, the lack of leguminous plants will be very noticeable, and such diseases as finger-and-toe will be rampant. *In any soil* the complete absence of lime produces something approaching sterility, *i.e.* starvation of plant life. Beyond these general indications one of the simplest tests is that of introducing litmus paper to a strong solution of the soil : if it is markedly acid, blue litmus will be changed to pink ; if decidedly alkaline, pink litmus becomes blue. Another simple and very useful test is that afforded by the addition to the soil of a little hydrochloric acid (spirits of salts), when the presence of lime will cause effervescence.*

* See "Economy in the Garden," published by the Society, paragraph 15, p. 8.

All these tests at best, however, merely afford rough indications and give but little idea of the extent of the deficiency. If an accurate estimation is required, the only known means is a chemical estimation by analysis. In view of the fact that within our own islands the lime contents of the soil may vary from 60 per cent. to $\cdot 1$ per cent. (or one tenth of 1 per cent.), it will seem that an accurate determination is essential. As Hall says in his well-known book on manures :—" Every farmer should find out by analysis the amount of lime in the soil, as the whole scheme of manuring should depend upon it."

The Table shows the extraordinary variations in the lime content of different soils taken from various parts of the country.

LIME CONTENT OF VARIOUS SOILS.

No.	Per cent. of Free Lime as Carbonate	Remarks
1	2.0	Soil in high state of fertility.
2	$\cdot 273$	Hereford—soil sour—wanted draining—responds to lime.
3	1.38	Worcester—hop soil.
4	$\cdot 69$	Pershore—intensive cultivation.
5	45.77	North Kent—fruit soil.
6	$\cdot 678$	Worcester—old pasture.
7	$\cdot 345$	Romney Marsh soil.
8	6.9	East Kent—good potato soil.
9	$\cdot 805$	Average Guernsey soil.
10	1.86	Kent.
11	$\cdot 48$	Middlesex—market-garden ground—infested with club-root.
12	2.68	Middlesex—market-garden ground—no club—very healthy crops.

Some difference of opinion exists as to the percentage of lime that should be present in the soil, and it is impossible to fix any definite limits, but it is probably accurate to say that, at all events in the case of highly-manured soils, $\cdot 5$ per cent. is the lowest limit and is necessary for the health of vegetation, and to get the best results it should not be less than 2 per cent., but this largely depends on the fine state of division in which the lime is present.

When it has been proved by one or more of the above tests that the soil is deficient in lime, the next considerations are, first, the type of lime to use, and, secondly, the method of application. With regard to the first point, it is obvious that the ground carbonate, owing to the simple method of production, is considerably cheaper than any of the forms of caustic lime, and it will therefore be more economical to use it when either form will give equally good results.

It has been proved that in acid soils, as long as there is absolute acidity to counteract, carbonate of lime is as effective in neutralizing the acidity as the more expensive caustic form. On peaty soils, therefore, and sour pastures, and all soils that give a definite acid reaction, carbonate should be used. On soils very rich in humus, as most old garden soils are, carbonate will be the more economical, as the intense chemical activity of the caustic form will result on such soils in a loss

of a certain amount of ammonia ; for a similar reason it is best to use the carbonate on light sandy soils, as the caustic is apt to cause a too rapid decay of the organic reserves in the soil. When growing crops are on the land, especially young plants with delicate roots, the caustic form is apt to cause damage.

On heavy clays where the chemical activity of the lime is required to set free the dormant food materials, where the coagulation above referred to and the consequent improvement of the texture are of paramount importance, the more active caustic lime should be used. Whatever kind of lime is decided on, it is imperative that it should be in a fine state of subdivision, as in order to get effective action it must be as evenly distributed as possible throughout the soil. Users should therefore see that their ground limestone is in a very fine powder. If the lump caustic or burnt lime is used it should be put in heaps over the land to be treated, covered with soil, and allowed to slake gradually, and then spread as evenly as possible. Care should be taken not to allow lime so treated to become wet—otherwise spreading is impracticable. It is because of this necessity that lime should be in fine particles that the ground caustic form has been put on the market. Although rather more expensive than the lump, it can be sown through a drill, and even distribution is readily secured. It will be obvious that it is always preferable to apply lime when there is no crop on the land ; and the autumn or winter, especially in the case of caustic lime, is naturally the more convenient time.* It can be applied either before or after digging or ploughing : the former is naturally the more convenient, as it is easier at that time to get on to the soil, but it must be remembered that the tendency of lime is always to sink in the soil, and there is therefore a constant loss in the drainage water. This movement of lime is due to the fact that it is soluble in water containing carbonic acid (CO_2), under the influence of which it becomes bicarbonate of lime—a compound which is responsible for the temporary hardness of water and is the chief ingredient of our natural mineral waters. The idea, therefore, that lime is brought back to the surface by ploughing is only partially true.

The *quantity* of lime to be applied on an acre will naturally largely depend upon the extent of the deficiency, and it must always be remembered that carbonate contains less lime than caustic. From half to twice as much again of the former must be used to supply the same amount of actual lime to the soil.† To obtain the best results, from 30 cwt. to 2 tons an acre of the carbonate may be safely used ; of caustic lime 1 ton to the acre is a good dressing, and of ground caustic 10 to 15 cwt. will be sufficient. All these quantities refer, of course to open land. Market growers—especially of tomatoes under glass—are accustomed to use much heavier dressings, even up to 15 to 20 tons to the acre—but knowledge and experience are necessary with such

* On ordinary arable agricultural soil it is best to apply it to the stubble in the autumn before ploughing preparatory to a root crop.

† Chemically 100 of quick-lime = 178.6 of carbonate of lime.

quantities, or damage to crops may result. It is interesting to note in this connexion that 10 tons of lime to an acre will only raise the quantity in the top nine inches by 1 per cent. It has been explained that lime is wanted as a base, and for this purpose free lime is essential. The idea, therefore, that lime is being added to the soil when superphosphate, bones, or gypsum are applied is a fallacy that cannot be too strongly refuted. It is true that these compounds contain lime in combination, but they are either acid or neutral, and the lime they contain is consequently useless. There is another popular idea that requires explanation, if not contradiction, and that is that lime exhausts the soil; it is this belief to which expression is given in the old saw, "Lime and lime without manure will make both land and farmer poor." The underlying truth in this old saying will be apparent to the reader; it is simply that lime is not in itself a manure, *i.e.* it does not contain the food materials necessary for the plant; it merely renders available those already in the soil, and enables the plant to feed on them. It is to the cultivator's advantage that these dormant and therefore useless materials should be turned to account; otherwise they represent locked-up capital; but having liberated them by the use of lime, it is the cultivator's fault if he does not replenish this capital by further applications of manure.

It is obvious that the more intensive the cultivation, and the heavier the manuring, the more important does liming become.

One last use of lime must be mentioned, *viz.* its value as a fungicide and insecticide. Mention has already been made of finely powdered slaked lime for spraying purposes; it is also an important ingredient of such fungicides as Bordeaux and Burgundy mixtures, and is invaluable for powdering on the soil for the destruction of slugs &c. For the latter purpose the caustic lime must be used, as its function is to burn the slug, and in this connexion it is important to note that two successive dressings must be used and should closely follow one another, as the slug has the power of exuding a slime which enables him to escape from the first powdering his body receives; a second performance of this manœuvre, in a short space of time, is beyond his powers.

It will be seen therefore that the uses of lime are manifold and the benefits to be derived from its application great. It is no exaggeration to say that the productivity of most of the farms and practically all the gardens of this country would be greatly increased if sufficient attention were paid to this subject. Not only would the soils work better but the crops would be improved both in quantity and quality at a cost quite out of proportion to the value of the result obtained.

It is therefore a matter of national importance that all cultivators of the soil should apply one of the simple tests given above and if a deficiency of lime is apparent at once take steps to remedy the defect.

THE BAMBOO.

By J. HUDSON, V.M.H.

[Read August 29, 1916; Dr. F. KEEBLE, F.R.S., in the Chair.]

My purpose in the following remarks is to point out the usefulness of the Bamboo as a hardy decorative plant in at least the southern and midland counties of England and Wales and in Ireland. Bamboos have been cultivated in these districts to my personal knowledge for more than sixty years. So conservative, however, are we gardeners generally that only within the past twenty-five years has any real effort been made to use them widely, and it has taken a few years to find out some of their requirements.

Shelter.—By shelter I mean protection from severe and cutting winds. In my experience I find shelter necessary, and I think other growers will bear me out in this. I do not by any means intend to suggest that artificial methods of shelter should be used, but rather that a suitable spot should be chosen, such for instance as the dell at Kew Gardens, where they thrive so well. At the Wisley Gardens too they are luxuriating in a remarkable degree. In each case there is natural shelter from the prevailing winds. I find at Gunnersbury that an easterly wind is most injurious. It has a tendency to dry up the soil as well as to cause greater loss of water from the growths themselves, and in this way much harm is done. I believe that many Bamboos will withstand what we may term a severe winter—say with the thermometer down to zero for a short time—and suffer no serious harm if the kind of shelter I have indicated be provided.

Moisture at the roots.—Moisture at the roots is essential even in the coldest weather. The Bamboo, if it be deprived of moisture, will die. As a rule, too, the Bamboo is surface-rooting to a great extent. Moisture at the roots is most important for all newly-planted Bamboos, both before and after planting.

Season for Planting &c.—After some years' experience I find no time so suitable for planting as the early part of May; in fact, just at the time young growth begins to appear. If there are any indications of the ball of soil about the lifted plant becoming cracked or broken, or if the plant be a large specimen, I advise that it be tied up somewhat tightly and a mat put around it, this being for a time kept moist. The mat will also shelter the plant against any gusts of wind. Let the hole be well prepared, the soil being stirred up deeply and well decayed manure added thereto. Always plant a trifle deeper than on the previous occasion, so as to provide a top-dressing and to secure a good supply of water during dry weather.

Pruning and Cutting Down.—By pruning I mean thinning out.

There comes a time in the life of every Bamboo when a judicious thinning out of the older and somewhat exhausted growths will prove beneficial. These, as a rule, should be cut clean out at the base. Keep these growths for use as stakes and as small sticks. I find nothing better for staking herbaceous borders than these cut-out growths of the *Phyllostachys* with their lateral shoots remaining upon them. These we insert amid the growths and simply pass a string around the group. The shoots are rigid, and with the spray-like growth still upon them sufficient support is afforded. The old canes from the *Arundinarias* and *Bambusas* are more suitable as single stakes. Be cautious, however, in thinning out those that from year to year become more pendulous because of the weight of their foliage and dense spray-like growths, such, for instance, as *Arundinaria nitida*, which will droop outwards and touch the ground, thus forming one of the most graceful objects imaginable.

By cutting down I mean cutting off all the growths just above the ground level; this do when it is seen that renewed growth is commencing in the spring. One that best repays this process is *Bambusa auricoma*, at no time a tall plant by any means. By thus cutting this Bamboo down a much finer growth is ensured, with larger and better developed leafage. The colouring, too, is more intensified, a deep golden colour pervading the mass of leafage. Other species similarly benefited are: *Bambusa Fortunei*; *B. disticha*, somewhat similar in habit but not variegated; *B. Veitchii*; *B. tessellata* (syn. *B. Ragamowskii*); *B. japonica* (syn. *B. Metake*); and *B. palmata*. The last may be treated in two ways. If it be so placed as to give height, only cut off all the leafage; it will then break out afresh and soon be a leafy mass of spring shoots. If, on the other hand, it is growing as a mass and in the foreground, cut it down to the ground and spring shoots will soon push forth. I have never experimented with any of the *Arundinarias* or *Phyllostachys* in this way, for they seem to me to be quite distinct in habit from the *Bambusa* section.

Flowering of the Bamboo.—It is generally conceded that upon this stage in the life of any Bamboo death ensues. This has been my experience so far. In this way I have lost *Arundinaria Simoni* almost entirely. *Phyllostachys nigra*, of which we had a magnificent specimen, followed suit, though we have some smaller ones left. *P. Boryana* and *P. Henonis* we lost completely at the flowering period. Mr. F. BEDFORD, when at Straffan, Co. Kildare, experimented with the Bamboo at the flowering stage by cutting all shoots down to the ground as soon as any symptoms of flowering appeared. In this way he met with encouraging success, but whether it only proved a postponement of the evil day or a complete remedy I am not able to say.

An opportunity is afforded, when the cutting down is practised, to clear away all rubbish at the base and also to give a good top-dressing of well-decomposed manure. When the growths are cut out let them be tied up tightly in bundles, so as to keep them straight.

Growth in tubs or pots for decorative uses.—Those who have to provide plants for indoor decoration may go farther and fare much worse than if they used some of the Bamboos for these varied purposes. The one essential is to see that the plants are permanently established before they are used. For niches or alcoves, or in corridors and entrance halls, they are most useful. They are not used so much in this country as on the Continent, for their value in this direction has not yet been realized here. I once saw them arranged to a good effect in an hotel in Rome. Messrs. F. SANDER used to grow them for this purpose at Bruges. A few of the best are *Phyllostachys aurea* (perhaps the best of all), *P. Boryana*, *P. Henonis*, *P. flexuosa*, *Arundinaria anceps*, *A. nitida*, and *A. fastuosa*. Even in localities where Bamboos do not thrive freely in the open it is always possible to use them outside during the summer season for effective grouping. All that is needed is a cold-house during the winter where little frost need be feared. Protection at the roots and free use of the water-can during growth are the essentials.

Bambusa Fortunei and *B. auricoma* are cultivated in small pots for decorative uses by many nurserymen. Both should be cut down in the spring, then re-potted or top-dressed; the young growths afterwards made will be quite fresh and attractive. When growing Bamboos in pots I advise that a fair proportion of peat be used, as this will assist them when thus restricted.

Suitable Soil.—The soil best suited in my opinion for the Bamboo is a calcareous loam of good depth. To this should be added a fair amount of farmyard or stable manure, not sufficient to cause too sappy and soft growth, but enough to encourage free growth. Bamboos will, I know, grow well in a lighter soil with more humus in it and even in peat, but I do not consider that the growth so obtained is so durable. We should aim at building up firm growth rather than sappy, for then the plants will endure a cold winter much more safely.

Classification.—For all practical purposes it may be said that all the Bamboos that are hardy in this country come under three genera, viz. *Arundinaria*, *Bambusa*, and *Phyllostachys*. If one picks up a catalogue and compares it with another catalogue some confusion in the nomenclature will nearly always be found to exist. The basis upon which I have classified them is as follows. The *Arundinarias*, in nearly every instance, push up their culms to the extreme height right away, and for that season do not put forth many lateral shoots. *Bambusas* make their culms in the same way, but send forth a cluster of leaves at the ends of the shoots. These do not branch lower down in the following year, but radiate from the topmost shoots again, whereas the *Arundinarias* branch forth in a somewhat irregular manner from year to year. In the species of *Phyllostachys* the culms commence to branch out as they are lengthening and in a somewhat uniform manner; for instance, a culm may still be increasing in height yet have lateral shoots some 2 feet in length. That is my rough and ready way of distinguishing one

from the other. Take as examples *Arundinaria nitida* with its slender culm of perhaps 6 feet in height and no lateral shoots, and *Bambusa palmata* with its culm almost developed but with signs of shoots pushing forth at the apex, and *Phyllostachys aurea*, which has lateral shoots fairly well advanced before it has attained its full height. As far as height is concerned in each case the limit is reached the first season; the cane does not lengthen afterwards.

List of useful Species.—We find the following the best at Gunnersbury; they have stood the test of some years now and are well established.

Arundinaria anceps.—This Bamboo stands well except in the severest of winters, and then it is the younger shoots which suffer most. It is in every way distinct, being of somewhat erect growth. The terminals only drooping because of the weight of foliage. It has a tendency to spread freely; the culms will at times appear a few feet away from the parent stock. These can be cut off, and if this be persisted in the growths will be quite dense. It is a fine Bamboo for massing, and it grows very freely with us. The canes are somewhat slender, but yet stiff in habit. It thickens out well down the stem and forms thick masses of foliage. For emergency use in a cut state it is one of the best, the single stems being so well clothed as to produce a good effect. Its height is about 10 feet.

Arundinaria fastuosa.—In my opinion this is the noblest of all our hardy Bamboos. It is of comparatively recent introduction, having been brought into prominence by M. LATOUR-MARLIAC at Temple-sur-Lot, in southern France, and sent out by him in 1895. With the advent of this species *Arundinaria Simoni* is in my opinion quite superseded. It is of similar and quite erect habit. In growth it is rigid, whilst even with its greater height it withstands the wind well. It is denser in growth than *A. Simoni*, and of the two its leaves are of a darker green; it carries its leafage well through the winter. As a rule its culms remain at home, or at least but a little way removed from the parent plant. Its culms thicken out well during the second and third years of growth. With us its greatest circumference is 5 inches, and the height about 18 feet. (By some authorities this is put into the genus *Bambusa* and by others in *Phyllostachys*. Lord REDESDALE, in his work "The Bamboo Garden," classes it with the former, and some well-known nurserymen with the latter. I place it under *Arundinaria* on account of its mode of growth.)

Arundinaria nitida.—If *Arundinaria fastuosa* be considered the noblest of all Bamboos, I consider *A. nitida* to be decidedly the most graceful. When seen in its full beauty towards the end of the summer there is nothing in the wide range of hardy fine-foliaged plants more beautiful. Its foliage develops earlier than that of any other Bamboo. It is often in good leafage when many others are looking somewhat unsightly and forlorn. It has a denser habit than many, with more lateral shoots which, in process of time, because

of their weight, cause the slender canes to droop over until they touch the ground. Its leaves are smaller in actual size than any, but their profusion quite makes amends for this. Its culms do not wander away to any extent from the parent plant. If planted as a small plant, it will quickly make headway and form quite a feature. From the point of hardiness I find it to be one of the most reliable. Varietal forms have been raised from seed. We have one under the name of *A. nitida Michauxii*. Of *A. nitida* at Gunnersbury we have a plant 10 feet high by 15 feet wide.

Arundinaria rubicunda.—We have one plant under this name. I cannot, however, verify the name, nor can I trace it in any list or catalogue; yet it is distinct. It has something of the character of *A. Simoni*, but it is of more slender growth, and the canes therefore become somewhat pendulous. Its leaves are rather long and narrower than in *A. Simoni*. The growth is freely made, and in height reaches about 10 feet.

Arundinaria graminea.—This Bamboo is usually catalogued as *A. Hindsii graminea*, but I am of the same opinion as the late Lord REDESDALE, that it is distinct from *A. Hindsii*. It is hardy with us, quite distinct in growth, with narrow glaucous-green leaves and a graceful drooping habit. Its height ranges from 5 feet to 6 feet.

Bambusa auricoma (Arundinaria auricoma).—This was formerly known as *B. Fortunei aurea*, but it does not appear to have any relationship with that species. Of all the dwarf Bamboos with golden variegation this is by far the best. It reaches 3 feet in height in good soil, and it should be planted in the full sunshine in order to intensify its variegation. I find it to be far more satisfactory if cut down every spring just as the new growth commences. This keeps it more compact and finer foliage is developed. It is quite hardy with us.

Bambusa Fortunei (Arundinaria Fortunei).—Formerly known as *B. Fortunei variegata*. This is another dwarf species of Bamboo, but it has no affinity with the preceding so far as I am able to detect. Like *B. auricoma*, it does well if treated to the cutting-down process, but, quite unlike that species, it does far better if planted in the shade. In such a position it is seen to the best advantage. I find it to be perfectly hardy. This Bamboo is grown in pots probably more than any other as a decorative plant.

Bambusa palmata.—This Bamboo will spread more rapidly than others with which I am acquainted. If allowed to grow into a large mass it will produce a fine effect and well pay for the amount of ground it occupies. Do not, however, allow it too much latitude, so as to encroach upon any other variety that is not so rampant. We used to have a very fine mass of it, but it was decided to break it up. Now I have planted it as a screen, for which it is well adapted, if the culms are prevented from extending. Altogether it is a noble-looking plant with imposing growth and large, dark green leaves, each individual leaf being well displayed. If it be decided to transplant or to divide a specimen I should prefer to cut it down at the time of removal, or

at least to cut off all the leaves. For a time it may look bare, but young growth will quickly take place and in two months it will be again a mass of young leaves. At Gunnersbury it has attained to between 6 and 7 feet in height.

Bambusa japonica (*Bambusa Metake*).—This was the first Bamboo that I ever planted at Gunnersbury, and we have a fine mass planted now next to the water. My experience of it is that it is one of the hardiest of all. I planted it nearly forty years ago, and we have had some severe winters in that time. Occasionally we give the entire mass a very thorough cleaning out. I find this Bamboo to be quite shallow-rooting, and it is one of the first to give out in dry weather, or during a keen easterly wind, hence I advise that it be planted in a moist situation. As undergrowth in shady places, or as a covert plant, it is one of the best to grow. With us it reaches a height of 15 feet.

Bambusa Veitchii (*Arundinaria Veitchii*) is quite a dwarf species with a character quite its own, for when the leaves are just about perfect the margins of each leaf fade to a dingy yellow. It does not appear to be a burn, nor do the leaves die away or decay. It appears to be well defined upon almost every leaf. I thought that the cause may have been the result of too much sunshine, but I have had to alter my opinion, for in a photograph that I had the opportunity of inspecting it was present where it was under the shade of trees, and that too in its native country. I find it to be quite hardy, and in spite of the peculiarity I have noted it is very well worth growing.

Bambusa tessellata (*B. Ragamowskii*) is another dwarf species. It possesses the largest leaves of any of the hardy Bamboos and will, under good conditions, grow to 2 feet in height. It forms a dense, close growth, and is well adapted for use as an undergrowth in partial shade, or as an edging to taller Bamboos. It spreads freely when once established. I find it to be quite hardy; protection is afforded during a snowstorm from the simple fact that it soon becomes covered with snow. It is one of the best for growing on sloping banks when once it becomes established. When it is transplanted I advise that the foliage be all cut off as in the case of *B. palmata*. There is a similarity of growth in the case of *B. tessellata*, *B. Veitchii*, and *B. palmata*.

Bambusa humilis (*B. Fortunei viridis*, *Arundinaria humilis*).—This is a slender-growing species, and if the name of "*gracilis*" were not given to another, viz. as a synonym of *Thamnocalamus Falconeri*, I should have preferred it as descriptive of this Bamboo. It succeeds well if treated to the cutting-down process every spring, when the old and rather dense growth can be cleared away. It ranges about 2½ feet high at Gunnersbury, and does well in the shade.

Phyllostachys aurea.—I consider this to be one of the hardiest of Bamboos, as it is at the same time one of the most distinct. It is of more erect growth than any other, and forms a distinct specimen; its culms remain well at home, more so, I think, than any kind we grow. Its canes are quite stiff and rigid, with short internodes. It with

stands drought well, as its roots go down deeper for their nourishment. It makes a quite distinct and very fine specimen. So far as I have seen it is one of the latest to start into fresh active growth, but it is one of the best and brightest during the winter season. With us it attains to a height of 13 feet. I should add that its specific name is somewhat misleading, for there are but few traces of yellow in it.

Phyllostachys Castillonis.—This is still, I think, a rather scarce plant, which may arise perhaps through its not being one of the best to establish. When, however, it is once settled down it will grow and thrive well. No other Bamboo has such a distinctive character as *P. Castillonis*. In this instance the rich golden yellow is most pronounced. Of this bamboo the late Lord REDESDALE says in "The Bamboo Garden":—"The double groove is bright green, the rest of its circumference being yellow, and this colouring is not on the surface only but goes right through the wood to the cavity. Owing to their position the two colours are alternate all the way up the culm, the hues being intensified with age." Its leaves are beautifully variegated also, at first of a decided yellow; this with age fades to a creamy white. Compared with *P. aurea* it is rather more spreading in habit. Its height with us is 14 feet, and it is still increasing.

Phyllostachys flexuosa.—This species comes, I consider, nearer to *P. viridi-glaucescens* than to any other, though its stems are somewhat like *P. nigra*. It is a plant of moderate size and of a very graceful habit. It is not so strong in growth as either of the species just named. In every respect it is most graceful and one that will not quickly outgrow its allotted space. As to its hardiness there is no question whatever, as it was introduced from the colder regions of China in 1864. Its height with us is 6 feet.

Phyllostachys nigra.—Of this species we had a magnificent specimen, but unfortunately it succumbed after flowering during that period of what I might term the flowering epidemic, about ten years back. (We, at the same time, lost *P. Boryana*, *P. mitis*, and *P. Henonis*, and all our plants of *Arundinaria Simoni*.) Now we have a few examples, but not nearly so large as the lost one. It is one of the hardiest of all in my opinion. The habit is extremely graceful, the older growths, from their dense profusion of foliage, weight themselves down until they touch the ground. Its dark stems and plumes of bright green foliage render it a most attractive plant. Lord REDESDALE, in "The Bamboo Garden," states that this species is recommended for planting as a source of supply for umbrella sticks, sword-canes, whip-handles, fishing-rods, and various other purposes. This had reference to what was being accomplished in the south of France. It is largely grown in the south of France. We have not now a large specimen, hence its height of 6 feet is in a way misleading as to its actual merits.

Phyllostachys Quiloi.—This species, when it is well established, makes a very fine specimen. It is nearer, in my opinion, to *P. viridi-glaucescens* than to any other, but is not of such a spreading habit as

that species. In the Gunnersbury Park Gardens there is a very fine specimen which reaches to a height of 18 feet. It has been sold also under the name of *P. Mazeli*, but that name seems now to have dropped out of most lists. The leaves are larger than in any other species of the *Phyllostachys* group. As this plant gains in vigour its culms become more erect, and it might mislead many as to its true character. We find it to be a most enduring plant, and in this respect one of the most reliable in our collection.

Phyllostachys viridi-glaucescens.—This species is a desirable one for any garden. Its stout much-branched stems create a density of habit; they spread away somewhat from the centre of the plant and give the appearance of a much larger plant than it actually is. Its leaves are of a deeper green than many, and are well retained through the season, even until early spring. It has about the hardest constitution of any in my experience. I note that in one of the later catalogues of Messrs. JAS. VEITCH this fact is borne out when they say "clothed with bright green foliage that continues fresh throughout the winter." Its height so far with us is about 12 feet.

The Bamboo in France.—In the south of France the Bamboo is a conspicuous feature in parks and gardens. Under the favourable conditions of warmth, moisture, and a genial soil it is somewhat surprising to see the semi-tropical luxuriance of the Bamboo. The finest I have ever seen in France were at M. Latour-Marliac's Nurseries at Temple-sur-Lot, Lot-et-Garonne. There the largest stems were 9 inches in circumference at 4 feet above the ground, and the growth collectively was most remarkable.

In Italy.—Around the Lake of Como, both at Cadenabbia and Bellagio, the Bamboo simply luxuriates, but I never noticed any quite so large as at M. Latour-Marliac's. The finest there were *Phyllostachys mitis* and *Thamnocalamus Falconeri*, the first named stately and erect, the latter most graceful and plumose, somewhat like a fountain of green. I noted too that in many instances the plants were placed so as to receive the water trickling down from above. In one garden the growths had all been cut down because of the density of the plant. The young canes would then quickly come away, the process to be repeated later on as occasion might require. The well-ripened canes in such a case would be invaluable for staking purposes. (I find myself that the canes cut out of such species as *Phyllostachys aurea* are most useful for this purpose; these are not trimmed, but used just as they grow, with the spray upon them.) For a more detailed account of the Bamboo I would refer my readers to the late Lord REDESDALE's work on the Bamboo and to Mr. W. J. BEAN's work on Trees and Shrubs, in which the Bamboo is prominent.

THE COOKING OF VEGETABLE FRUITS, &c.

By C. HERMAN SENN, C.G.A., F.R.H.S.

[Read September 26, 1916; Mr. G. WILSON, F.L.S., in the Chair.]

THE final division of vegetables, the theme of my fifth and last lecture on the subject of cooking vegetables, includes at least three sections, viz.:—(a) cereals; (b) vegetable fruits, a term which I use to distinguish them from other edible fruits on account of the small amount of sugar which they contain; and (c) legumes or pod plants.

1. The cereals, such as rice, maize, wheat, &c., belong primarily to the bread foods, so will only be briefly referred to. Every member of this group is rich in starch, and many of them contain in addition a certain proportion of fat and proteids. Rice and maize are largely used as or in place of vegetables by the inhabitants of tropical countries.

2. Vegetable fruits are chiefly valuable because of the large quantities of water they introduce into the system. Otherwise they have but little nourishment. The best known in this section are the vegetable marrow, pumpkin, cucumber, tomato, and aubergine or egg-fruit.

Some recent varieties of the ordinary marrow can be obtained with edible skins. The most popular forms are the tender little bush-marrows, and the curious custard-marrow, which is justly celebrated as surpassing all other kinds in delicacy of flavour.

The gourd family contains many allies, which make pleasant eating in summer-time owing to the quantity of water they contain, but are not very nutritious. The common gourd or pumpkin is more eaten in the United States than in this country. There it is but seldom eaten raw, but made into soups, sliced and fried, put into pies, &c. The squash is another form which is used in America.

Cucumbers are a watery but favourite vegetable. In their young state and when quite small they are often pickled under the name of gherkins. The melon belongs to the same family, and although so watery is yet rather indigestible. Cucumber is largely used in this country for salads and pickles, but in the East it is consumed as a staple article of food. It is abundant in tropical and warm countries, and particularly in Hindustan. It is cultivated on floating weeds in the lakes of Persia, China, and Cashmere. Its antiquity in the East is very great, and the Israelites, we are told, longed for it in the desert. It has been common in England for about 500 years.

The tomato may be served in many different ways. It may be boiled, fried, baked, roasted, stewed, pickled, and preserved. Itself the "prince of salads," the tomato is never better than when eaten raw and fresh. It is a popular vegetable, which charms the eye as well

as the palate. It was originally grown in pots and in gardens as a pretty plant, to satisfy the eye, but not to be eaten. It owes its pleasant sour taste to oxalic acid, and on that account, like rhubarb stalks, it is generally forbidden to those of a gouty tendency, since oxalic acid forms insoluble salts with lime and magnesia.

The aubergine or egg-plant (also known as egg-apple) is really a tropical vegetable fruit, but is now being cultivated in England to some extent. The fruit is not unlike a small cucumber. There are many kinds, which can be distinguished by their shape and colour; both the black and the violet varieties are edible, whilst the others are purely ornamental. A favourite West Indian method of serving aubergines is to stuff them with minced meat and breadcrumbs, and then bake them in the oven.

3. The legumes or pod vegetables are chiefly represented by the pulses, viz. peas, beans, and lentils, which are particularly valuable as a food owing to the large quantity of nitrogenous matter they contain in addition to carbonaceous material. Pulses, however, are rather indigestible, and frequently cause flatulence owing to the presence of sulphur. Peas are not quite so nutritious as beans, being poorer in fat and proteids. Peas are, perhaps, the oldest known vegetable, for they existed in prehistoric times, having been found in the Swiss lake dwellings of the Bronze period. Broad beans, except when quite young, should have the pale outer skin removed before serving at table.

Okra pods are better known in the West Indies and America than in this country. On account of their mucilaginous and aromatic properties they are largely used for making soup, especially the popular gumbo soup, made of the green pods. When quite young, okra or gumbo pods are often pickled and preserved in tins.

Dried peas, green or yellow, are most useful in the winter, when other vegetables are both scarce and dear. All dried pulses require soaking for several hours, and if possible should be cooked in soft water to loosen the husks.

Fungi form a class by themselves. The chief edible fungi are the common mushroom, ceps or ceps, which have a most agreeable and nutty flavour, and make an excellent vegetable side-dish or after-dinner savoury, and the morel, rare in England, but much used on the Continent. All the above are cooked after various methods, besides being used in ketchup, or dried for flavouring purposes.

The truffle is a subterranean fungus grown chiefly in the chestnut forests of France and Italy, where it is rooted out by dogs trained for the purpose. In England truffles are chiefly found in Wiltshire, Hampshire, and Kent. There are two varieties, the black truffle and the white truffle, the former being the most valuable for culinary purposes. Both forms, however, are very indigestible.

The following recipes for the cooking of the various kinds of vegetables mentioned have been specially selected from the book entitled "How to Cook Vegetables," by C. H. Senn.

RECIPES.

VEGETABLE MARROWS AND PUMPKINS.

Boiled Vegetable Marrow.—Take 2 marrows, cut each in two lengthwise, peel each half thinly, and remove the seeds. Put the marrows in a stew-pan with sufficient slightly-salted water to well cover, and allow to boil gently for about $\frac{1}{2}$ hour. To make the sauce, proceed as follows: Put 1 oz. of butter in a saucepan and stir in a tablespoonful of flour, work it until smooth; moisten with stock, and let boil for a few minutes; season the sauce with salt and pepper. Drain the marrow, place it on a dish, pour the hot sauce over it, and serve.

Vegetable Marrow Fritters.—Peel 1 or 2 green marrows, take out the seeds, and stuff the marrows tightly with a salpicon made of equal proportions of cold ham, tongue, beef, or any other kind of cold meat; bind with a little sauce, and season with salt, pepper, chopped parsley, thyme, and marjoram. Cut the stuffed marrows into slices, about $\frac{1}{2}$ inch in thickness, dip these in egg and crumb in finely crushed water biscuit or ordinary breadcrumbs, fry in hot fat or clarified butter, drain on a cloth, dish up on a paper or folded napkin, garnish with fried parsley, and serve.

Baked Vegetable Marrow.—Take 2 medium-sized vegetable marrows, 2 oz. cooked meat, 4 oz. cooked ham, a little grated lemon rind, pepper and salt, egg, breadcrumbs, grated cheese, $\frac{1}{2}$ oz. butter, some well-made gravy or brown sauce.

Peel the marrows, cut each in halves lengthwise, remove the seeds, and parboil in salted water, then drain them carefully. Butter a baking tin, lay the pieces of marrow carefully in, cut side up. Mince the meat and ham, and mix with 1 oz. breadcrumbs, add the lemon rind and pepper and salt, and moisten with a beaten egg. Fill each piece of marrow with this. Cover with breadcrumbs and grated cheese, place some very small pieces of butter on top, and bake in a hot oven for 30 minutes. Dish up, and serve with gravy or brown sauce.

Vegetable Marrow with Cheese.—Peel 2 green marrows not too large in size, cut them lengthwise into quarters, scoop out the seedy parts, place them in a sauté-pan with 1 oz. of butter, season with salt, pepper, and grated nutmeg. Put the pan on the fire for $\frac{1}{4}$ hour, shaking it from time to time; moisten with a little cream, and add a tablespoonful of grated Parmesan cheese. Dish up the marrow neatly on an oblong dish, sprinkle with breadcrumbs and Parmesan cheese, place in a hot oven for a few minutes, and serve with piquante sauce poured round the dish.

Vegetable Marrow au Gratin.—Peel the marrows and divide in round pieces of about $1\frac{1}{2}$ in. in diameter. Blanch in salted water for a few minutes, and drain on a sieve. Butter a gratin dish and arrange the marrow in it, season with salt and pepper, sauce over with a little

Béchamel sauce, and sprinkle with grated cheese, half Gruyère and half Parmesan. Bake and brown nicely, and serve hot.

Pumpkin with Cheese.—Peel a small pumpkin, cut it in two and remove the seedy part, steep in salt water for $\frac{1}{2}$ an hour, take out, and drain. Cut as many slices as may be required (the remainder will keep in salt water); melt some fresh butter in a stew-pan, put in the slices, season with a little salt, pepper, and aromatic spice; fry for a few minutes. Dish up on a buttered gratin dish, sprinkle the top thickly with grated Parmesan cheese, some fresh breadcrumbs, and a few small bits of butter. Bake in a hot oven for 10 minutes, and serve.

CUCUMBERS.

Fried Cucumber.—Peel 2 cucumbers, cut them into sections about $1\frac{1}{2}$ in. in length, and divide each piece in two. Take out the centre part of each, sprinkle over with salt, and let stand for about 1 hour. Wash well, then cook with 2 oz. of butter, a little stock, a teaspoonful of caster sugar, vinegar, cayenne, and a peeled onion. A $\frac{1}{4}$ of an hour's cooking is sufficient. Drain the cucumbers on a cloth, and when ready to serve dip each in frying batter, and fry in hot fat to a golden brown. Take up, drain, sprinkle with salt, dish up, garnish with parsley, and serve with tomato sauce, separately.

Cucumber with Tomato.—Peel thinly 1 large or 2 medium-sized cucumbers, cut them into 1 in. thick slices or cubes, and with a small pastry cutter cut out the centre portion of each. Place them in a pie-dish, and marinade them with oil, vinegar, salt, and pepper. Mix a jar of potted meat with a little cream or fresh butter. Fill the cavities of the cucumber shapes with this. Dish up on a folded napkin, put a slice of ripe tomato on top of each, and garnish with a hard-boiled yolk of egg, rubbed through a sieve and placed in the centre of the tomato. Garnish the dish with sprigs of fresh parsley and serve.

Stuffed Cucumber à la Reine.—One good-sized cucumber, 3 oz. cooked chicken or veal, 6 small mushrooms, 1 oz. cooked ham, $\frac{1}{2}$ gill white sauce, $\frac{1}{2}$ gill of aspic, and $\frac{1}{2}$ gill fresh cream.

Cut the cucumber into 1 in. thick slices, peel thinly, and stamp out the inside by means of a pastry cutter. Blanch the pieces in salted water and drain on a cloth. Pound the meat, mushrooms, and ham together in a mortar, when fine rub through a sieve. Put the purée in a stew-pan, season with pepper, a little salt, and a pinch of grated nutmeg, warm up the sauce and aspic together, stir over ice till it begins to set, then add the cream previously whipped. Stamp out some rounds of brown bread a little larger than the cucumber shapes, spread over with some of the above prepared purée, place a round of cucumber on each and fill up the centre of each with the purée (pile up high). Decorate tastefully with some creamed butter and lobster butter, dish up, garnish with sprigs of fresh parsley, and serve.

Braised Cucumber with Beef Marrow.—Peel and prepare a cucumber the same as for stuffing ; place in the cavity of each piece a long piece of marrow fat and cover with a little forcemeat or bacon. Braise till tender, glaze the surface, dish up, garnish with thin lemon slices, and sprinkle with parsley.

TOMATOS.

Baked Tomatos.—Chop finely 4 oz. of cooked ham, 1 oz. beef suet or fat bacon, and 3 to 4 mushrooms. Mix these with 1 teaspoonful of chopped parsley, add a grate or two of lemon rind. Fry these ingredients in a little butter, then season, and moisten with a beaten egg. Remove the stalks from 4 large ripe but firm tomatos, wipe them, and cut each in half. Scoop out some of the pulp, which may, if liked, be mixed with the stuffing. Put enough of the mixture in each half of tomato to completely fill it. Sprinkle the top with bread-crumbs, and place a small piece of butter in the centre of each. Bake in a fairly hot oven for 15 minutes. Dish up, and serve hot.

Stuffed Tomatos à la Tartare.—Select 8 to 10 medium-sized firm tomatos (scald and peel them if so preferred), scoop out carefully the centre (pulp) part. Shred very finely the white portion of half a stick of celery, half a small cooked beetroot, the white of a hard-boiled egg, and rub the yolk through a coarse sieve. Fill the tomatos with layers of the above ingredients, and curl the fillet of an anchovy on top of each filled tomato. Place them on ice for about 2 hours. When required for table put a dessert-spoonful of tartare sauce in the centre of each. Dish up on crisp lettuce leaves, garnish tastefully, and serve.

Sautéed Tomatos.—Wipe 1 lb. small, firm, even-sized tomatos with a cloth and cut into slices. Peel and chop 2 shallots finely. Melt 1½ oz. butter in a sauté or frying-pan ; when hot put in the shallots and fry to a golden brown. Be careful not to let them get too brown, else the flavour of the tomatos will be spoilt. Place in the tomatos, and fry them over a brisk fire—they will take about 10 minutes to cook. Season with salt and a little mignonette pepper. Dish up on a hot dish, and sprinkle a little finely chopped parsley over the top.

Curried Tomatos.—Chop half an onion very small, and fry it in butter until cooked ; then add a large dessertspoonful of curry powder, about 2 slices of minced apple, and a gill of rich gravy. Stir the ingredients all together, and allow them to simmer for 10 minutes. Add six small skinned ripe tomatos, and, just before serving, a teaspoonful of lemon juice. The sauce for this dish should be thick enough to coat the tomatos. Serve with plainly boiled rice.

Tomato Pudding.—Scald and peel 8 to 10 ripe tomatos, then slice them and range them in a buttered pudding basin with layers of thin slices of bacon and breadcrumbs. Season each layer of tomato with salt, pepper, and grated nutmeg, and sprinkle a little oiled butter between the layers of breadcrumbs. Continue thus till the basin is

filled, cover the top with slices of bread dipped in butter. Cover with a cloth and boil the pudding for 2 hours. Unmould on to a dish, and pour a nicely-seasoned tomato sauce over the pudding.

Tomatos on Toast.—Cut 6 ripe tomatos into thick slices, put these in a single layer in a buttered sauté-pan or baking-tin, season with pepper and salt and a little lemon juice; sprinkle with white bread-crumbs, put a small piece of butter on each of the slices, and bake in a hot oven for 15 minutes. Prepare some neatly shaped pieces of buttered toast, dress the baked tomatos upon these, dish up, and sauce over with the gravy left in the pan.

Tomato Salad.—Six firm even-sized tomatos, 1 tablespoonful vinegar, 2 tablespoonfuls salad oil, 1 teaspoonful mixed mustard, 1 teaspoonful chopped chives or parsley, pepper and salt.

Wipe the tomatos, remove the stems, and scald the tomatos in boiling water for one minute, drain on a cloth, carefully remove the skin, and let cool. Then cut them into thin slices, and place in a salad bowl. Prepare the dressing as follows: Put 2 saltspoonfuls of salt in a basin, together with 1 saltspoonful of pepper, the mixed mustard, pour in the vinegar and oil, and mix thoroughly with a wooden salad spoon. Just before serving the salad, add the chopped chives or parsley to the dressing, and pour it over the tomatos.

Tomato Pillau.—Slice 1 or 2 small onions, and fry them in a stew-pan to a golden brown in 2 oz. of butter. Add 1 pint of tomato purée and $\frac{1}{2}$ pint of vegetable stock. Season with salt and pepper, and bring to the boil. Skim, add $\frac{1}{2}$ lb. of well-washed rice, and cook gently until the liquor is almost absorbed. Melt 2 oz. of fresh butter in a stew-pan, when hot add the rice, and stir over the fire for a few minutes. Cover the pan, and place it on the stove for about 15 minutes. Dish up, and serve hot.

AUBERGINES.

Aubergine Pie.—Peel 6 aubergines and cut each lengthwise into 4 pieces. Sprinkle the slices with salt, and leave them for 2 or 3 hours; then drain them on a clean cloth. Dip the slices in flour, then fry them in butter to a nice golden brown colour. Meanwhile mince finely $\frac{1}{2}$ lb. of cooked veal and 6 oz. of fat bacon, then add about a gill of tomato purée, and season with salt and pepper. Line a pie-mould with good short paste, spread a layer of the farce at the bottom, place some slices of aubergine on it, and cover them with another layer of farce; proceed thus till the mould is full; then melt 2 oz. of butter and pour it over the top. Cover the mould with a layer of paste, and bake in a moderately heated oven for about an hour. Unmould carefully, dish up, and serve hot or cold.

Aubergine Fritters.—Peel 3 aubergines or egg-plants and cut them across in slices of about $\frac{1}{4}$ of an inch thick. Spread on a plate, and season with salt and pepper. At the end of half an hour drain them on a cloth. Dip each piece of aubergine in batter, drop

into some very hot frying fat, and fry them to a nice colour, drain, and dish up in crown shape on a serviette, garnish with fried parsley, and serve.

Baked Stuffed Aubergines.—Peel the required number of aubergines and cut them into slices lengthwise about a third of an inch thick; sprinkle them with salt, leave them for an hour or two, and then wipe them carefully in a clean cloth. Now fry them lightly in olive oil, place them on a flat dish, and cover each slice with savoury meat or rice stuffing; sprinkle some grated Parmesan cheese on top. Bake in a hot oven from 20 to 25 minutes, then dish up and serve.

THE HISTORY AND DEVELOPMENT OF THE RED CURRANT.

By EDWARD A. BUNYARD, F.L.S.

[Read September 12, 1916; Mr. GURNEY WILSON, F.L.S., in the Chair.]

THE Red Currant is one of the most modern of our fruits, and its history is therefore comparatively easily traced, as the whole of its development has taken place since the invention of printing. It is thus possible to find in herbals and early gardening books a fairly accurate record of its progress. The question of the influence of cultivation upon plants is one of great interest, and conflicting views are held as to its importance and existence. The writer endeavoured to show in a recent paper that in the history of the Strawberry it had played but an unimportant part, the whole of the increase in the size of the fruit being due to the interbreeding of large-fruited wild species.*

The Red Currant is a parallel case, and I think it quite possible to account for all the garden Currants of to-day, with the exception of one group, in the same manner. In the excepted case a sudden appearance of a distinct type has to be accounted for, and there is no evidence of a gradual amelioration by cultivation. As it is somewhat difficult to treat concurrently the botanical and horticultural developments, the former will be taken first, the evidence of garden literature becoming clearer when studied in its light.

The three species which have taken part in the history of the Red Currant are *Ribes rubrum*, *Ribes vulgare*, and *Ribes petraeum*. These have been much confused in the past, but the recent work of JANCZEWSKI^{(1)†} has rectified this, and will be taken as the authority for the following descriptions, which will give such salient characters as suffice for our purpose. Special stress must be laid upon the character of the flower, as the size of the fruit varies so remarkably under cultivation that it does not provide a reliable recognition mark. Such increase in size is of course only maintained so long as the conditions remain constant, and must not be confused with that of a genetic character.

Ribes vulgare Lamarck, 1789 (see figs. 36-40).—Native of Western Europe, France, Belgium, Great Britain. A small spreading shrub, leaves 3 or 5-lobed, slightly downy beneath in some forms; flowers flat, pale green; sepals turning back; petals minute, wedge-shaped. The fleshy ring around the style is a good character by which this species can always be recognized, and even in crosses with *Ribes rubrum* it can still be distinguished (fig. 36, 1c). The racemes are pendulous

* See *Journal R.H.S.* xxxix. p. 541 (1914).

† For references see p. 269.

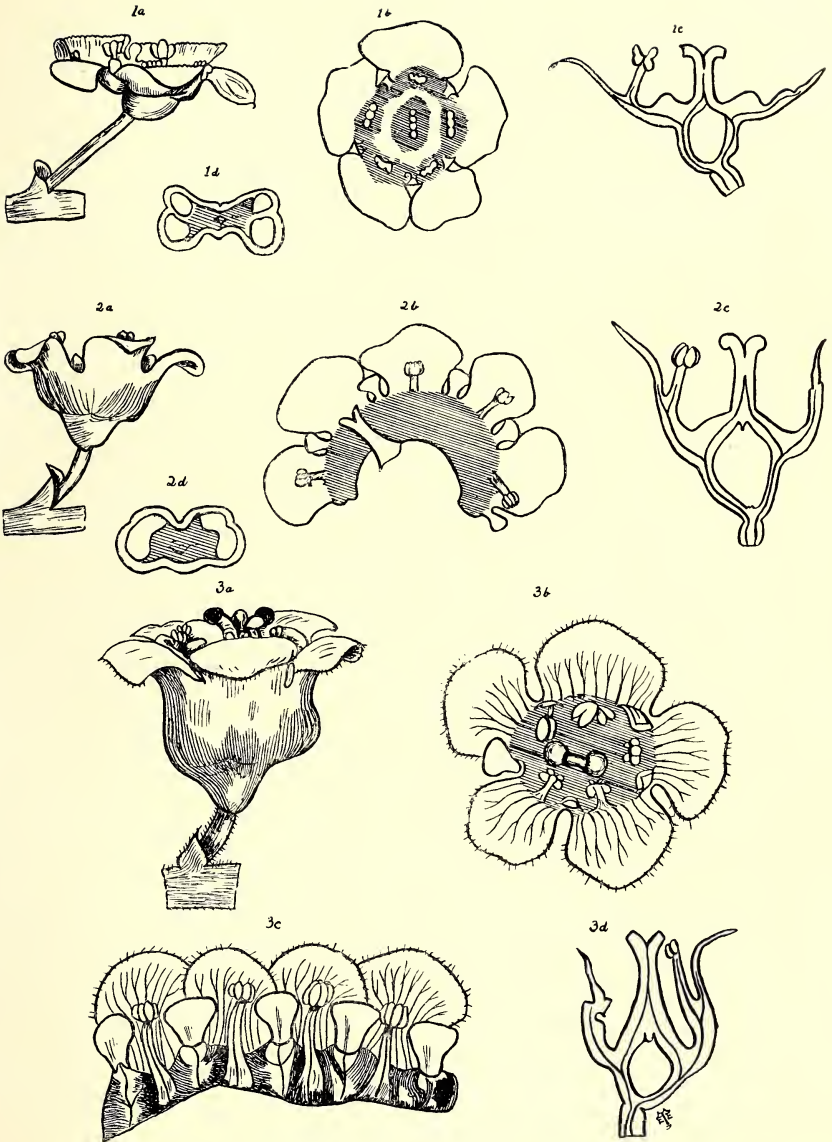


FIG. 36.—FLORAL DETAILS OF
 (1 a-d.) *RIBES VULGARE*. (2 a-d.) *RIBES RUBRUM*. (3 a-d.) *RIBES PETRAEUM*.
 (After Janczewski.)

[To face p. 260.]

(figs. 37, 39). Buds small, dark brown, fairly closely pressed to the twig (fig. 38).

Ribes vulgare shows but little variation when growing wild, and only one variety has been made under this species by JANCZEWSKI. LAMARCK distinguished a *sylvestre* "lobis foliorum brevisculis, petiolis pedunculisque subhirsutis," and *hortense*, "lobis foliorum acutioribus, petiolis pedunculisque subglabris." For our purpose, however, we need but consider the typical *vulgare* and its large-fruited form, called by JANCZEWSKI *macrocarpum* (fig. 39). The latter will be discussed under the horticultural section.

Ribes rubrum Linnaeus (1753), Central and Eastern Europe and Asia, Scandinavia, Poland, Prussia, Russia, Siberia, and Manchuria. A small bush, leaves rounded, 3 to 5-lobed, generally densely pubescent. Flowers bell-shaped, pale green or reddish, racemes held horizontally (fig. 36) till fruit develops and weighs them down. Buds small, generally covered with white hairs, a little away from wood (fig. 38). This species is easily distinguishable when in flower. The campanulate flowers are held out at right angles from the stem in contradistinction to the pendulous flowers of *R. vulgare*. The absence of a disc upon the receptacle is also constant. Of this species JANCZEWSKI distinguishes five varieties: *scandicum* Hedlund, *pubescens* Schwarz, *galbellum* Trautvetter and Meyer, *hispidulum* Jancz., *Palczeskii* Jancz. Of these *pubescens* and *scandicum* seem to have played the most important part in such garden forms as I have been able to collect. *R. rubrum pubescens* is often described in English works under the name of *Smithianum*.

Ribes petraeum Wulfen, 1781. High mountains of Europe, North Africa, and Siberia. A very distinct species, making very stout wood, with large buds (see fig. 38). Leaves very dark green, stout and firmly held, the middle lobe being always longest. Fruit more or less acid, generally tapering a little to stem, giving a slight Bergamotte shape. Flowers late in the season (fig. 36). Of this species JANCZEWSKI distinguishes six varieties: *bullatum* Otto and Dietrich, *carpathicum* Kitaibel, *caucasicum* Bieberstein, *atropurpureum* C. A. Meyer, *Litwinovii* Jancz., and *altissimum* Turczaninow. Of these, *Ribes petraeum bullatum* seems mainly to have been concerned in the parentage of garden Currants.

To simplify matters it may be said roughly that the species and varieties which mainly concern us for the present purpose are *R. vulgare*, *R. rubrum pubescens*, and *R. petraeum bullatum*, though it is possible that further research may show others must be brought in. It will now be necessary to refer to the authorities who have studied this matter, and to state briefly their opinions as to the part which these species have played in the genesis of the garden Red Currant. Until recent years all writers (e.g. DE CANDOLLE, "Origine des Plantes Cultivées") considered that *Ribes rubrum* was the sole species concerned. The work of HEDLUND⁽²⁾ in the "Botaniska Notiser" in 1901 is the first which treats the origin of the Red Currant in detail,

and his opinions deserve special notice. He groups the above species under *R. rubrum*, and then distinguishes many elementary species. This arrangement has now been superseded by Janczewski. The great distinctions between *R. vulgare*, *R. rubrum*, and *R. petraeum* are sufficient to give them specific rank. What is now correctly known as *R. vulgare* was divided by HEDLUND into *R. sylvestre* and *R. hortense*. They both possess pale-green flowers, but in *sylvestre* the receptacle is generally tinted red, whereas in *hortense* it is not, and small differences in the leaves and anthers are specified. From this he proceeds to argue that no white varieties are descended from *hortense*, and some historical data are based upon this supposition. It is, however, evident that this red eye would not appear in a White Currant, which is a true albino, and the presence or absence of a pigmented "eye" can hardly suffice to establish species. To group these two under *vulgare*, as JANCZEWSKI has done, is obviously right. The true *R. rubrum* is represented by several elementary species, *scandicum*, *pubescens*, &c. These are considered as varieties of *R. rubrum* by JANCZEWSKI. *R. petraeum* is given specific rank, and *bullatum* placed as a variety.

The conclusions HEDLUND arrives at are as follows:—

(1) "That cultivation produces varieties with white berries or variegated leaves, which, in consequence of physical weakness, can with difficulty attain full growth in nature." It is, of course, quite unproven that cultivation has *produced* these; it has preserved them. The white varieties are often of weak growth, but several very vigorous varieties exist.

"That the fruits of those grown for the berries are larger than those grown in the wild state." This is not correct. Several forms of *R. petraeum* have been found uncultivated with fruits as large and bunches as long as any cultivated variety.

(2) "That the cultivated elementary species are like those occurring naturally (wild)." This is doubtless true, but does not agree with the writer's previous statements as to the increase of size due to cultivation; this, by his argument, should have "improved" them.

(3) "That amongst the hybrids due to cultivation some are not known in a wild state."

(4) "That through multiplications of hybrids different varieties were obtained which unite many of the cultivated elementary species."

Of these last two propositions the first may be disproved at any time. The last is, in my opinion, a true statement of the origin of the cultivated Red Currants.

The next account of the genesis of the Red Currant is that of JANCZEWSKI, "Ancêtres des Groseilliers à Grappes" ⁽³⁾ (1909), in which, as has been pointed out above, the three species *R. vulgare*, *R. petraeum*, and *R. rubrum* are separated and the part that each has played is discussed in some detail. The author collected from various nurseries in Europe a number of Red Currants and studied them carefully, and he concluded that *R. vulgare* had played the main part in the production of the Red Currant. He quotes some forty-

four names under this species. As descending from *R. rubrum* he received only four varieties; three unnamed sorts from gardens in Lithuania, and one striped variety, 'Gloire de Sablons.' Deriving from *R. petraeum* the 'Rote Kernlose' (seedless) was noted, and from hybrids between the above species ten varieties. From this the author concluded that *R. rubrum* had played but a small part in the production of the Red Currants generally known in commerce, and since his day this opinion has been generally accepted, as witness a remark in Mr. BEAN'S recent work, "Trees and Shrubs Hardy in Great Britain," p. 409: "*R. rubrum*. . . Cultivated forms of this species are grown in the gardens of Scandinavia, but in Western and Central Europe the cultivated Red and White Currants are exclusively *R. vulgare*." This is, in my opinion, a misstatement. It is curious that in the collection brought together by JANCZEWSKI direct descendants of *R. rubrum* were missing, but the fact remains that there are many grown in this country and elsewhere. The well-known 'Raby Castle' is a true *R. rubrum* with large fruits, showing no characters of *R. vulgare*, as also are the 'Red Scotch,' 'Millearn Red,' and 'Erstling aus Vierlanden.' Many varieties are obviously crosses between *rubrum* × *vulgare*, such as 'Fowler's Long Bunch,' 'La Constante,' 'St. Madoe's,' 'Langtraubige,' 'Red Champagne,' and others. It seems evident that it was only a matter of luck that JANCZEWSKI'S collection did not include these sorts, and that *R. rubrum* has played no inconsiderable part in the origin of the Red Currant. The part played by *R. petraeum* will be dealt with in the next section.

In tracing the horticultural development of the Red Currant the writer has had recourse to Herbals and such garden literature as was available. Of previous writings on this aspect of the question there are the useful works of STURTEVANT,⁽⁴⁾ which give many references to literature, but his history only begins at RUELIIUS and makes no reference to the part played by the different species or to the date they came into Currant development. For the early literature a paper by FISCHER BENZON,⁽⁵⁾ is valuable, and taken in conjunction with that of STURTEVANT gives a fairly complete reference to the Herbals in which records of the Red Currant may be found. In searching for the earliest record of the Red Currant it is not surprising to find that it was unknown to the Greeks or Romans or any of the other Mediterranean dwellers. The history of cultivated fruits, with but few exceptions, records a steady invasion from the East, westward and northward, accompanying successive waves of civilization. The Red Currant, being a fruit of the temperate regions, has never spread far south, and its insignificance compared with the luscious Eastern fruits would not have assisted any such movement. Whilst *Ribes rubrum* and *R. petraeum* are found in the Alpine region of Central Europe, they do not seem to have attracted the attention of gardeners. An old French writer puts forward the speculation that HANNIBAL in his trans-alpine journey may have descended from his elephant

and refreshed himself with these fruits, but we cannot regard this as anything more than a valuable suggestion for an historical painter.

In the "Capitularies" of CHARLEMAGNE (*De Villis*, cap. 70) there is an interesting list of fruits, but Red Currants are not mentioned, though of course this is no proof that they were not grown.

During the Moorish occupation of Spain horticulture was kept alive when in other parts of Europe it had fallen into neglect under the invasion of the Northern barbarians, and in an interesting Arabic work of this period by IBN EL AWAM, which has been translated into French by J. J. CLÉMENT MULLER, we find the "*Ribes*" which has sometimes been mistaken for the Currant.

This, however, is a species of *Rheum*, much valued by the Arabs as a drug. In the effort to identify plants with those described by the ancients, which was so common a feature of early Renaissance days, the wild Currant was thought to be the *Ribes* of the Arabs. This led to the use of the word *Ribes*, and the Swedish *Risp*, Danish *Ribs*, still remain the popular names in these countries. Of the Red Currant no trace is found in IBN EL AWAM'S treatise. According to KOCH, DE CANDOLLE, STURTEVANT, and other writers who have copied their statements, the Red Currant is not met with in European literature until the sixteenth century, RUELLIUS (1536) being usually quoted as the first writer to mention it. This, however, is demonstrably wrong, and it appears in a German MS. of the early fifteenth century as *Ribes* and *Johannisdrubel*.

The first known drawing of a Red Currant appears in the "Mainz Herbarius" of 1484. This book was the first of the printed German Herbals, and was probably compiled from existing manuscripts. The name here given is *Saint Johans Drubjin*, and the description is as follows:—"Ribes is a bush, the fruit of which is red and sweet with an acid roughness, and therefore it follows that it cools the stomach and allays the thirst &c." The picture is naturally somewhat crude, but recognizable, and shows a five-lobed leaf with fruits. A better illustration is found in the later "Gaerde der Suntheit," Lübeck, 1492.

These facts prove that the Red Currant was known some 136 years before the time of RUELLIUS; if cultivated in gardens or merely gathered from wild plants it is, of course, impossible to say, but it seems probable that, as in other fruits and herbs, its value once recognized, it would not be long before it would be introduced into the herb garden.

In the early herbals of the sixteenth century we begin to find the Currant mentioned as a plant commonly cultivated. The French writer JEAN RUEL, or RUELLIUS as he was more generally called, published his well-known "De Natura Stirpium" at Paris in 1536. In this work the Red Currant is recommended as a plant for borders or edgings, and it was used as an appetizer. A few years later AGRICOLA (AMMONIUS) ⁽⁶⁾ speaks of it as "cherished in our gardens." It is therefore evident that the Red Currant was known in gardens in France and North Germany. We first meet in RUELLIUS a name



FIG. 37.—RIBES VULGARE.
(From Decaisne's 'Jardin Fruitier.')

[To face p. 264.



A.

B.

C.

FIG. 38.—WINTER SHOOTS OF
(A.) *R. VULGARE*, (B.) *R. PETRAEUM*, (C.) *R. RUBRUM*.



FIG. 39.—*RIBES VULGARE* VAR. *MACROCARPUM* 'VERSAILLAISE.'



FIG. 40.—RIBES VULGARE.
(From Fuchs' Herbal.)

[To face p. 265.]

which has caused some discussion and speculation. Recognizing an affinity to the Gooseberry, BOCK named it *Ribes Grossula*, and also *Grossula transmarina* and *Groseille d'outre mer*. The last two names clung for many years to the Currant, and are met with in later English authors as "Over-seas Gooseberry" and in Holland as "Besiekens over zee." Several explanations have been put forward to account for this curious name, remarkable for the reason that in the countries where it was used the Red Currant was a native plant. HEDLUND suggests that it may have been introduced from Scotland to the Continent, and other writers have suggested its transport to France by the Normans. These theories, however, do not explain the curious fact that different countries should have adopted identical names, and it seems more likely that an explanation must be sought in another direction. In the eighteenth century the Red Currant was commonly thought to be the plant which produced the dried Currants of the grocer, and many names show this confusion, such as Reisons, Corinths, Bastard Corinths, &c. It may therefore be that, as the dried Currants came over the sea from the Mediterranean shores, the Red Currant was thought also to be a native of the south. It is, however, certain that the name Corinth was used for a long period, giving rise to the present word Currant. In the "Herbal" of FUCHS (7) so renowned for its wonderful drawings, a good figure of the Red Currant is given (see fig. 40). From the known accuracy of the draughtsmanship in this work we can safely assume that this gives a very close idea of the size of the fruit of those days. It is interesting to note that, though cultivated for something like one hundred years, the size is not greater than that of wild plants, and also that so far only one variety is recorded. From the flowers it is evident that it is to be placed under *R. vulgare*. This fact is interesting, as from historical reasons we should presume this to be the case. The distribution of this species placed it in the tracks of the advance of civilization, whereas the more northerly *R. rubrum* and the mountain-loving *R. petraeum* were introduced into Currant history at a later date.

The introduction of the Currants into cultivation in England is usually placed by historians about the beginning of the seventeenth century for two reasons. The word Currant is first found in English literature in 1619 in LYTE'S translation of DODOENS' "Herbal," and in the list of fruits given by TUSSEY (8) the word does not occur.

There is however, I think, no doubt that the "Reisons" found in TUSSEY'S list refer to the Red Currant. The confusion with the dried Currant has been mentioned above, and furthermore TUSSEY'S fruits are all hardy varieties which are planted in the farmhouse garden. Grapes are definitely mentioned separately, so it cannot refer to these. It would be somewhat remarkable if a fruit which was grown in Continental gardens and described in Herbals for two centuries should not have reached this country, even were it not a native, and the custom of taking wild strawberries from the wood and planting in gardens shows that this method of enriching gardens with native

fruits was not unknown. In the "Commentaries" of MATTHIOLUS⁽⁹⁾ a good description is given of the Red Currant of the day, and it merits translation as establishing two interesting points:—

"*Ribes vulgare*. Ribettes or Over the Sea Raisons. German, St. Johans Treublin. We deal here with this plant, unknown, as I believe, to the ancients, which is falsely called the *Ribes* of the Arabs. This plant produces strong branches and throws a leaf like that of the Vine or Poplar.

"Its branches are supple and pliable, and from them depends a small round fruit in grape-like bunches, like that of the Berberis (*Berberis vulgare*). It is as large as a pepper (*gros comme poyvre*) and very red when it is ripe, having a sweet and acid taste. It flowers in May, having flowers yellowish white, *rayed like a star*. This plant is common in gardens and is used for edgings (*cloysons*) to enclose the parterres of the garden."

This description establishes the fact that cultivation so far had not increased the size of the fruit, and also that the flower is undoubtedly *R. vulgare*. It is evident, therefore, that the Currant of the gardens of those days is a pure *R. vulgare*, and that crossings with other species had not yet taken place. In other works of about the same time *R. vulgare* can be distinguished by its pendulous and characteristic flowers.

CAMERARIUS⁽¹⁰⁾ recommends the sowing of seed from the wild plants, and this is interesting as opening the way for the introduction of natural hybrids into garden culture.

We now come to an important period in Currant history, namely the introduction of *R. petraeum* into garden cultivation. The date of this is established with some accuracy by the encyclopædic KONRAD GESNER, who describes that in 1561 he found a Currant growing in the woods around Berne, which was locally known as *Reechbeere*. This he was especially pleased to introduce into his garden, as the fruits were larger than the ordinary variety of those days. From the description of the leaf and fruit it is quite clear that this plant was *R. petraeum*, and it is a significant fact that only a few years after we find the first notice of new varieties with larger fruit. In 1576 a mention is made in Lobel's "Stirpium"⁽¹¹⁾ of a sweet variety and varieties with larger berries than usual, and in the "Hortus Medicus" of CAMERARIUS⁽¹⁰⁾ we meet two varieties, the old Red and a variety "*baccis rubris majoribus*" from the garden of FREDERICH, Archduke of Austria. From the description of the latter it is evidently *R. petraeum*, which is now becoming distributed in gardens. It is very interesting to note the unanimity with which all writers of the period remark upon the large size of this new variety and its sudden appearance. Its introduction into this country would seem to be somewhere about 1620. In the first edition of GERARD'S "Herbal"⁽¹²⁾ no Currants are definitely mentioned, but under the "Gooseberry" the following occurs:

"We have also in London Gardens another sort altogether without

prickles, whose fruit is very small, lesser by much than the common kind (*i.e.* the Gooseberry), but of a perfect red colour, wherein it differeth from the rest of its kind."

In Johnson's edition of GERARD (1633) a figure of the Currant is given, and we read of a new variety twice as big as the old one. While GERARD's knowledge of botany is known to have been small, we may accept without much doubt the fact that, as head of a famous garden in London, he would probably have known an improved Red Currant had it existed in his time.

In LYTE's translation of DODOENS' "Herbal" ⁽¹³⁾ only one variety of Currant is mentioned. This has pendent flowers and is therefore a *vulgare* descendant. In PARKINSON's well-known "Herbal" ⁽¹⁴⁾ we meet again the large Red sort, the size of the fruit only distinguishing it from the old Red sort. It is therefore evident that this variety suddenly appeared in gardens and was most probably a hybrid of *vulgare* with the newly-introduced *R. petraeum*, or possibly *R. petraeum* itself, but in any case not the product of gradual increases in size due to cultivation and selection. In several other works of the early seventeenth century we find the contrast between "baccis major" and "minor," and the illustration from the "Hortus Eystettensis" ⁽¹⁵⁾ (fig. 41) illustrates their relative size. Towards the end of the seventeenth century we meet the "Dutch" Currant, which was remarked by all writers as being so fine that the common variety was no longer worthy of cultivation. The first mention of the Dutch Currant I have found is that of SWERDERUS, a Swedish horticulturist, who grew it in his garden in 1670. It is also found in the well-known book of MERLET ⁽¹⁶⁾ and he states that it has caused the cultivation of the old Red to be given up entirely. It seems, therefore, likely that the "major" variety first noted by CAMERARIUS may be the Red Dutch.

The confusion of nomenclature in Red Currants to-day is equalled in other fruit, and it does not at all follow that the Red Dutch of the seventeenth century will be that of the twentieth. If we examine the Dutch grown in this country it is found to be a descendant of *R. vulgare*, and this will not agree with the suggestion above that it was the crossing of *R. petraeum* and *vulgare* that produced the large-fruited variety of the sixteenth century.

In gardens of Holland, Germany, and France, however, we find a Dutch of an entirely different character and a true descendant of *R. petraeum*, showing the leaf, flower, bud, and late spring development so characteristic of this species. This variety is known in England as 'Prince Albert' and 'Rivers's Late Red,' &c. I consider it extremely probable that this is the original Red Dutch Currant, and if so it fits in excellently with the historical facts as detailed above. As a further confirmation of this it may be noted that CLUSIUS ⁽¹⁷⁾ speaks of a large-fruited variety as existing at Brussels and having a red flower, which shows that it was certainly of *petraeum* descent.

As the raising of seedling Currants was recommended by CAMERARIUS

(see above) in 1586, it might be anticipated that it would not be long before a white-fruited form would appear, and in 1598, in BAUHIN'S⁽¹⁸⁾ edition of Matthioli, we find the first record of such a variety. Many sweet Red Currants have been recorded from time to time, both wild and cultivated, and the first record seems to be by LOBEL in 1576⁽¹¹⁾ and BAUHIN, CLUSIUS, and others all mention this form. From the end of the seventeenth century the Red Dutch Currant overshadowed all others. We find it in England in 1678, when WORLIDGE⁽¹⁹⁾ remarks that the English Red, once in esteem, is now "cut out," and in RAY'S "History of Plants,"⁽²⁰⁾ where the common, *large red*, and white are given.

In EVELYN'S "Sylva," MILLER'S "Dictionary," and LANGLEY'S "New Principles of Gardening," the same varieties figure, and when we reach the year 1724 we find that the old Red has been nearly displaced, as SWITZER⁽²¹⁾ says it is "not worth planting in comparison with the great dark red." The same writer mentions also a large White Dutch and also a Yellow Dutch. This makes a distinction between the cloudy-white fruits (called *perlée* in France) and the more transparent yellow varieties, though in this country they are all called "white" indiscriminately. As to the introduction of *Ribes rubrum* no exact information exists, but it would seem probable that it was of comparatively recent date. The well-known (and much mixed) 'Raby Castle' is the only definite case which can with accuracy be quoted. This variety was raised about 1820, and, as has been said above, is a pure descendant of *Ribes rubrum* var. *pubescens*.

Up to this time we have, therefore, clear evidence that all the three species described at the beginning of this paper had been introduced into Currant history. In the year 1840, however, a parcel of Currants was received by M. Adrien Seneclouse, of Bourg-Argental, France, which bore fruit of remarkable size. They were sent from Italy and labelled *Ribes acerifolium*. These were soon growing in the Jardin des Plantes, and there seen by M. Laurent de Bavay. Of the origin of this plant nothing can be found. In flower they resemble exactly *Ribes vulgare*, but the leaf is larger, more coriaceous, and of a curious milky green. Whether it is the result of a cross with some of the lesser-known species of *Ribes*, or if they must be simply labelled, as by JANCZEWSKI, as mutations, it is impossible as yet to say. This introduction was, however, of the greatest importance in Red Currant history, for from these plants came that section called "*macrocarpum*," of which the 'Versaillaise,' 'Cherry,' and 'Fay's Prolific' are representatives. The general characters of very large, thick leaves, extremely stout wood, and large berries make them easily recognizable among all other varieties. From the strong shoots comes the habit they all have, in varying degrees, of breaking off at the base of the shoots. It must be observed that, whatever its origin, this new section was accepted in France as a distinct and valuable novelty, and from that date a very large number of new introductions have the "*macrocarpum*" characters very markedly in their composition.



FIG. 41.—RIBES FROM "HORTUS EYSTETTENSIS."

[To face p. 268.]

Ribes petraeum has not of recent years played a prominent part in the production of new varieties, nearly all I have collected proving to be either the Continental Dutch ('Prince Albert' &c.) or 'Gondouin,' a variety raised at Versailles probably about 1785.

It remains to consider two recent additions which are of special interest as introducing two new species. The first is known as *Ribes* × *Koehnianum*, a hybrid between *Ribes multiflorum* and *vulgare*. In this we get a very distinct plant, of strong upright growth, with stout woolly leaves and bunches of great length, bearing often thirty-five to forty fruits. The second, *Ribes* × *futurum*, is remarkable for its vigorous growth, enormous leaves, and fruit of a dull brownish red, the flavour of the fruit being mild and agreeable. Both of these hybrids are of great promise, and may, when interbred with existing garden forms, give seedlings of value.

In discussing the relative parts played by the different species as shown by the characters of the plant, it at once occurs that it would be interesting to analyze these by means of self-fertilization. It is found, however, that a large number of the garden varieties come more or less true from seed whether descendants of one species only or of more. So far as my own experiments have gone they seem to confirm the experience of previous workers, and no segregation of parental species has occurred. The great confusion in the nomenclature of the Red Currant has doubtless been increased by this fact, seedlings having often reproduced the parental characters.

In conclusion I submit that there is considerable historical evidence to show that cultivation *per se* has not played any part in the amelioration of the Red Currant; such improvement as has occurred may be traced in all cases but one to the introduction of new species and their intercrossing.

My thanks are due to many friends who have aided me with material, and in a special measure to Dr. B. DAYDON JACKSON for kindly translating HEDLUND'S paper for me.

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A SUSSEX ROCK-GARDEN.*

By F. J. HANBURY, F.L.S.

[Read October 10, 1916; Mr. E. A. BOWLES, M.A., F.E.S., F.L.S., in the Chair.]

RATHER more than two years ago our Secretary, Mr. WILKS, was staying with our late Treasurer, Mr. JOSEPH GURNEY FOWLER, at Tunbridge Wells. During this visit Mr. FOWLER brought his guest one afternoon to see the Rock-garden which we had been constructing at East Grinstead during the previous four years. Unfortunately, we were away from home at the time, but Mr. WILKS subsequently wrote a very appreciative account of his visit; and shortly afterwards asked if I would give a lecture on the Rock-garden before the Royal Horticultural Society. This was some months before its construction was completed. I felt some misgiving, and stipulated that if I did I must ask for time to get a series of photographs prepared; this being readily accorded, I assented to the suggestion, and it is in these circumstances that I am here to-day.

I do not propose to take up much of your time with preliminary remarks. It is necessary, however, to say a little about the locality, altitude, geology, and climate of our district, in order that you may the better understand the conditions under which we have constructed and carried out the planting of the rock-garden.

East Grinstead is in Sussex, about two miles from the Surrey border. The town is situated on a hill about 460 feet above sea-level. It is on the London, Brighton, and South Coast Railway, about thirty miles from London, and the journey takes an hour, East Grinstead Station being a junction from which trains run in four directions. I mention these points merely to show that we are easily accessible from the South-Eastern Counties.

Brockhurst is the name of my small estate, and it is situated nearly a mile south-east of the town, on the Lewes road. This road forms the north-eastern boundary of my land, from which the naturally undulating ground slopes by a fairly steep gradient to the south-west.

The range of hills on which we are situated stretches in a more or less broken line from the neighbourhood of Tunbridge Wells in the east to beyond East Grinstead in the west. The ridge runs parallel to the great chalk ranges which form the North and South Downs respectively, and is almost equidistant from each. The rock of which

* It will be readily appreciated how difficult it is to make a lecture that was illustrated with more than one hundred slides to read smoothly and intelligibly when space forbids more than about a tenth of the pictures used being reproduced. The latter part of the lecture is necessarily disjointed as it consisted of brief descriptions of each picture as it was shown on the screen.

this ridge is mainly composed, and which shows itself in imposing outcrops at various points, is of a porous nature, and is geologically known as Lower Tunbridge Wells sandstone, a rock which has proved admirably adapted to rock-garden purposes.

The site of the Rock-garden is a rounded hill with a steep escarpment towards the north-west. When we went to Brockhurst eight years ago, we had no idea that within a few feet of the surface of what we called the "Banky Meadow," in which our cows grazed, there was a mass of solid rock some 30 feet thick. In fact, we had just previously bought many tons of very similar stone from a quarry four miles away, when making our first Rock-garden. This was situated on a wet grassy slope below the lawn, and descended to the upper of a succession of four ponds that flow from one to the other down a small natural glen. We soon discovered that the wetness of the bank was due to a large spring rising from the natural rock below, and as soon as the spring was enclosed in cement walls we had a fine flow of beautiful clear drinking water, which, at its source, appears to have a uniform temperature of about 51° F. throughout the year. This stream was conducted in a winding channel through this first Rock-garden, so as to form miniature waterfalls and pools, and ultimately descend into the head of the pond. The flow is sufficient to keep all the ponds fresh, so that trout breed and flourish in them, and attain to a considerable size. We are fortunate in having five or six natural springs, and there is a large one in our Wilderness on the other side of the new rock-garden that is sufficient to work a ram, which pumps water to our reservoir a quarter of a mile away in sufficient quantity to supply all our needs both for house, garden, laundry, &c. I hope to make good use of the two or three smaller springs later on.

But to return to the rock-garden. It was not until we were planting some new Rhododendrons at the edge of the "Banky Meadow" that my gardener discovered that he had come on to a piece of rock. After getting this out, we found that there was more underneath. This discovery suggested the idea of making a small rock-garden close at hand by taking a small piece off the field; but I must shorten a rather long story. As we proceeded our ideas grew as more and more rock was found, but before we were able satisfactorily to complete our increasingly ambitious designs we ran short of rock at the spot where we were working. This led to making boreholes towards the top of the hill to ascertain if there were rock there also, and it was the discovery of an almost limitless supply of rock here that led to our gradually making a deep pit or quarry into the hill, from which we raised great masses of stone to the surface, at first with Jim poles and a pulley, but later with a large crane. The stones, when brought to the surface, were guided down the hill on wooden rollers, which ran over a track made with boards. As the rock-garden below the hill grew, and in doing so gradually approached nearer to the quarry, so the size of our excavations grew. It was then that the idea occurred to us of cutting right through the intervening ground,

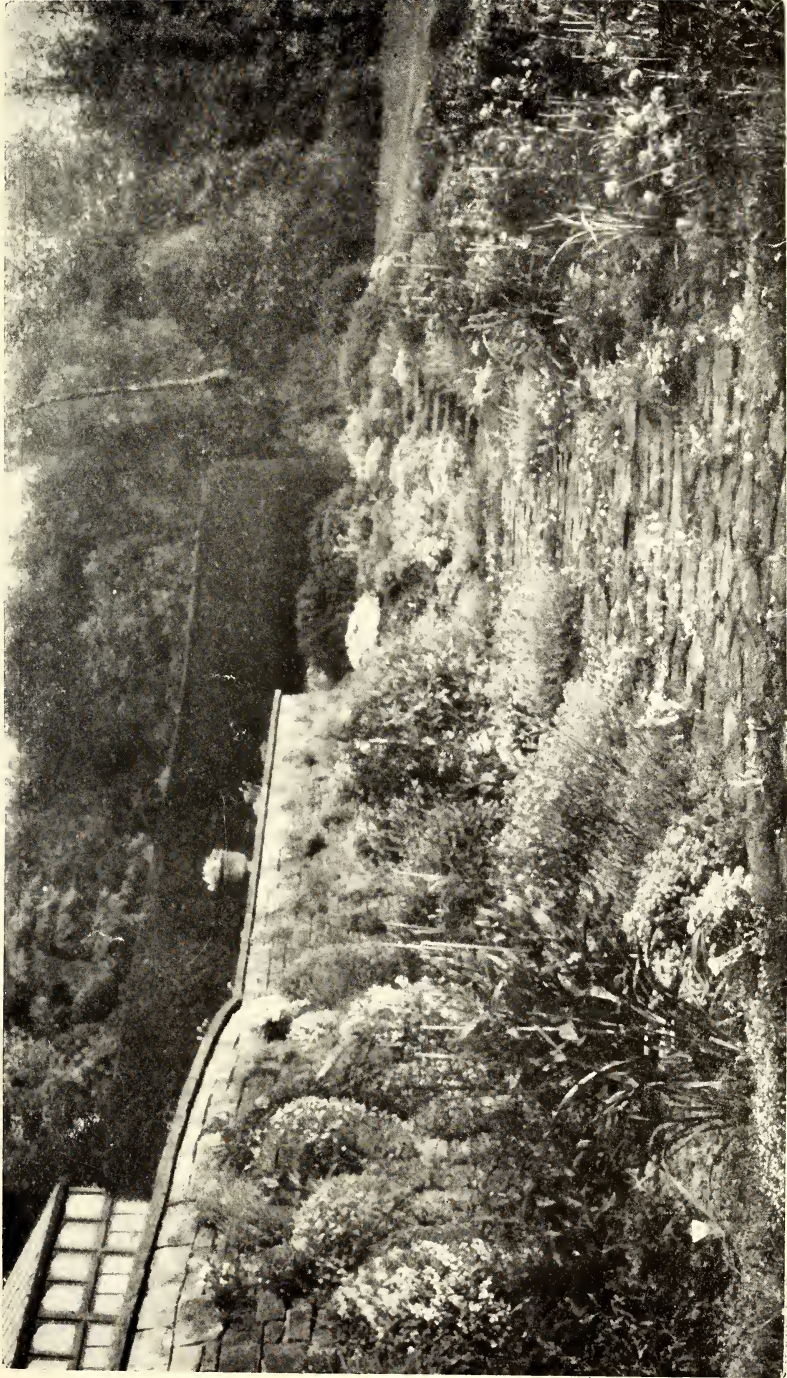


FIG. 42.—WALL OF TERRACE ON WEST SIDE OF HOUSE AND THE PLANTED PATH BELOW.



FIG. 43.—VIEW OF LAWNS AND UPPER POOL FROM WEST SIDE OF HOUSE.

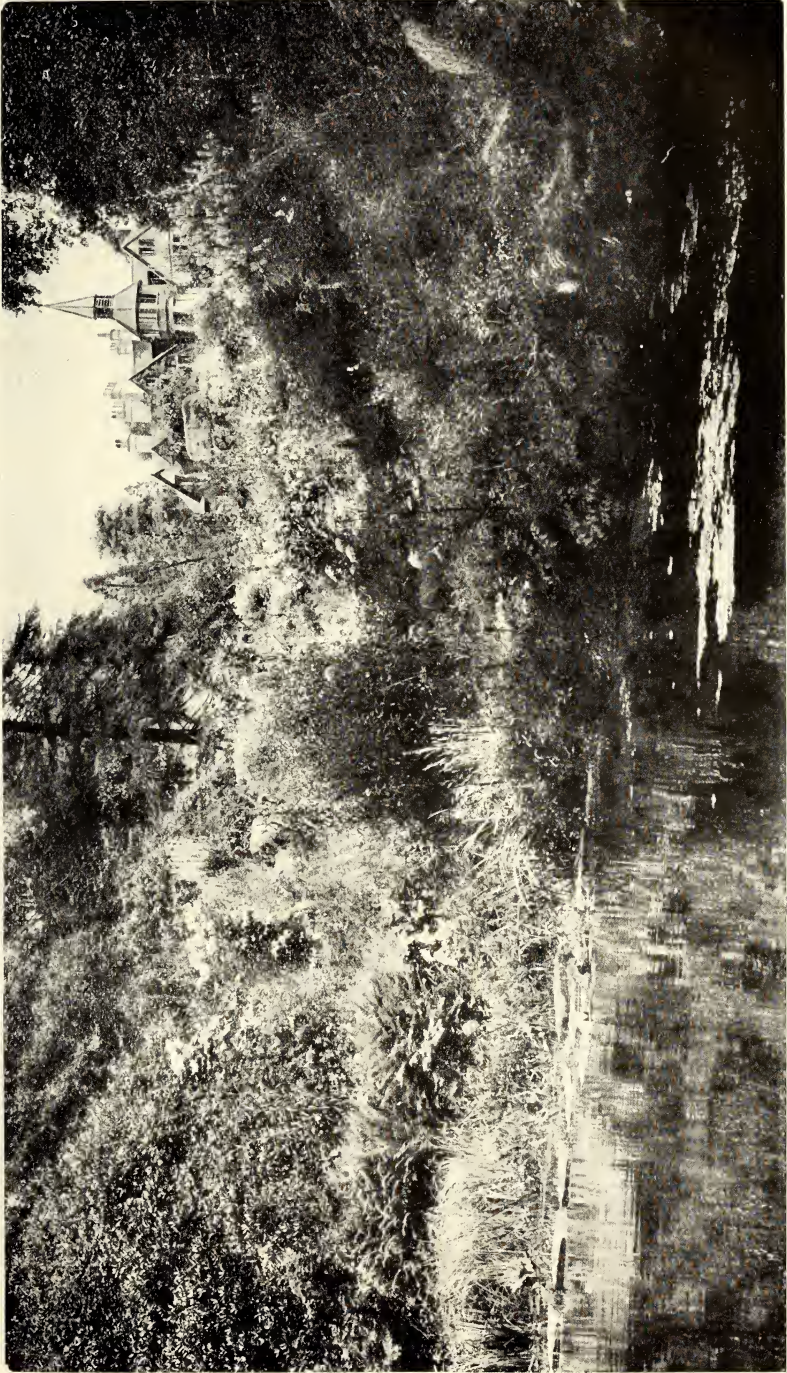


FIG. 44.—VIEW FROM THE UPPER POOL LOOKING TOWARDS THE HOUSE.



FIG. 45.—CISTUS PURPUREUS &C.

[To face p. 273.

and making a winding ravine leading from the rock-garden we were constructing to the quarry itself, and incorporating the latter into our scheme. I have entered into these details to show you that, although begun with very modest ideas, the general plan developed as we went on. The work of construction took four years.

Before passing on, I must mention my indebtedness to Mr. BOWLES for the valuable hints and suggestions he was good enough to make, both at the commencement of our work and later, when he and Mr. REGINALD FARRER helped with their advice in making the moraine-garden, of which I shall say more directly.

It is superfluous to occupy time with much detail as to the general principles on which a rock-garden is built. These can be obtained from the many excellent books on the subject. The more novel features in the Brockhurst rock-garden are the natural cliffs of solid rock and vents that abound, both in the ravine and the quarry. The first and lower portions were made in the usual way, and on the general principle of cutting wide sunken paths in the ground, and throwing up the earth thus dug out to form banks on either side. The poorer soil forms the core of the bank, the better soil being retained for the surface, which is then rocked upwards from the bottom, care being taken that each stone placed is firmly supported by one or more below it. The rocks are also slightly tilted towards the bank, so that rain falling runs towards the banks and among the roots of the plants, and not away from them leaving the plants to perish from drought.

These introductory remarks would be incomplete without a brief reference to our climate. I will not burden you now with much detail, but my astronomical assistant, Mr. W. S. FRANKS, F.R.A.S., has prepared a careful account of the meteorology of our neighbourhood. We are in the habit of sending our records weekly to the local paper, and annually to Dr. H. R. MILLS for his "British Rainfall."

The Brockhurst Observatory is equipped with the usual six thermometers, the sunshine recorder, and the rainfall gauge.

Owing to the topographical configuration of Brockhurst, with its downward slope towards the south and south-west, and through being protected by rising ground to the east and north-east, it is more sheltered than many other places in the immediate neighbourhood. It has frequently escaped the effect of frosts which have done serious damage at East Grinstead and Forest Row, on either side of it, and it also escapes some of the heavy rainfalls which sweep along the line of the valley, especially during thunderstorms.

As regards temperature, our observations prove that, as compared with Greenwich, we are a few degrees warmer in the winter months and cooler in the summer months, and compared with the Greenwich records we have over 12 per cent. more hours of bright sunshine registered at Brockhurst.

Now as to rainfall. The drainage area is that of the river Medway, which includes some of the wettest districts in Ashdown Forest. East Grinstead fortunately possesses a rainfall record of its own for

the last twenty-six years, the mean annual value of the local rainfall being 31.99 inches—which may seem a large amount when compared with the Greenwich average of about 24½ inches.

From the above facts it will, I think, be obvious that our local meteorological conditions should prove very suitable for growing many tender plants which cannot be grown in less favoured districts. There is little doubt, however, that we shall sometimes have a winter that will either cut down or totally destroy many plants that we have succeeded in growing during the last few years.

Close to the Observatory is the Heath-garden, which runs round the summit of the hill from which one sees in the distance Ashdown Forest. There is a large number of varieties of heaths in this collection, whilst the carriage drive is bordered by Cornish heath, which I understand was brought to Brockhurst about forty years ago by a former owner. It now forms a dense bank, and is a striking feature of the place in the autumn.

The portion of our house facing west has a terrace and small rock-garden below it. The stone for this little rock-garden was derived from the excavation we had to make into the hill when space was cleared for building the new dining-room and terrace, and below the terrace wall is a rocked path in which a number of plants are growing. (Fig. 42.)

The terrace wall itself is the home of many plants we put in while building it seven years ago, and they have thriven well ever since. On the steps is a fine growth of *Erinus alpinus*, in three colours, pink, mauve, and white.

The view (fig. 43) down the lawn from the top of the steps just referred to includes the upper pond, and a fine spring rising from here, flowing through the rock-garden below the lawn, keeps the water in the ponds thoroughly changed. The slope of the lawn has groups of Rhododendrons upon it, and out of the northern slope of this hill the new rock-garden has been made. On the lawn, our British *Spiranthes autumnalis*, the sweet-scented Lady's Tresses Orchis, grows abundantly, being a native here. Five or six other species of Orchis are to be found wild on our ground.

At the upper end of the top pond (fig. 44) many water plants grow behind the stepping-stones, among them *Sonchus palustris*, a fine British plant that used to be found in the reed-beds of the Thames about Plumstead, and also up the Medway. It is now nearly extinct. It attains to a height of ten or eleven feet. Near the stepping-stones also grow water-lilies and Richardias. The latter have been in the pond for several years, and are never taken up in the winter. The clumps have increased and flower freely.

Among the trees in the Wilderness is the large spring, from which there is a fall of twenty-five feet to the ravine we have already mentioned. A little valley running into the Wilderness has a small spring of its own, in which some interesting Carices, Cotton-grass, &c. have been planted, whilst moisture-loving plants, such as *Primula japonica*,

thrive higher up the banks. In this part of the wood I have introduced the beautiful *Myosotis sylvatica* collected in Teesdale. May I recommend this as a woodland plant well worth growing? It is of a very attractive light-blue colour with a yellow eye, and does not require the same amount of moisture as some of the Forget-me-nots.

We now turn to the Rock-garden proper, but must mention a rather serious set-back that occurred shortly after we had begun the building of its upper part. After very heavy rainfalls, we found that the large stones at the base of the artificial mound which we had constructed were slowly moving towards the edge of the quarry, and after watching this movement for some time with considerable anxiety we saw that the position was hopeless, and after another heavy rain a vast quantity of stone slipped right over the edge of the quarry and crashed down below, breaking all the fine rocks to pieces. This necessitated digging out a quantity of soft layers of clay and rock, and rebuilding this portion with reinforced concrete, and facing it with stone. The accident retarded the work for two or three months. It is extremely fortunate, however, that it happened when it did, and not later on, when all our tackle had been removed and the site covered with plants.

A fine thorn marks the commencement of our work of planting, and it is from under the far side of this thorn that the rock-garden is entered from the bottom. Beneath its shade a group of the true British Oxlip, *Primula elatior*, grows. This, as probably many of you know, only occurs in the neighbourhood of Saffron Walden and Bardfield over a small area, partly in Essex and partly in Suffolk. The plant that is found in many places throughout the country, and commonly called the Oxlip, is a hybrid that occurs very frequently between the Cowslip and Primrose, and is quite distinct from the true Oxlip, which is a good species. The heads of Oxlips always grow to one side, and the species has a much less inflated calyx than either the Primrose or Cowslip.

A small side-path leading from under the May Tree passes out to the edge of the Rock-garden, and a group of *Sparaxis* flowers just above this path.

Walking up the main path, on the left, we see a fine clump of *Nierembergia frutescens*, which has proved more or less hardy with us. It is a beautiful plant, with flowers like a large pale *Linum*.

At the foot of the bank on the right, *Waldsteinia geoides* scrambles down into the path, while a few paces further along clumps of *Helichrysum angustifolium*, and a silver-leaved Thyme which is sold as *Thymus Serpyllum splendens*, are seen. I cannot, however, believe that this silver-leaved Thyme with a perfume almost identical with the scented Verbena, can be any form of our common wild Thyme. On the right is a clump of *Hieracium villosum*, with its beautiful white shaggy foliage and brilliant yellow flowers, too well known to need any comment.

Two or three paces beyond the *Hieracium villosum* is a fine plant of

Coronilla cappadocica, whilst immediately below grows a much less showy plant, *Astragalus monspessulanus*.

Another side entrance to the Rock-garden from a little further up the hill, leads to the same point that we have just left, and a short distance along it on the right-hand side is a nice plant of *Agave Hanburyana*, a species named after my late cousin, Sir THOMAS HANBURY. This plant has stood in the open for the last four years, and has much increased in size.

I may here mention my indebtedness to the La Mortola garden for a large number of semi-hardy plants that we have been able to grow, though we have lost some of those tried. Here, too, is a group of the beautiful double Wood Anemone, which is pure white.

Where these two paths join is a small pool, from which water flows from the central rock when turned on. Our rocks become entirely covered with *Arenaria balearica* when situated in a moist and semi-shaded position. The plant is one of great beauty and one that no one would like to be without, but at times it is very troublesome in creeping over and killing many small plants in its neighbourhood. A gardening friend told me that his only remedy for it was a scrubbing-brush.

Opposite this pool is an albino variety of our British Musk Mallow (*Malva moschata*). The white form is well worth growing. This particular plant was found wild in our own neighbourhood; it seeds freely, some of the seedlings coming true white, others reverting to the typical pink form.

Leaving the pool behind us, we pass up the next bend of the main path, where the rock is now completely covered with *Cotoneaster adpressa*, and the white flower above it, a form of Candytuft, known as Snow-flake. Whilst speaking of Candytuft the planting of *Iberis gibraltaria* may be strongly recommended. It is a beautiful and showy biennial, which, when once established, propagates itself by shedding its seed all round.

On the left of the path is a bank with a medley of plants, including *Genista hispanica*, *Carpenteria*, *Erica lusitanica*, *Cistus* (fig. 45), and *Helianthemum*.

Immediately beyond it, on the left of the path, is a very fine mass of *Lithospermum prostratum*, with its gentian-blue flowers. This plant is scarcely ever without some flower throughout the year. The rock below it is clothed with the inevitable *Arenaria balearica*, with double Daisies on the pathway below that. The rocks at this corner are among the largest that we were able to move with the tackle at our disposal. Several of them weigh nearly five tons each, having been brought to this spot from the top of the hill on rollers.

Facing the rock with the *Lithospermum* is a small corrie containing several plants of interest, including *Salix reticulata* from Perthshire. A plant of the large silvery-leaved *Salvia argentea* grows on the bank at the right. The path up the steps on the left leads to another side exit from the rock-garden. At the foot of the rocks is a good bed

of *Rubus arcticus*, which spreads, and flowers freely here, and by this same corrie is a fine mass of *Sempervivum arachnoideum*, the pretty pink flowers forming a pleasing contrast to the white cottony foliage.

Pursuing the main path, and leaving the large masses of rock, previously alluded to, on our left, we pass to an irregular-shaped pool on the right in the centre of the rock-garden (fig. 46). In the foreground of this picture is a fine clump of the Melancholy Thistle (*Carduus heterophyllus*), brought from Killin, in Scotland. In the little marsh round the pool are such plants as Grass of Parnassus (*Parnassia palustris*), *Hypericum elodes*, *Soldanella*, and several interesting rushes and sedges, including *Carex Buxbaumii* from Lough Neagh in Ireland, and *Carex aquatilis* from Loch Tummel in Perthshire. A rock by the path to the right of the picture is covered by a clump of *Polygonum vacciniifolium*, which is a plant that can be highly recommended for decorating prominent rocks with its bright pink flowers, which last throughout the autumn, and near by is a group of the bright yellow *Ranunculus montanus*, a compact and very attractive species.

A few paces further along the path, and looking back, one sees the bank on the opposite side of the path to the pool we have just passed, on which *Anchusa myosotidiflora*, like a giant Forget-me-not, and *Lavatera Olbia* and many other plants grow well.

Below the *Lavatera* are steps leading to the upper path of the rock-garden, where, among other things, is a fine clump of our beautiful native *Campanula patula*, found on a few sandy commons in the South of England. It is an annual of great beauty, and sows itself freely wherever introduced, if the soil be sufficiently light to suit it.

Passing the rock with the *Lavatera* on our left, and another side entrance on the right, we see in the distance the highest peaks of the rock-garden. To the left of the steps is a plant of *Erica ciliaris alba*, whilst on a sunny rock above is *Othonnopsis cheirifolia*, a plant admirably adapted to covering hot, dry, exposed rocks.

On the right of the path, a little further along, is a clump of *Primula* 'Mountain Ruby,' whilst on the left is a clump of *Helleborus corsicus*. This plant flowers from January onwards during the spring, and is a species well worth growing.

On the next shoulder to the right is a fine clump of *Saxifraga lingulata superba*.

Leaving the *Saxifraga* on the right, the main path passes into the ravine (fig. 47). This passage is cut through the solid rock. Above the rock is a bed of very soft sandstone, which was soon taken possession of by a large colony of sand-martins, which have nested there every year since. The steps on the left lead to the moraine, the sheet of white flowers being a rock covered with *Helichrysum bellidioides*, while to the left of this, and just outside the picture, is a fine plant of *Aethionema iberideum*. Ascending the steps, we reach the bottom of the moraine garden, the structure of which I will endeavour to explain to you; one may see from here the hole through

which the water flows from the moraine after passing the whole length through it. On the left of this winding path are sunken beds largely composed of moraine material, which are mainly devoted to *Gentiana verna* and *G. acaulis*; but besides these I have a collection of some of our rarest Chickweeds and *Arenarias*, which thrive splendidly in the small limestone, of which the *Gentiana verna* bed is largely composed. Among these I may mention *Cerastium Edmondstonii*, found only on Unst, the most northern island of the Shetlands; and *Arenaria norvegica*, from the same island.

Viola arenaria, a plant that probably few of you have seen, is there too. It grows only on the top of Widdy Bank Fell, in Teesdale, where it was discovered by the late JAMES BACKHOUSE many years ago. It is our rarest British violet, and is remarkable for having a downy capsule. The plant attains finer proportions in my moraine than it does where I found it in Teesdale, where it is only found on what is geologically known as sugar-limestone, so named because it is of the consistence of loaf-sugar, and can be readily crushed by the fingers. *Saxifraga decipiens*, at the edge of the moraine, sows itself in the moraine material.

In making the moraine we first constructed a succession of cement tanks, the side walls of which go uphill, the tanks being full at the front, and only half full at the back. A small square brick building in the lower corner of each tank has a valve, which is closed in the summer, but left open in the winter. By this means the water can be entirely drained from underneath, the plants being kept sufficiently moist by the rain which falls and soaks through the moraine material during the winter months.

The next thing to do was to build stepping-stones in the moraine, so as to be able to walk about it for planting purposes. The stones being of different thickness, they were all brought to approximately the same level by the different heights of the brick piers supporting them.

The moraine was then filled up with the proper material between the stepping-stones. The natural rock as it lay in the hill, after having had all the super-soil removed, lies to the right of the moraine, and is utilized for growing a considerable collection of Sempervivums and Saxifrages, which are thriving exceedingly well and spreading. The upper edge of this mass of rock is immediately above the ravine, which leads to the chasm. *Draba imbricata* grows in a little crevice with overhanging rock above, and there is a little ledge close by with *Hutchinsia alpina* growing on it, and another close by with our native *H. petraea* upon it.

We now leave the moraine, and return to the entrance to the ravine. In the bottom left-hand corner a clump of *Mesembryanthemum edule* will be seen, *Primula Juliae*, *Commelina*, and close by *Euphorbia Myrsinites*, a very attractive plant, of compact habit and very glaucous, which has proved quite hardy for three or four seasons. At the foot of the rocks in the next bend is a good clump of

Beech-fern (fig. 48), brought by us from Scotland, and in chinks in the rock above it *Asplenium viride* thrives, whilst opposite grow *Asplenium Trichomanes* and *Asplenium Adiantum-nigrum*.

Matthiola rupestris, a fine species of Stock found round the coast of the Mediterranean, is also in the ravine. It is very sweet-scented, and attains to a large size; with us it appears to be biennial.

The ravine is very beautiful when *Saxifraga Cotyledon* is in flower. It forms enormous rosettes in the wide natural vents in the rock. When planting, it is of course necessary to fill the vents up with suitable material for the plants to grow in. Immediately beyond this Saxifrage is the entrance to some long caves formed by our tunnelling into the hill for more stone required for completing the upper portions of the Rock-garden.

In several of the vents *Primula Forrestii* thrives wonderfully. The large-leaved *Magdalis tomentosa* grows just below. Passing round the bend in the ravine, we come on a vent planted with *Primula* 'J. H. Wilson,' a very handsome plant, and one that is easily grown in such a situation.

We have now turned the last corner in the ravine, and come in sight of the great chasm, or quarry, that we made in the hill. A beautiful plant of *Saxifraga nepalensis* hangs from the rocks on the right. Just below this will be seen three steps which are the beginning of a flight of fifty-three steps, which lead up between the rocks to the level of the ground before we made the excavations. If the picture of 'Banky Meadow' with the cows be recalled to mind, it will be seen how great a transformation has been wrought in a piece of ground which, when we came to Brockhurst, we did not know to contain any rock at all. Opposite the flight of steps on the right is a still higher flight of steps passing up the left bank and behind the bold rock, which was purposely left standing, and which for convenience we designate the "pulpit" rock (fig. 49).

Before passing to these steps, we may notice the planting on the right side of the ravine. Here is *Saxifraga nepalensis*, whilst to the right is a crevice filled with *S. Burseriana gloria*, which, this year, was in full flower before the end of January and during the month of February. To the right of this again is *Gypsophila repens rosea*, and below this native plants of *Myosotis alpestris*, brought home with us from Scotland from the Ben Lawers range in Perthshire.

Our native Vetch, *Vicia sylvatica*, which we collected from the northern side of the Malvern Hills, also grows well here. Last year we saw this plant growing in great beauty and profusion on the cliffs at Melvich, in Sutherlandshire, whence we could see the Orkney Islands. It is a plant well worthy of cultivation in our gardens.

Pursuing the main path to the large chasm, and turning the corner abruptly to the left, brings us to the deep pool which we excavated; the dripping well will be seen (fig. 5c), and to the right of it a natural vent in the cliff with fine plants of *Saxifraga lingulata superba* growing in it and to the right again a few plants of *S. Cotyledon* (fig. 5I).

One of the Alpine willows grows on a ledge below and to the left of the dripping well.

A group of our rare native Fern *Cystopteris montana*, brought from Ben Laoigh, in Perthshire, after a very long day's excursion to obtain it, thrives well at the base of the cliffs, and a natural vent is planted with the much commoner *Cystopteris fragilis*, brought from the neighbourhood of Killin. The plant of *Saxifraga oppositifolia* growing with it is from the same locality. We also grow in quantity a larger-flowered form of this species, sold as *S. oppositifolia splendens*.

Near by are two more interesting native plants, both brought from the neighbourhood of Killin—namely, the Holly Fern (*Polystichum Lonchitis*) and *Poa alpina*, which is nearly always found in a viviparous state as it grows here.

The Green Spleenwort grows very luxuriantly in a naturally damp crevice of the rock, where it never gets direct sunshine. The leaves produced here are larger than any I have found in the wild state.

In a sheltered nook in the natural rock at the base of the steps that go up to the right, I planted *Primula Winteri*, not knowing how it would succeed in the open, but my confidence was not misplaced. The plant faces north-east, and is more or less sheltered from above by slightly overhanging rocks, and it formed a beautiful picture last January. *P. Bulleyana* grows at the foot of the cliffs just by.

The steps (fig. 52) ascend from the ravine towards the north-east, and pass immediately below and against the "Pulpit" rock, and near them specimens of *Saxifraga longifolia* form a beautiful feature. *Echium plantagineum*, a rare plant found in the Channel Islands, and a fine specimen of one of the New Zealand Celmisias, *C. Munroi*, and *Saxifraga Kolenatiana* also grow here. Above the last is the graceful and rather rare English grass, *Melica nutans*. This we brought from a wood near High Force, Teesdale. A great mass of our common *Echium vulgare* grows on one of the outer sandy banks of the Rock-garden; although a common British plant, it is very beautiful, and is extremely attractive to bees and other insects.

Having ascended the steps, the top of the chasm with the upper portions of the Rock-garden come into view. The steps are continued to the left, and when they reach the stage by the tunnel they again go off to the left and then to the right, the upper path passing along just below the peaks, and commanding a fine view into the chasm and over a large part of the rock-garden and the country beyond.

Standing at the level of the tunnel, and looking back, we see at the bottom of the ravine the path which brought us to the chasm—the steps leading out of the rock-garden to the south, and the commencement of the upper path which extends the whole way back through the Rock-garden to the point from which we started. An almost entirely fresh set of plants is found along this path, and the views, looking down, are quite different from those obtained when walking up the lower path. *Diascia Barbarae*, growing here, is interesting as having a flower with two spurs.



FIG. 46.—POOL NEAR MIDDLE OF ROCK-GARDEN *CARDUS HETEROPHYLLUS* IN FOREGROUND.

[To face p. 280.

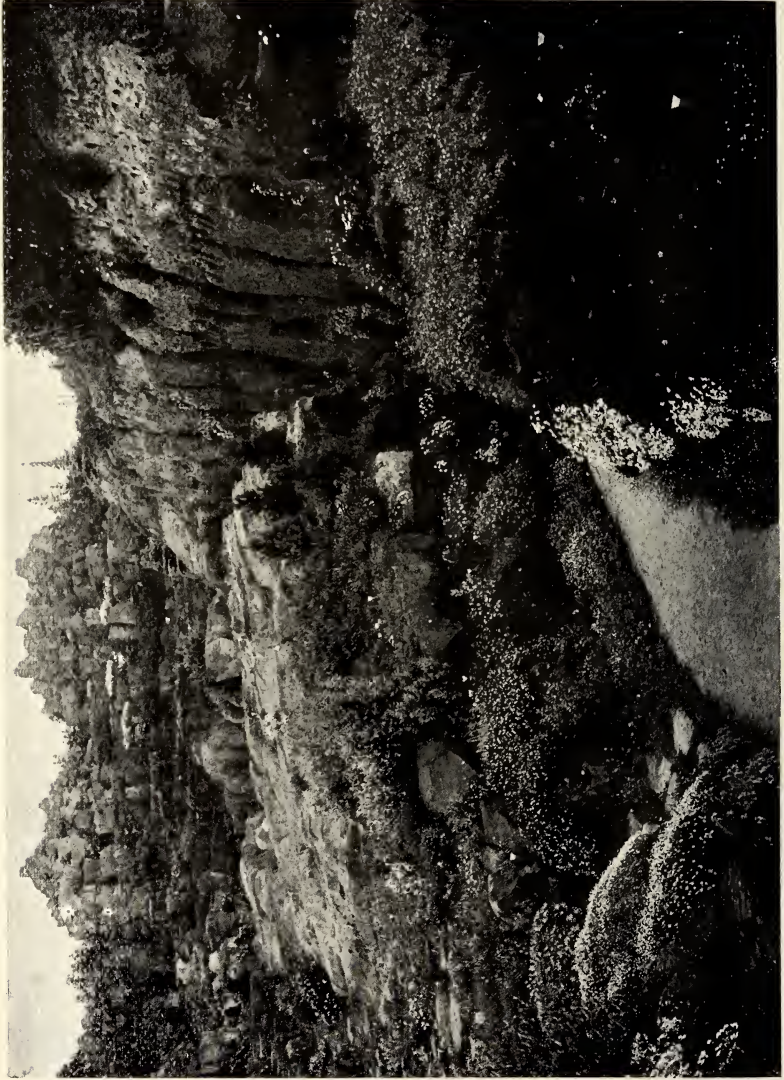


FIG. 47.—STEPS 'ON LEFT TO THE MORaine ; PATH THROUGH RAVINE TO CHASM.



FIG. 48.—BEECH FERN (*PHEGOPTERIS POLYPODIOIDES*).



FIG. 49.—END OF RAVINE MADE THROUGH THE NATURAL ROCK.



FIG. 50.—POOL IN CHASM AND DRIPPING WELL.



FIG. 51.—SAXIFRAGA LINGULATA ON LEFT, S. COTYLEDON ON RIGHT,
GROWING IN NATURAL VENTS IN THE ROCK.



FIG. 52.—VIEW LOOKING BACK (WEST) SHOWING PORTION OF THE MORaine IN FOREGROUND.



FIG. 53.—MAIN STEPS FROM RAVINE (TO NORTH) BEFORE REACHING CHASM.
[To face p. 281.]

Turning round and facing the entrance to the tunnel, *Echeverias* will be seen growing and flowering freely in the chinks between the stones. These plants have been here for two years, and some planted in a similar way on the other side of the ravine have stood out for four years without damage from frost. Doubtless, if these had been planted flat, so that water could have lain in them, they would have been destroyed. *Androsace lanuginosa* and all the other species of *Androsace* that we have tried have thriven well on our rock. We give some of them slight protection in the winter.

In the chinks of the chasm and rocky cliffs at the base of the rock many alpiners are planted, one of the cracks being filled with *Dianthus alpinus*, another with *D. caesioides*, and so on.

Among the rocks to the right of the pool, and below the cliffs, there is a fine colony of *Saxifraga Fortunei*. I have planted and am allowing a large number of our rarer British *Hieracia* to seed about naturally in the cracks of the rocks, some of the alpine species being of great beauty.

Returning to the other side of the Rock-garden, we come back by the upper path, on the sandy edges of which the pretty British Pansy, *Viola Curtisi*, from Braunton Burrows, grows.

I should like to repeat that our Rock-garden was begun without any general scheme, and developed as we went along according to the configuration and nature of the ground. It is easy to make well-founded criticisms, and, given the same conditions, it is certain that no two persons would have arrived at precisely the same result. Though the general design was our own, I wish to acknowledge how much I owe to my gardener, THOMAS MATTHEWS, for the skill he displayed in selecting and placing suitable stones, for carrying out the various details, and for his intelligent, painstaking, and careful supervision of the entire work.

I will only add that if any of my readers feel tempted to come and see our Rock-garden when they are in the neighbourhood, it will be a pleasure to Mrs. HANBURY and me to afford them every facility for so doing.

BORDER CHRYSANTHEMUMS.

By THOMAS STEVENSON, F.R.H.S.

[Read November 7, 1916; Mr. JOSEPH CHEAL, V.M.H., in the Chair.]

THE term "Border Chrysanthemums" is applied to varieties which flower successfully in the open air before the advent of severe frost, and as this section is now a very large and varied one no apology should be necessary for my endeavour to still further popularize what I consider to be one of the most useful plants in cultivation.

I have heard it remarked by many that they do not like to see Chrysanthemums flowering in the borders, for they look upon them as a sign that winter is at hand. There are others, and I am one of them, who are pleased to see the waning summer, as it leads on to the blooming period of various plants that are much less fleeting in character than those that flower during the heat of the year, and I am sure everyone will agree that the Chrysanthemum is one of the most lasting of all flowering plants, whether cultivated in the open ground or in pots for decoration in late autumn and winter.

In conversation recently with one of our largest growers of cut flowers, a man whose aim is to put large quantities on the market every weekday during the year, and who naturally puts sentiment on one side in his endeavour to make the business profitable, chanced the remark that he was always pleased when the early Chrysanthemums were ready to market, as he felt, whatever the public were paying for the flowers, they were at least getting value for money, and I entirely agree with him. Whether the Chrysanthemums are grown for display in the garden, or for cutting for indoor decoration, whatever time and trouble expended on them are amply repaid by the beautiful effects obtained and the length of time the flowers last, whether on or off the plants.

Every real gardener and garden lover thoroughly appreciates the effects produced by the various classes of plants in their seasons, but at no season of the year do we see anything that is more in harmony with its surroundings than are the various shades of yellow, bronze, and crimson of Chrysanthemums, and when these are planted close to shrubs whose foliage changes with the shortening days they provide a wealth of colour-blending that would need a clever artist to depict, and someone with a better flow of language than I to describe.

In my paper—a year or two ago—on Chrysanthemums in pots,* I ventured to remark on the great quantities that were grown for

* JOURNAL R.H.S., xli. p. 64.

use as cut flowers, and those who have been privileged to see some of the great cut-flower producing establishments have not only marvelled at the enormous number of plants grown, but also at the high standard of cultivation, and I should certainly like to see this class of Chrysanthemum taken up with more enthusiasm by the private gardener and amateur generally.

At the present time there is unlimited choice of varieties, as during the past fifteen to twenty years much progress has been made, and many good raisers have worked hard to improve them.

Previous to this, however, the number of good varieties was very limited, and the date of flowering of most of them was rather too late for them to be termed early-flowering Chrysanthemums. The comparative hardiness and the power of frost resistance possessed by these short-petalled varieties, however, were great, and even as recently as last year I saw some of them flowering away quite freely in December, and when on a visit to Scotland a year or two ago, about the third week in November, practically every garden by the roadside had masses of these old, as well as some of the newer varieties in bloom. This is only an instance or two of their hardiness; much more, however, may be said of their general usefulness, and I hardly think I should be exaggerating if I said that Border Chrysanthemums can be grown wherever there is a small garden or borders, and I have seen quite good displays in such poor receptacles as herring boxes. Furthermore, they are not averse to the conditions prevailing in large towns, in fact they seem to revel in a smoke-laden atmosphere, and many of the finest displays of Border Chrysanthemums I have seen have been in the smoky districts in and around London.

Several of the London parks and open spaces have been and are still noted for their annual displays of Chrysanthemums both under glass and in the open beds and borders, and it must be a pleasure to those responsible to see how thoroughly their efforts are appreciated by the great numbers who visit the parks during the time they are in bloom.

If under such conditions Border Chrysanthemums will make a good and lasting show, how much better should they be where the nature of the soil, climate, and atmospheric conditions are ideal! Gardeners generally would do well to try to emulate the example set by the market growers whose plants are perfect specimens of good cultivation and the flowers such as would lend themselves to any scheme of decoration.

The Border Chrysanthemum is no new type of the flower, though it has been improved almost out of knowledge both as regards the date of flowering and in the number and beauty of the varieties.

Mr. HARMAN PAYNE, in a paper on the subject in 1906, mentioned that the first early-flowering Border Chrysanthemums made their appearance in this country in 1852. These were no doubt Pompons. In 1865 Mr. JOHN SALTER gave a list of fifteen summer-flowering varieties in his work, "The Chrysanthemum—its History and Culture."

In 1869 'Sœur Melaine' was introduced. Many of us know this variety, and quite recently I saw it growing.

'Madame Castix Desgranges' was introduced a few years later, in 1873 or 1874, and it and its sports are still grown and, I believe, sent to market, though I doubt the wisdom of this, seeing the number of better varieties we now have. This variety, however, established the popularity of the early Border Chrysanthemum, and after its appearance we soon began to get others of the large-flowering or Japanese type.

The Massé family was another notable introduction, and 'Madame Marie Massé' and its sports are still grown in hundreds of thousands, both for cut flowers and in small pots for decorative purposes.

This family gave us a greater range of colour in the larger-flowering type than heretofore and added greatly to the interest in the flower. It is since its introduction that the greatest strides have been made in the colour and type of flower and in the habit of the plant. Naturally, different raisers are striving after different ideals, and whilst some endeavour to get varieties of close, compact habit for the embellishment of the garden, others, chiefly growers of cut flowers for market, prefer good strikingly coloured varieties on fairly long stiff stems, which, when disbudded, give blooms of from four to six inches in diameter or quantities of good light spray flowers after the type of 'Roi des Blancs.'

One other type of the flower which I have so far failed to mention is the early-flowering single. This is, I believe, of a much later introduction, very few varieties, if any, being introduced before 1900, and it is to our late friend W. WELLS of Merstham that we are indebted for many of the better varieties. In one season alone he planted out 20,000 seedlings, thus showing his great interest and enthusiasm for the new type of flower; and, though I cannot say that I prefer it to the Pompon and Japanese types for outdoor cultivation, there are many varieties that are bright and effective in the garden, and as they yield an abundance of bloom they are most useful for decorative purposes in the house. Where they really fail is that they do not pack well, the single or double rows of florets being somewhat easily damaged, and thus their beauty is spoiled and their sphere of usefulness limited.

This very brief résumé of the history of the flower is quite sufficient to show that the plant has been developing in this country for well over half a century. Though the Pompon was the original, we now have three distinct types, Pompoms, Japanese, and Singles, all of which are useful, and when we consider that by their aid we can prolong by a month or two the displays of bright flowers in our beds and borders, and also secure large quantities of cut flowers for the decoration of the home up to the end of October, such plants deserve more than ordinary consideration.

The several ways in which these Border Chrysanthemums can be utilized are well worth a word or two. They will grow in any kind

of garden soil and in almost any position, and if this is not too moist will live through the winter and go on blooming year after year, but such treatment I do not recommend, as it is not conducive to the best results. Planted in fairly large clumps in the herbaceous border they are quite at home, and, providing due consideration is given to the selection of varieties, they add greatly to the charm of the border during the late summer and autumn.

Planted in beds of fair size—either one variety or two or three selected for their height and colour—if the beds are on a fairly expansive lawn they make a brave show, and under such conditions are perhaps seen at their best. It is not necessary to grow them in such beds all the summer, but they may be removed thence just previous to flowering.

In or around the edges of open or newly-planted shrubberies they can be utilized with much effect, and it is in such positions that the stools may be left a year or two, and I have known instances where the 'Massé' family have done much better, treated in this way, though, generally speaking, young plants put in each season produce by far the best results.

Grown in large tubs, pots, or boxes they make exceedingly good decorative subjects and add considerable colour to the terrace or verandah during September and October, varieties that are of suitable habit and colour for the purpose in view being selected.

For cutting purposes they are best cultivated in a border or in beds in the kitchen garden, where their wants can be properly attended to, and, though without any protection whatever, good results are obtained. A little provision for protecting the flowers in case of early frost or prolonged moisture during the opening stages is amply repaid.

As a market subject the border or early-flowering Chrysanthemum is extremely popular, and its cultivation is carried out on a very extensive scale. As direct evidence of this one has only to visit one of the large markets any morning during the season, and anyone not familiar with the subject would indeed wonder where such enormous quantities of flowers came from. On the other hand, if one were to see the nurseries of such growers as LADDS of Swanley, MIZEN of Mitcham, CRAGG, HARRISON, and CRAGG of Heston, LOWE and SHAWYER of Uxbridge, or many others that might be mentioned, the wonder would be even greater and the question would immediately be asked, "Wherever do such quantities of flowers go to?" The growers, however, are only catering for the public demand, and rarely is the supply greater than the demand. Even if there is a glut it is usually of the lower grades, and not the better class of disbudded blooms.

I have already mentioned how well they are cultivated by the growers for market; growing them as they do in such huge quantities, they become acquainted with the exact requirements of each variety and treat them accordingly. In comparison with the quantity of plants the number of varieties grown is small, and it is indeed

a good variety that passes muster with the market grower. Not only must the colour be right for selling, but the habit and cropping qualities must be good as well, and the florets of such texture or substance that they are not easily damaged in packing, and are still fresh after being out of water from twelve to twenty-four hours. The last is a severe test, and anything of a soft or flimsy nature is soon cast aside, buyers quickly recognizing those that do not give satisfaction.

In dealing with the cultivation of a plant it is usual to commence with the propagation, but before doing so I should make it quite clear that Border Chrysanthemums under fair conditions will live and flower well for quite a number of years, practically without any attention, and the fact of their being left to themselves tends to make the plants hardier. The soil which they are in naturally becomes poor and the growth less rampant each succeeding year, and so the stools get harder and the young growths in the spring less vigorous and consequently more likely to come through the spring safely than young plants put out in well-prepared ground the previous spring. The latter often throw up very vigorous growth from the base during November and December, and it is this class of shoot that very quickly succumbs to frost.

Those who are desirous of cultivating the plants on these lines would be well advised not to cut back the plants too hard after flowering, but rather to let them die back naturally after the flowering shoots have been cut. If cut down, say, to within six inches of the ground while the roots are still active, they are apt to bleed and the constitution of such plants is ruined, so when planting to establish Border Chrysanthemums permanently—that is without propagating each spring—it would be best to plant in soil not too rich, and in selecting the position let it be one that does not lie too wet during the winter.

A very simple method of propagation, and one best suited to the amateur and owners of small gardens without glass accommodation, is to lift the plants that have flowered the previous autumn some time during April, pull off the young growths, which by this time are throwing up well from the base and are usually well rooted, and plant them in the borders. They will make good plants by the autumn; five to nine such shoots planted about a foot apart make really effective clumps. The only things likely to injure them are slugs, but a slight dusting or two of soot in the early stages will invariably ensure them against much damage. Any quantity of plants may be raised in this way, and for an ordinary display in the borders any other form of propagation is really unnecessary.

Where, however, a speciality is made of Border Chrysanthemums or where they are required in quantity for cutting purposes, it is usual to propagate them under glass, the date of propagation varying from the end of January to March, and except in the case of particular varieties there is little to be gained by early propagation. Cuttings inserted the first or second week in March make good plants by the end of April, which even in a very favourable district is quite early

enough for planting. May is the best time for planting in most districts, and so the date of propagation must be governed somewhat by the proposed date of planting, and of course by the class of plant desired at planting time.

To ensure good cuttings the care of the stock plant is important, and where possible these should be lifted in the autumn before the advent of severe frost, and placed in a cold house or frame where frost can be excluded, lightly covering the roots with fine soil. Very little or no water will be necessary during the winter months, but plenty of ventilation should be given. Many shoots will be thrown up during January and early February, and usually they are pretty strong. They should be removed with a knife at or just beneath the surface of the soil and thrown away, and the next lot of cuttings, though not so strong, will be better and likely to root more evenly than the first, the lengthening days and stronger light keeping them harder. A moderately hard cutting not only roots quicker but emits many more roots than a large sappy one, and the growth of every plant is governed by the amount of serviceable roots it has.

A light sandy compost should be used for propagating, but whether this is made up in the form of a bed in a moderately cool house or frame or in boxes is quite immaterial, either method having its advantages; but it is essential for the cuttings to be made quite firm in the compost and well watered in, afterwards keeping them close till roots are emitted, when the young plants should be gradually hardened off by giving more air day by day.

Where only a few dozen plants are grown it may be an advantage at this stage to pot them off singly into small pots, but where they are being cultivated in large numbers this is unnecessary, the best plan being to box them off or plant them out in three or four inches of soil in frames at from four to six inches apart.

It may be necessary to keep them close for a few days after potting or replanting, but great care should be exercised, as too free growth is the one thing to be guarded against, and for this reason also the watering must be very sparingly done, particularly if they are planted out, just sufficient being given to prevent flagging. Once they have lifted their heads after replanting or potting plenty of air will be necessary to ensure sturdy growth, and as at this date the days generally will be fairly warm the lights should be removed entirely whenever the weather is fine.

Potted plants will take a great deal more water when they become well rooted than those planted out, and though I strongly urge the necessity for care in this direction they must not be stunted by being kept too dry.

Sometimes during April aphides will make their appearance in the points of the shoots, but one or two light sprayings with an insecticide will quickly eradicate this pest. Towards the time for planting out the lights should be removed night and day, and everything done to ensure hardiness in the young plants.

The preparation of the soil is an important matter, particularly if they are to be grown in quantity for cutting. Very deep digging or bastard trenching during the winter or early spring is a good plan to adopt, doing this sufficiently early to allow the soil to become ameliorated by the action of the weather and to consolidate slightly. The amount of manure to be added should naturally be varied according to the nature of the soil, but rarely should it be necessary to dress the ground heavily with fresh manure.

In private places where batches of plants are grown for cutting in the kitchen garden, or borders adjacent thereto, and which may have been well manured for previous crops, little or no manure should be given, as I have found that plants which grow away very freely in the early stages do not produce such good quality bloom as those grown more steadily and well fed after the appearance of the flower-buds.

Stations that are reserved for Chrysanthemums in the herbaceous borders may be rather more liberally treated, as the permanent occupants of the borders will naturally take a good deal of the nourishment out before the Chrysanthemum roots get well hold.

It must not be inferred, however, that Chrysanthemums will give the best results from an impoverished soil. They will not! A well-worked soil not too rich in nitrogenous manure, which will give good steady growth from the outset, is far the best, and it is much easier and less wasteful to add or give manure later in the season than to try to check the growth of plants which are making far too much soft wood through a superabundance of manure at the outset.

When the plants are being grown for lifting and transferring to flower-beds in the early autumn, the soil should be such as will produce plenty of fibrous roots, and if it is not naturally fairly light the addition of leaf soil, spent hops, or old mushroom-bed manure will help it in this direction; a good autumn display might easily be spoilt if—when lifting—the roots come up without a good ball of soil.

The date of planting will vary a little in different localities and seasons; it may be safe to plant the first week in May or even a little earlier on moderately light soil and in a warm neighbourhood, but when the soil is heavier and the locality subject to late frosts it may be necessary to defer it to the third or last week in the month, and though some varieties, if well hardened, will stand a little frost, there are others which suffer considerably, and so it is not wise to take too many risks.

Firm planting is essential, and it is detrimental to plant when the soil is in a wet condition, the plants getting away much quicker when it is nice and friable.

The distance they should be planted apart will depend somewhat on the varieties. Pompons may only require from eighteen to twenty-four inches each way, and in light soil even less, but the stronger-growing Japanese type should be from two to three feet apart, a good plan being to plant in double rows two feet apart and two



FIG. 54.—POMPON CHRYSANTHEMUMS GROWN IN BORDERS.

[To face p. 288.]



FIG. 55.—CHRYSANTHEMUM 'MERCEDES,' AN AUGUST-FLOWERING VARIETY.



FIG. 56.—DISBUDED FLOWERS OF EARLY-FLOWERING CHRYSANTHEMUM
'DELIGHT.'



FIG. 57.—DISBUDED FLOWERS OF EARLY FLOWERING CHRYSANTHEMUM
'FRAMFIELD EARLY WHITE.'

[To face p. 289.]

feet from plant to plant in the rows, and a distance of three between each pair of rows. This saves space somewhat and yet gives plenty of room for working between the plants during the growing season.

Some time during the season the plants will require staking, and probably the best and quickest plan is to put the stakes in before planting out ; if this is done the young plants may be tied as soon as they require it, and the rows or beds will be much more tidy in appearance than when the stakes are put in at a later date.

After planting, the ground should be frequently hoed. This operation serves the treble purpose of keeping down weeds, promoting healthy growth, and during dry weather checking the loss of moisture. If it is systematically done very little watering should be required, and certainly none till near the flowering period.

When the flower-buds are showing, the treatment should be more liberal, and both feeding and watering must be regularly attended to. It is difficult to say how much water and manure should be given, this being governed by a variety of circumstances. Heavy soils may require very little, whilst on light porous soils a feed and good soaking of water every week or ten days would not be too much. It is astonishing what difference proper attention in this respect makes to the colour and general quality of the flowers.

Disbudded plants for cutting, I find, like even more generous treatment than those grown for sprays or for a border display, and a severe drought after disbudding not only prolongs the time they are opening but robs them of colour and size.

During the growing season the plants are liable to be attacked by greenfly and thrips, but the treatment suggested for the young plants will keep both these pests under.

The worst enemies of Border Chrysanthemums, at least where they are being grown for cutting, are two small bugs which attack the points of the shoots during August and September, piercing the stems, thereby checking the growth, and deformed flowers are the result. Mr. WELLS, in his book on the Chrysanthemum, fully describes them. Since he wrote this, however, these pests have become very troublesome in some localities, almost ruining the crop of bloom on certain varieties. Both are difficult to deal with, and the only remedy I can at the moment suggest is to spray regularly with nicotine insecticide.

Plants for ordinary garden decoration are best allowed to grow quite naturally. The introduction of any system of stopping involves a greater amount of tying, which tends to a stiffer appearance, and in the borders this should be obviated as far as possible and varieties selected that require little or no staking.

When growing for cut flowers, whether for sprays or disbudded blooms, it is sometimes advisable to take out the points of the plants at or about the time of the first natural break ; this conduces to a more even set of shoots, and where it is desired to retard the flowering period of a variety they may be stopped again, afterwards restricting the shoots to the number required on each plant. Generally speaking,

the first week in July is late enough for this purpose in the south; further north this second stop may not be necessary, and in the case of some of the later-flowering varieties it may even be necessary to anticipate the natural break by stopping earlier, thus inducing the bloom buds to appear at an earlier date; this applies chiefly to plants being cultivated for the production of disbudded blooms.

Plants for a supplementary display in the flower-beds or borders should be treated as already advised, lifting them soon after the flower-buds are well set. Needless to say, they should be well watered a day or two beforehand, and if a showery time is chosen so much the better, thereby lessening the check. Care must be taken to lift them with as much soil adhering to the roots as possible, watering them in well after replanting, and giving them a light spray overhead for a few days while there is any tendency to flag. Excellent results are obtained in this way.

As mentioned at the outset, varieties are very numerous, some five hundred having been on trial at Wisley in 1914, and the certificated varieties and Committee's selection will be found in the Society's Journal* for April 1915. This in itself is a good guide, but as varieties differ so much in different localities it is sometimes wise, before planting, to make a note of those which do well in the neighbourhood. However, I have been interested in this subject for a number of years, and venture in conclusion to give short lists of varieties for various purposes in the hope that they may be of service.

VARIETIES FOR DISBUDED BLOOMS.

White	{	Candida	White	Yellow	{	Knaresboro' Yellow
		Framfield Early				Mrs. R. Hamilton
Pink	{	Débutante	Des-	Bronze and Chestnut Shades	{	Mrs. G. Wermig
		Madame Castix				Almirante
		granges				Eldraco
		Cranford Pink				Dolores
		Delight				La Pactole
		Fée Parisienne				Nellie Blake
Yellow	{	Consul	Crimson		{	Emperor
		Uxbridge Pink				Alcalde
		Cranford Yellow				
		Cranfordia				

VARIETIES FOR THE GARDEN OR FOR CUTTING AS SPRAYS.

White	{	Madame Castix Desgranges	Yellow	{	Carrie
		Roi des Blancs			Leslie
Blush Pink	{	Market White	Yellow	{	Horace Martin
		Perle Châtillonnaise			Elstob Yellow
		Betty Spark			Polly
		Dorothy Ashley			Cranford Yellow
		Hector			Jas. Bannister
		Lillie			Diana
		Marie Massé			Ryecroft Glory
		Provence			Mrs. J. Fielding
		Normandie			Almirante
		Patricia			Hollicot Bronze
Fée Parisienne	Abercorn Beauty				
		Miss Balfour Melville			
		Nina Blick			
		Dolores			

* JOURNAL R.H.S., vol. xl. p. 511.

Crimson	{ Alcalde	White	<i>Pompons.</i> White Pet
	{ Crimson Polly		Flora
	{ Goacher's Crimson	Yellow	{ Piercy's Seedling
Purple	Claret		{ Mrs. A. Thomson
	<i>Singles.</i>		{ Mignon
White	{ Mrs. Earle	Blush Pink	{ Golden Petite Marie
	{ White City	Bronze	Blushing Bride
Yellow	Golden Firebrand	Purple	Bronze Bride
Bronze	Brazier's Beauty	Orange	Anastasia
Purple	Kitty Riches	Crimson	Madame Lefort
	{ Carrie Luxford		{ Little Bob
Crimson	{ Firebrand	Chestnut	{ Crimson Précocité
	{ Kate Westlake		Bijou

SOME FALLACIES REGARDING THE CLEMATIS.

By A. G. JACKMAN, F.R.H.S.

[Read November 21, 1916; Dr. F. KEEBLE, F.R.S., in the Chair.]

IN August 1915 I had the honour of reading a paper before you entitled "The Clematis, its Development and Cultivation,"* and I now wish to thank the Council for again inviting me to give a lecture on this very interesting and beautiful class of plants.

I have chosen for this lecture the title "Some Fallacies regarding the Clematis" because I wish to take an opportunity of disposing of some misconceptions, and of correcting some mis-statements which have been made from time to time, and repeated in certain sections of the Press.

The principal misconception is with regard to the cause of the sudden "dying off" which unfortunately affects some of the Clematis. This, as I mentioned in my previous lecture, has been attributed by different writers to (1) frost; (2) eelworms; (3) the bursting of the cells through excessive moisture; (4) too rich food; (5) grafting.

None of these reasons, as I have most definitely stated in my previous lecture, do I believe to be the principal cause.

With regard to frost, there is no doubt that, owing to the Clematis being one of the earliest plants to break forth into growth, severe late spring frosts do damage them, if they are in an exposed position. This, however, is generally perceptible, but the facts that plants "die off" in seasons when there have not been any severe late frosts, and also when they have been growing under glass, effectively dispose of this theory.

Eelworms are sometimes found on the roots, and, though injurious, are not the cause, as it is rather the exception than the rule to find them on the plants affected, and in many cases the roots, on examination immediately after the plant has died back, have been found perfectly healthy.

I have noticed the bursting of the bark, due to increased vigour of the shoots, after the earlier growth had become ripened and set, or to careless handling in training the shoots. This, in many cases, has no detrimental effect, but in others probably becomes the seat of the cause of the "dying off," as I will explain later on.

With regard to too rich food, as previously stated, I do not remember any case of "dying off" coming under my notice where the cause could be brought home to overfeeding, and I can state most emphatically that, in the majority of cases I have seen, no such treatment has been given.

* JOURNAL R.H.S. vol. xli., p. 209

With the last of these imagined causes of dying back—namely grafting—I will deal at somewhat greater length.

It has been asserted that, when Clematis are grafted on the native *C. Vitalba*, the latter being so strong, it, in time, causes the death of the graft, and to this are to be attributed the losses sustained. I entirely dissent from this statement.

Before, however, giving my own views, I should like to quote the remarks of M. MOREL, of Lyons, which are published in a letter—unfortunately left untranslated—which has recently appeared in one of the weekly horticultural journals.

After having given his views on the cause of the trouble—views, as I shall show presently, which are in conformity with those I have put forward—and thus having ruled out grafting from the list of possible causes, M. MOREL observes that “when grafted on the roots of *C. Viticella*, a union is secured, which borrows from the stock only temporary aid wherewith the scion forms for itself roots, on which it is to live.”

That this is so will be seen in the accompanying illustration (fig. 58), and I need scarcely add that this stock, as well as *C. Vitalba*, is used in our nurseries, and furthermore that the disease occurs no less when this stock—approved by M. MOREL—is used than when *C. Vitalba* is employed.

As the figure—of a two-year-old plant of *C. ‘Lady Londesborough,’* a hybrid of the *patens* type, grafted on *C. Vitalba*—shows, the “own roots” from the scion have developed considerably more than those of the stock on the left-hand side, and show no sign of being killed by the latter.

In the second figure (fig. 59), which is of a plant of *C. ‘Lady Betty Balfour,’* a hybrid of the *Viticella* type, grafted on *C. Viticella*, you will notice that, although the roots of the stock underneath have increased since grafting, those of the scion roots above have also increased to a far greater extent.

In further illustration of the excellence of *C. Viticella* as a stock, I have here a plant of *C. Jackmanni superba* * (fig. 60), lifted from the open ground, of several years’ growth, showing a considerable increase in the quantity of both stock and scion roots, and a growth of stems during the past summer of several feet.

This also disproves the contention, which has been put forward, that nursery cultivation does not let the plants mature, and is not the best way to study the question.

Another reason why I think that grafting is not the cause of the “dying off” is (as is apparent from these examples) that the plants, after they have formed their scion roots, are mainly supported by them and not by the roots of the stock.

If grafting were the primary cause of the “dying off,” it would be reasonable to suppose the plant will be affected from the union upwards, which is not so in this case.

* The lecturer showed a plant.

Finally, with regard to this aspect of the subject, the fact that the disease occurs in seedlings and cuttings growing on their own roots, and ungrafted, disposes once for all of the prejudice, which could not be entertained by any experienced grower, that in grafting is to be found the cause of the disease.

Now, as to the real cause of the disease, as I claimed in my previous lecture, it is undoubtedly due to a micro-organism.

The parasite causes light-brown spots to form on the leaves, which spread down the petiole to the shoot, giving the foliage a sickly appearance. It also attacks the shoots when they have been injured or cut, causing gradual clogging and destruction of the cells, and extends downwards, until it arrives at the lateral shoot or shoots, causing them to succumb suddenly.

The parasite apparently increases more rapidly with heat, thus accounting for the plants mostly dying back during the hot summer months, when they are in full growth, and sometimes in flower.

Figure 60 clearly demonstrates the course of the disease. You see last year's growth, which has been broken off, or cut. The fungus entered the shoot at this wound, causing the cells gradually to decay, until it arrived at a node, when two shoots suddenly withered and died. The lower shoot, you will see, is quite healthy and growing, and there are plump, healthy buds shooting out from the main stem lower down. The roots are also perfectly healthy.

This illustration also proves the correctness of the advice I gave in my previous lecture as to planting, when I recommended Clematis being put in a sufficient depth to allow the top of the union with the stock, being about 2 inches below the surface of the ground, in order to encourage the plant to form secondary roots, and to throw up strong shoots from below the surface.

In this illustration you will again perceive that last season's shoot has been broken off a few inches above the level of the ground, a young shoot being sent up from the remaining eye. The parasite entered the old shoot at the wound, forced its way down the stem, encircling the node of the young shoot, causing it to succumb, the strong shoot on the left, coming from the main stem, being quite healthy.

In the case of a plant which had been raised from a cutting, one eye at the top started into growth. The spores of the parasite attacked the leaves in the early stages and spread down the petiole to the shoot, arriving at the node at the top of the cutting, killing both the main stem and lateral shoot, whilst the other bud at the top of the cutting endeavoured to push into growth, though its life could be of but short duration.*

The seedling figured (fig. 61) is three years old, and has grown well until this summer, when the parasite attacked it at the injury some three feet up the stem, killing all the branches above, whilst the lower portion of the main stem is still alive.

Since stating my conclusion that the disease is due to a micro-

* The lecturer showed an example bearing out his statement.

organism, I have received particulars of experiments made by Mr. W. C. GLOVER, of the New York Agricultural Experiment Station, who has been able to isolate the parasite which causes the "dying off," and to identify it as a fungus belonging to the genus *Ascochyta*, which he calls *Ascochyta Clematidina*, and his views entirely bear out the conclusions I had formed as to the nature and development of the disease.

M. MOREL, the writer of the letter already referred to, shares somewhat similar views regarding the nature of the affection. In the course of his letter, he observes:—

"The real cause of the sudden death of the Clematis, which often die off when in full bloom, appears to me to be of bacterial origin, and is generally confined to a comparatively small portion of the stem, sometimes located more or less high up, more often near the base of the plant, but also sometimes half-way up, or in the upper part. At this point, which is easy to find the moment a withered plant is cut open, it is found that the interior of the stem, extending sometimes for only a fraction of an inch, is filled with black powder coming from the decomposition of the vessels. . . . Above this point the plant is dead, below it is alive, and preparing vigorously for new growth."

The last of the subjects with which I have to deal is that concerning the origin of *C. Jackmanni*, which is, as is well known, a hybrid raised by my father.

It has been asserted, on the authority of M. LAVALLÉE, in "Les Clématites," t. 4, pp. 9-12 (published over thirty years ago), that it is the Japanese species, known as *C. hakonensis*. I can only repeat what I know to be absolutely the fact, as stated in "The Clematis," p. 9, by MOORE and JACKMAN, that it was "the result (with others) of crossing *C. lanuginosa* by *C. Hendersoni* and *C. Viticella atrorubens*, in the summer of 1858. The plants bloomed first in 1862, those named *C. Jackmanni* and *C. rubro-violacea* being shown at Kensington in August 1863, and receiving certificates of merit of the first class."

The first mention of *C. hakonensis* that I am aware of is in the "Enumeratio Plantarum in Japonia" (1879), ii. 263, by FRANCHET and SAVATIER, twenty years after *C. Jackmanni* was raised.

If more is required to demonstrate the frivolity of the claim that *C. Jackmanni* is nothing but *C. hakonensis*, it is only necessary to turn to M. LAVALLÉE's description of the latter species, in which he states "its seeds are always numerous, germinate easily, and reproduce the species almost without variation," whereas *C. Jackmanni* is generally sterile.

Again, according to FRANCHET and SAVATIER's description of *C. hakonensis* (which the latter found growing in several districts in Japan), the leaves are "ternate," a characteristic of the *patens* and *florida* sections, whereas those of *C. Jackmanni* are pinnate or pinnatisect. Also, in a recent Japanese work, the "Index Plantarum Japonicarum," vol. ii. part 2 (1912), p. 110, by J. MATSUMURA, *C. hakonensis* is regarded as a synonym of *C. florida*.

CONFERENCE ON BULB-GROWING IN THE BRITISH ISLES.

AUGUST 1, 1916.

AN Exhibition of Dry Flowering Bulbs was held for the first time by the Royal Horticultural Society at its fortnightly Meeting on August 1, 1916 (see p. xcvi). The schedule included Daffodils, Tulips, and other bulbs, corms and tubers such as Crocuses, Anemones, &c. Exhibitors were required to give a formal declaration that the whole of their exhibits were grown by themselves on land in their own or in their firm's occupation in Great Britain, Ireland, or the Channel Islands. The object of the exhibition was to encourage bulb-growing as a British industry, and a Conference was held in the Lecture Room on the same day with a view to giving greater impetus to the movement, to making the occasion a more auspicious one for the inauguration of an important industry on a larger scale than heretofore, and to demonstrating the excellence to which such bulbs can be grown in Great Britain and Ireland.

THE CONFERENCE.

Lieut.-Colonel Sir ALBERT K. ROLLIT, Litt.D., Member of Council, presided at the Conference, and, in his opening remarks, said: This Dry Bulb Show may be a dry subject, and it certainly cannot be called the "blooming" Show, but it is very instructive and educational, from horticultural, scientific, commercial, and international standpoints; and, as Ex-President of the Association of British Chambers of Commerce and of the London and Hull Chambers, I am glad to respond to the Council's request to me to preside and give a brief introductory address. For "the Royal Horticultural" exists to do its best, horticulturally and commercially, and by way of organization, for the great and growing trade which it has brought into line and helped to place at the head of the Horticulture of the world. When once asked to propose "The Trade of Ireland," Dean Swift replied: "Sir, I drink no memories"; and all in Great Britain want none but prosperous memories and good prospects in the victorious world-peace of the future, greater than the "Pax Romana" of Tacitus and the historians, for that was a peace of force, a peace of subjection, a peace of the sword, the hilt of which was at Rome and the point everywhere, whereas the peace we pray for is to be the "Pax Britannica," one of free nationalities, great and small. But even such a peace will bring its long years of strain and tension after war, and these must be prepared for in advance—for a fight for markets, new and old—and, alas, with a sad experience of the results of a want



FIG. 58.—CLEMATIS 'LADY LONDESBOROUGH' (PATENS)
GRAFTED ON C. VITALBA, SHOWING "DIE-BACK."

[To face p. 296.]



FIG. 59.—CLEMATIS 'LADY BETTY BALFOUR' (VITICELLA)
GRAFTED ON C. VITICELLA, SHOWING "DIE-BACK."



FIG. 60.—CLEMATIS JACKMANNI SUPERBA
GRAFTED ON C. VITICELLA, SHOWING "DIE-BACK."



FIG. 61.—CLEMATIS SEEDLING, SHOWING "DIE-BACK."

[To face p. 297.]

of organization and preparation for both peace and war in the past. We must also realize the necessity for education and public instruction, wide, and of the right sort, because knowledge is the basis of all business. There must be an end in our Universities and Schools of the high and dry academic attitude towards Modernism, which begot the old University aphorism: "We know nothing of science here, we don't even teach it," and of such medieval systems of teaching as of the languages—especially the dead; the sciences—especially the abstruse; the Arts—especially such as can be said to be the most remote from common use. It is in these directions that this Dry Bulb Show and joint Conference of the Royal Horticultural Society and the Horticultural Trades Association are a modest first attempt to aid this branch of the horticultural trade and industry; just as the Royal Horticultural Society has established a National Diploma in Horticulture, and has helped to found Science Degrees in Horticulture at the University of London, and so to equip our horticultural students, in place of the sword and spear of the gladiator, with the best and most modern weapons of intellectual precision, and to add to the rule-of-thumb the rule of trained teaching and experience. And it is to be hoped we shall, as a nation, remember our present lessons from the past, banish *laissez-faire*, and recall such warnings as those in the Report of the Royal Commission on Technical Education of even twenty or thirty years ago, telling us plainly of the dangers of the loss of our tar industries and our aniline dye trades to Germany, of our optical glass trades, lenses and glass bulbs, also largely lost to us, of our forgotten or neglected medical herbs and herb gardens (of which I have an old Georgian one at Chertsey), a hygienic subject on which the Royal Horticultural Society has also done its best by having had a large Conference here, over which I had the honour to preside; all these "key" industries being the only "open sesames" to success in our great textile and other trades, neglect of which has placed us in the most dangerous dependency on enemy nations. Such things must never be again—"Under which king, Bezonian? Speak or die." Our very food supplies have thus been imperilled, and we begin to realize that the greatest public malefactor is the tyrant who boasted that where his charger's hoof had trod no blade ever grows again, and the greatest patriots and benefactors they who help to make two blades grow where only one has grown before. "Now" must be our new effort—now or never. Let me, then, encourage you and others to new efforts and methods by summarizing the situation of the nascent Dry Bulb Industry, as illustrated by to-day's Show, which I hope may be contributed to by this Conference of Experts.

Amongst what may for convenience be called "bye" or "side" products of the war has been a distinct call to all patriotic Britons for the encouragement of Home Industries, and, as a help in this direction, the Council of the Royal Horticultural Society consented to hold this Exhibition of Home-grown Flower Bulbs, in order to demonstrate the

excellence with which they can now be grown in Great Britain and Ireland if the supply from abroad should ever again be cut off.

The call to British industry for development in all possible directions is of the most urgent importance at the present time. It will involve the utilization of every rod of available land, and it is devoutly to be hoped that in the near future, with the aid of science and deep mechanical cultivation, we shall see all suitable waste and vacant areas turned to economic advantage in a way hitherto little dreamt of.

It is to the interest of everyone and of every class to make this country as productive as possible, and especially in the produce from the land. Agriculture and Horticulture are the twin bases of a country's prosperity, and it behoves all whose interests lie directly or indirectly in land cultivation to see that the maximum results are secured from acreage by machinery and by labour.

Many areas of ground now under other crops are quite capable of carrying bulbs at the same time, and bulbs bring a double harvest both of the flowers and of the excess of dormant bulbs.

Until ten or fifteen years ago there was hardly any indigenous bulb trade in this country, but recently the industry has been successfully undertaken in various parts of the British Isles. It is already one of the chief industries in Scilly and the Channel Islands, from whence tons of blooms are received in London in the spring, and are followed in the summer by bulbs in shiploads, for dry bulbs lend themselves to easy transport.

Bulb-growing has also been particularly taken up in the Lincolnshire and in the East Anglian Fenland, where some growers in Cambridgeshire have many acres under cultivation; and there is no possible reason why bulbs should not be grown also in other parts of the country where the soil is suitable. It is found that, with the possible exception of hyacinths and crocuses, the bulbs equal in quality those received from abroad, and, in addition to supplying the home demand, a considerable export trade has already been set up.

Moreover, it is an industry which can be begun on a small scale; requiring very small capital and only a little bit of land, it is one which appears to be well worthy of everyone's attention. It is a pleasant and most interesting occupation, and is one, for the most part, within the limits of a woman's reasonable strength, and suitable to her sex.

The Board of Agriculture tells us that Daffodil cultivation can be made to yield an annual profit of as much as £15 an acre, though the Board is wisely careful to qualify this by saying that in estimating the quantity of blooms obtained from an acre considerable latitude must be allowed, as the crop will vary, according to varieties and good or indifferent cultivation &c. Therefore it is hoped that the Show which is being held to-day and this Conference will inaugurate a new era for this industry, which is of such comparatively recent origin in Great Britain; and, with profits anything like those suggested by the

Board of Agriculture, there appears sufficient encouragement to give bulb-growing a thorough trial, where soil and other conditions are suitable for it. Incidentally, and without clearly foreseeing the issue, the present juncture has, indeed, been most wonderfully prepared for by many hybridizers and researchers during the five-and-twenty years prior to the outbreak of war, and as the result of their efforts a large number of strong, vigorous, healthy, marketable varieties of our various bulbs, and particularly of Daffodils and Tulips, have been successfully produced, both horticulturally and commercially, and put upon our markets.

The selection of Tulips for commercial growing has further been much simplified by the Society's trial of varieties in 1914 and 1915 at its Gardens at Wisley, whereby those most suitable for cultivation in this country have been selected from the great mass of varieties which before the trial was so confusing.

The Show has been to myself most interesting, recalling as it has done sojourns in Asia Minor, Syria, Cyprus, and the Lebanon, on my way to Damascus, where I saw some of such bulbs in wild luxuriance, as on the highlands over Smyrna, which appeared to be carpeted with wild Cyclamen, to see which I even braved the brigands; and among the exhibits in the Show I observed an interesting bulb to sufferers from gout and rheumatism—the one specific for the former—Colchicum.

I have now the privilege of asking Mr. Arthur Sutton to address you.

Mr. ARTHUR W. SUTTON, remarking that the cultivation of hardy flower bulbs was a comparatively new industry in this country, and that it showed an enormous increase during the past twenty years, claimed that home-grown bulbs yield better cut flowers for market purposes than do foreign bulbs. There are numerous districts—notably in Lincolnshire, Cambridgeshire, Essex, Wiltshire, Somersetshire, Devonshire, Cornwall, Anglesea, many parts of Ireland, and the Channel Islands—where excellent Daffodil bulbs are grown. Most of these places, he remarked, have the benefit of frequent sea-breezes, which play no inconsiderable part in the production of good bulbs.

The leading growers are laying down stocks of choice varieties to meet the demand which they confidently anticipate in the near future, and have invested enormous sums of money in the purchase of the very best. Mr. SUTTON claimed that British bulbs have better constitutions than those of Continental production, and, as they usually have several shoots, instead of the single shoot of the foreign bulb, are much more floriferous.

He reminded the meeting that several British growers had raised more new varieties than all the foreign growers put together. The home-raised seedling Tulips—the beautiful Cottage and Darwin varieties—surpassed in beauty of form and colouring all the Continental varieties. In conclusion, Mr. SUTTON expressed his

appreciation of the Royal Horticultural Society's movement in respect to dry bulb cultivation.

Mr. P. RUDOLPH BARR said he thought the exhibits of British-grown dry bulbs shown in the hall that day afforded a pleasing example of the suitability of our British soils and climate for producing crops of many kinds which up to now we have been importing in such large numbers from abroad. The recent prohibition of imports of foreign bulbs caught us unawares, and in consequence there were some varieties, such as Early Single and Double Tulips, which would be very scarce this season, while of Hyacinths, Crocuses, and *Scilla sibirica*, to name a few other popular kinds, there were few or none in the country. Had growers known last autumn the intentions of the Government they could have arranged their plantings and have secured an abundance of these special bulbs. He was convinced that if the large bulb-growers in this country, especially those in the Eastern Counties, would devote themselves a little more to producing the kind of bulb required by the retail bulb merchant for his customers, they would find it a profitable industry. At present cultivation was carried on principally for the purpose of providing cut flowers for the market. To provide a bulb required by the public, and such as could compare favourably with a foreign-grown bulb, necessitated a somewhat different method of cultivation.

"Let me," said Mr. Barr, "briefly state the qualities of a bulb required by the retail merchant: (1) It must be true to name and description. (2) It must contain a strong flower-bud. (3) It should have a clean, healthy skin. (4) It should be properly graded, *i.e.*, the bulbs should be of even size."

Mr. BARR remarked on some of the principal bulbs which can be successfully grown in the United Kingdom.

"Daffodils," he said, "we might justly claim as being English flowers. The best-known varieties which fill the florists' shops in spring were raised by English hybridizers; 'Emperor,' 'Empress,' 'Horsfieldii,' and 'Barrii conspicuus' were household names. They were now very largely cultivated abroad, but nevertheless the British supplies are very great and are grown all over the country. He remembered that in the year 1883 the whole stock of 'Barrii conspicuus' consisted of one bed at his firm's Tooting Nurseries, and the price of this variety was then 25s. a dozen. He supposed there must be millions now spread over Great Britain, while the price has come down to 30s. a thousand.

"The cultivation of Tulips in Great Britain is also becoming a great industry, especially of the May-flowering 'Darwin' and the so-called 'Cottage' Tulips. Vast areas of these in bloom in May may be seen in the West and East of England, while in Ireland they are grown very successfully. It is, however, mainly for the cut bloom at present that these bulbs are grown here. When the cultivation is for producing suitable bulbs for sale to the bulb merchant the flowers should be nipped off with only about an inch of stem, the produce of

saleable bulbs being thereby increased, which points to the advantage of keeping the stocks for cut flowers separate from the stock for bulb sale. Although an English-grown Tulip bulb may not always have the same bright appearance as one from the Continent, and may not, perhaps, be so large, the flowers are certainly better. I have noticed the difference for many years in our own nurseries, where imported and our home-grown Tulips have been planted side by side. The English bulbs make a slightly taller growth, come into bloom earlier, and have larger flowers.

“The early-flowering Gladioli are successfully grown in the Channel Islands, and lately we have had some very satisfactory corms from Ireland. The large-flowered, late Gladioli do well in England. We know that in the West of England Messrs. KELWAY are very successful with their Gladioli. The corms grow freely in an ordinary loam. At our Taplow Nurseries very good late Gladioli are grown, and they increase freely.

“Of Bulbous Irises, the English and Spanish grow well in Lincolnshire, but the Dutch cultivate on so large a scale and work so economically that they will probably always be able to beat us in price.

“Crocuses can be successfully grown here, though the corms are smaller than the imported ones; but here again in Holland the areas devoted to their cultivation are so large and the prices so low that we may very well leave our wants to be supplied from thence.

“Quite as satisfactory bulbs of Scillas can be grown in Great Britain as anywhere, particularly of the well-known *Scilla sibirica* and of the later Scillas or Wood Hyacinths. With regard to the Wood Hyacinths, care must be taken to ripen off these bulbs properly. When lifted, they should be laid in a shallow trench and be covered with a little soil, so that they can colour and properly mature. They should then keep sound until Christmas.

“The ‘Heavenly Blue’ variety of Muscari is now largely grown in England, and as hardly any *Scilla sibirica* bulbs will be obtainable this year I strongly recommend this beautiful Muscari to take its place.

“All species of Anemone are successfully grown all over the country. In Cornwall, Ireland, and the Channel Islands large quantities of *Anemone fulgens* and *A. coronaria* ‘St. Brigid’ are cultivated.

“The Channel Islands specialize in Ranunculuses, while Ixias can be grown as successfully in Guernsey and Ireland (and probably in Cornwall) as on the Continent, and Montbretias grow well in many parts of the country.”

Mr. BARR added that British growers would never be able to compete with Holland in growing Hyacinths, as, except in a very few parts of the country, we have not the suitable soil conditions.

The Rev. JOSEPH JACOB thought the R.H.S. might do good work in holding trials of Daffodils to ascertain their relative value for forcing. Few private growers, he remarked, recognized the ease with which Daffodils force when the bulbs have been grown in an

early district as compared with the same variety from a late locality. He suggested that the Society might procure such varieties as 'Golden Spur,' 'Obvallaris,' 'Sir Watkin,' and 'Empress,' and force them under suitable conditions at Wisley, and then in due season exhibit the plants, if possible, or cut flowers in the Hall. It was also worth considering if the various districts could not be induced to specialize in the varieties best suited for their localities, as this would ensure cheaper production. The Channel Islands, Mr. JACOB suggested, might specialize in 'Golden Spur' and 'Obvallaris,' which do so well there, while in other districts later varieties could be grown in specialized quantities.

Mr. ALFRED WHITE said that, as his father was one of the oldest bulb-growers in the trade, it might be of interest if he said how the business started. Some forty years ago his father collected Snowdrop bulbs from the surrounding cottagers in Spalding, and eventually produced from a million to a million and a half bulbs a year. Amongst the Snowdrop bulbs were occasional bulbs of the old double Daffodil, and after selling some to the trade the surplus were planted, and in spring the cut flowers were marketed. In this way his father commenced as a grower of bulbous flowers. Foreseeing the possibilities of cultivating the choicer Daffodils, he invested £300 in bulbs of 'Emperor' and 'Empress' at a time when they were quoted at a shilling each. These bulbs were planted on a plot about 50 × 25 feet, much to the amusement of his friends. But a large stock was worked up, and the venture proved an unqualified success. Some twenty years later Mr. WHITE had about five acres planted with bulbs, while at the present time there are five hundred acres of bulbs in the Spalding district. Mr. ALFRED WHITE was of the opinion that the same thing might be done in other places, but he hoped no one would come to Spalding, where bulb-growers were "quite thick enough." Besides the large stock they possess, he said tons of bulbs had been exported to Holland, where they were propagated and sent back to England. Mr. WHITE was emphatic in his opinion that the best prospects of the bulb-growing industry in this country lie in flower-production, and not for bulbs alone. At recent prices of the cheapest varieties it would not pay to grow for bulb-production alone. Protection would be necessary to enable growers to be independent of the flower market. Few persons besides those engaged in bulb cultivation realized the small proportion of bulbs that are fit for the seedsman. Mr. WHITE also contended that prices should be regular, so that the grower could rely on a regular income. If the prices are good enough, bulbs can be grown well in England where there is plenty of suitable soil.

Mr. H. DUNCAN PEARSON supported Mr. White's remarks concerning the small proportion of the bulb crop which is saleable as bulbs. In his opinion not more than 25 per cent. of the bulbs grown here were of the size and appearance demanded by the salesman, whereas nearly all imported from the Continent are flowering bulbs.

Mr. W. CUTHBERTSON outlined the steps which the Horticultural

Trades' Association had taken, and said that if we could compete with the foreigner in price, quality, and service, there was a great future for the industry in this country. As regards the quality, that, he knew, was right, and so do the large forcers of bulbs, but our bulbs have not the refined appearance of the Continental produce. In the matter of service he was of the opinion that there were no insuperable difficulties, but price was a ruling factor in all kinds of commerce.

Prefacing his remarks by mentioning his personal objection to tariffs, Mr. CUTHBERTSON said he believed two-thirds of the horticultural traders were strongly in favour of a tariff, and suggested that a standing joint committee should be appointed at an early date to consider the question. He expressed the opinion that to bring back a prosperous countryside many changes were necessary.

Mr. G. W. LEAK insisted on the necessity for education even with bulb cultivation. In Holland there are finely-equipped extension schools, where the lads, on leaving the elementary schools, receive expert training on subjects which will be of value to them in their work. He said that if we hope to compete successfully with foreigners we must produce bulbs of quality equal to theirs. We also must pay more attention to sales by sample. Here bulbs in quantity are rarely anything like the sample, whereas the Dutch are much more particular, and trade purchasers at least can rely on the sample being observed. This was in part due to the metric system of measurement. He regretted that there was no uniformity of sample in England. One man's first size of bulb might be comparable with another's second size, and vice versa. There were, Mr. LEAK continued, labour troubles in Holland as well as Britain, and there labour is scarce and wages increasingly high. In order to cope with the increased cost of production some Dutch growers had come over to study our methods of cultivation, especially with regard to ploughing in the bulbs. Mr. LEAK concluded by advising growers to go abroad and study other methods if they would succeed.

Mr. GEORGE MONRO, junr., remarked that the large cut-flower trade gave the home grower a great advantage over the foreigner, but there was just as great a danger of over-production with flowers as with any other things. He felt that the Government should grant a little protection to the home grower. Then, as we can produce bulbs of equal merit with the foreign ones, it would be a profitable industry. He spoke in favour of co-operation. In the past he thought the R.H.S. had scarcely considered the trade sufficiently, but had rather confined its energies to the requirements of the private grower, though the trade owed a great debt to the Council for their action with regard to the investigations which they have initiated into the 'streak' and other diseases. The question of samples was a vexed one, and any failures were due to human nature. In his opinion that remark applied as much to Holland as to England, but the Continental packing was much better than ours. He did not agree with Mr. LEAK that the adoption of the metric system would

get over the trouble. He advocated rather the adoption of a system of selling bulbs according to their weight.

The Rev. W. WILKS, in proposing a vote of thanks to Sir Albert Rollit for so kindly presiding, said that he was more than pleased with the result of the Show and Conference. In his opinion the chief difficulty confronting any effort to introduce a largely increased trade in British-grown bulbs did not lie only in quality or price or service, but also to a very great extent in the almost ineradicable tendency of Britishers to extol everything coming from a foreign source and almost to decry anything home-grown. One of the benefits which he looked for and hoped for from this disastrous war was the creation of a better appreciation of our own merits and capabilities, at least in the Gardening direction—"for I don't believe there is any country under the sun where they can grow better garden stuff than in this dear old, much abused, land of Great Britain and Ireland."

THE DAHLIA : ITS REPUTED INTRODUCTION IN 1789.

By C. HARMAN PAYNE, F.R.H.S.

FOR more than a hundred years it has been asserted by every English writer on the history of the Dahlia that it was first introduced into England by Lady Bute, otherwise the Marchioness of Bute, in 1789.

Having long had good reason to doubt the accuracy of this statement, I propose in the present paper to set out the results obtained after a critical examination of the facts as recorded by authorities who have dealt with the matter in their writings.

There are few florist's flowers that have been so persistently ill-treated by the historian as this popular autumn favourite. The errors and mis-statements regarding its introduction, the origin of its name, and other circumstances connected with it, would fill a paper by themselves, and they can be only briefly referred to here as they lie somewhat beyond the scope of my paper. There is no doubt that the time has come when much of the historical and literary matter presented to the flower-loving public by our older writers on the Dahlia is in need of verification and revision.

Before proceeding to give an account of one of the most important errors that have crept into Dahlia history and the steps taken by which it has been revealed, it will be useful to relate a few of the main facts in the history of the Dahlia as they are generally accepted by the best-informed students of floricultural history.

It may be taken for granted that the first Dahlias grown in Europe were those sent from Mexico by VINCENZO CERVANTES to the Royal Botanic Garden at Madrid. The native Mexican name, as we gather from FRANCISCO HERNANDEZ, was *Acocotli* (see "Rerum medicarum Novae Hispaniae Thesaurus, seu Plantarum" &c., Rome, 1649, where the plant is figured by him under that name, and also his "Cuatro libros de la Naturaleza y Virtudes medicinales de las Plantas y Animales de la Nueva España," Mexico, 1615). This introduction into Spain took place, as we are told, in 1789.

Although some writers say that the new-comers were flowered by the Abbé CAVANILLES in that year, it is more than probable that he did not do so, at any rate satisfactorily, till the following autumn. CAVANILLES, in his "Icones et Descriptiones Plantarum," the first volume of which appeared in 1791, figured and described (tab. 80) one of these plants which he called *Dahlia*, adding in a footnote "In honorem D. Andreae Dahl, Sueci botanici." The specific name given to this plant of a new genus was *pinnata*, subsequently called by some other authors *purpurea*. CAVANILLES says of it: "Vidi vivam in Regio horto Matritensi mense Octobri," which may reasonably be

presumed to have been the October previous to the publication of his "Icones."

The third volume of the same work, which was published three years later, contains the figures and descriptions of two other varieties called by him *D. rosea* (tab. 265) and *D. coccinea* (tab. 266), and the observation added by him after the latter was: "Tres hucusque novimus Dahliae species. Prima est flore pleno, cuius color coeruleo-rubens; secunda flore simplici, coloris rosei; tertia coccinei." It is essential for the reader to bear this in mind, as it will be necessary to refer to these names further on. All these figures by CAVANILLES are uncoloured.

These three Dahlias were introduced into France in 1802. ANDRÉ THOUIN gives coloured figures and a lengthy description of them in 1804. (See "Annales du Muséum," vol. iii., p. 420 *et seq.*) The plant does not seem to have reached Germany till some time between 1800 and 1805, and although GEORGE W. JOHNSON* tells us that WILLDENOW changed the name *Dahlia* to *Georgina* in 1803 it will be found that that author had done so long before, because in his "Species Plantarum," tomus iii., pars iii., p. 2124, CAVANILLES' *Dahlia* is described under the name *Georgina*, which was given to it by the German botanist in honour, it is said, of Professor GEORGI, a Russian traveller and botanist.

In 1802 JOHN FRASER, of Chelsea, procured *D. coccinea* from France and flowered it the following year. A coloured figure and description appear in the "Botanical Magazine" (tab. 762). It also seems that in 1803 Mr. WOODFORD, of Vauxhall, flowered *D. rosea* in his garden there, his plant also being obtained from France.

It was at this point that my suspicions were first aroused, for in the references to FRASER'S and WOODFORD'S flowers there is no mention of any previous introduction, and yet it is plainly stated by so many English authorities that the flower was first introduced here in 1789. It is most remarkable that for quite a century every English authority on the Dahlia repeats the same story. None of them ever seems to have questioned it. And yet how singular such an occurrence must have been? A plant newly imported into Spain from Mexico, a plant unknown, unbloomed, unnamed, undescribed, the first variety of which was not figured and described till 1791, was actually, according to these English writers in the periodical press and in their special monographs on the flower, first introduced into England from Madrid in the same year as it reached CAVANILLES there. The thing, on the face of it, was not only highly improbable but impossible, and I shall show the means by which such a conclusion was finally arrived at.

How widespread this error is may be proved from a few extracts from some of the leading authorities. The first of them, and without needlessly multiplying them, is PHILLIPS, who in 1829, in his "Flora Historica," vol. ii., p. 353, says: "It was introduced to this country

* "The Dahlia: its Culture, Uses, and History," 1847.

by the late Lady Bute, who procured it from Madrid in the same year that it arrived from America, but either through a want of care or judgment in the cultivation these plants were entirely lost to our gardens until seeds were reintroduced by Lady Holland in 1804."

In the "Annual Dahlia Register," 1836, the history of the flower is given in the form of an extract from "Floriculture," by J. MANTELL, the second edition of which appeared in 1834. It begins: "The Dahlia is a native of Mexico and was first introduced into this country in the year 1789, at which period it attracted but little notice, and the species was soon lost."

Sir JOSEPH PAXTON, in "A Practical Treatise on the Cultivation of the Dahlia" (1838), tells us: "We are informed from indisputable authority that this plant was first introduced into this country from Spain by the Marchioness of Bute, so early as 1789, but, as it was not subsequently heard of, it is supposed to have been lost shortly after this introduction."

Nine years later GEORGE W. JOHNSON, in "The Dahlia, its Culture, Uses, and History" (1847), says the same thing in almost the same words.

In "The Dahlia: its History and Cultivation" (1853), the late Dr. ROBERT HOGG, too, tells his readers: "The first account we have of its introduction to this country was by the Marchioness of Bute in 1789 from Madrid, where the Marquis was then residing as ambassador from England to the Court of Spain." The reader will see later that this story is nothing short of fabulous.

When SHIRLEY HIBBERD published his series of "Garden Favourites" in 1857 one of them was devoted to "The Dahlia." He records the mythical introduction in the following words: "The Dahlia is a native of Mexico, and was first introduced to Britain in 1789, the then Lady Bute procuring plants from Madrid, whither they were first sent from the Spanish possessions." This is really worse than the previous statement, for the then Lady Bute was a different person from the one subsequently known as the Marchioness.

There now occurs a great gap in independent Dahlia literature. From the date of SHIRLEY HIBBERD'S treatise in 1857 down to the year 1897, a lapse of forty years, when "The Dahlia: its History and Cultivation" appeared in a series called "Dobbie's Horticultural Handbooks," there was no separate treatise published on that flower. In this work there is a chapter by RICHARD DEAN, headed "History of the Dahlia"; the details given are meagre and reveal no fact of historic interest beyond those related by SHIRLEY HIBBERD in a paper read by him at the National Dahlia Society's Centenary Conference in 1889, and to which attention will be drawn more fully in a subsequent paragraph. It is in the work last cited that we find the remarkable statement that the Pompon Dahlia was raised in 1808, "when HARTWIG of Karlsruhe obtained a double variety from the single scarlet *Dahlia coccinea*," a statement which I have shown in a recent article in the "Gardeners' Chronicle" has no foundation in historical fact. In this

work, as in all others right down to the most recent " Dahlias " by GEORGE GORDON, published four years ago, the Marchioness of Bute, sometimes called Lady Bute, is credited with the original introduction of the Dahlia into England from Madrid in 1789.

It would be tedious to the reader to furnish other extracts, and the selection may be brought to a close by a brief mention that FOLKARD in his " Plant Lore " and the Hon. Mrs. EVELYN CECIL in her " History of Gardening in England " also concur in the fact as related by the other writers.

Against such an array of what one might reasonably suppose to be authoritative evidence it might have seemed to some amateurs like myself an act of temerity to dispute a fundamental historic statement, accepted by such well recognized and capable authorities. But it must, I submit, be admitted that no statement of historical fact is worthy of our credence unless it can be substantiated by contemporary corroborative evidence ; and as this was wanting, as will be seen later, the conclusion was forced upon me that the statement of these writers, some of whom had obviously copied their historic matter from their predecessors, without independent investigation on their part, must be wrong.

So firmly was I convinced of this that I determined to go through the whole of the available Dahlia literature, a task of far greater magnitude than some of the modern Dahlia writers are aware of, especially when one of them begins his opening lines by saying : " Information available for the history of the Dahlia is not as plentiful as we could wish." Anyone who starts in this way advertises the fact pretty clearly that he practically knows nothing whatever of the matter. There is, as the references in this paper clearly show, an abundance of literary and historical material on the subject if the student will only take the necessary trouble to discover where it is to be obtained.

And apart from the large number of monographs on the Dahlia in English, French, and German, of which I have given in my " Florist's Bibliography " the titles of no fewer than forty-eight separate works without counting societies' publications, there are scattered here and there throughout the whole range of botanical and horticultural general literature many important articles by authors eminent for the work they have accomplished in connexion with the Dahlia.

Of these I shall quote a few of the most serviceable for my purpose, and in doing so it will be seen that we are led still nearer to the point from which it is certain that the disputed statement originated. It is just here that it seems to be useful to remind the reader that whatever varieties the Marchioness of Bute introduced and in whatever year the introduction took place they were ultimately lost as alleged, and that the evidence is overwhelming and conclusive that the flower was introduced a second time into England by Lady Holland in 1804. It would occupy too much time and is not material for present purposes to do more than just state the fact.

The chronological arrangement of the events in their proper sequence presents some little difficulty in order that the story may read coherently, but every effort will be made to prevent the reader's attention being drawn aside from the main issue.

Among the references in periodical literature the first will be found in the "Botanical Magazine." *Dahlia coccinea*, as already noted, is there figured and described, but there is an absence of any reference to a previous introduction.

In "Andrews' Botanist's Repository," vol. vi. (1805), pl. 408, there is a coloured figure of *D. pinnata* in its single form, not semi-double as shown in CAVANILLES' and THOUIN'S illustrations, which is said to have been "raised from seeds sent from Madrid last spring by Lady Holland, and flowered last September and October in the open ground in her ladyship's collection at Holland House." Vol. vii. pl. 483 shows *D. pinnata nana*, which had then been seen for four years. In neither case do we get the faintest allusion to the Bute introduction.

"The Paradisus Londinensis," vol. i. pt. i. (1806), gives three plates of Dahlias dated 1805. The descriptions in that work are by RICHARD ANTHONY SALISBURY, and he too omits any reference to previously known Dahlias.

In ALEXANDER McDONALD'S "Complete Dictionary of Gardening," 1807, vol. ii. (after the letter Z, the work is unpagged), there is a communication from Mr. BUONAIUTI, librarian (there called "gardener") to Lord HOLLAND, reproduced also in the "New Flora Botanica," 1812, in which he gives an account of the genus *Dahlia* and of the species that had then been described by CAVANILLES, THOUIN, ANDREWS, and SALISBURY, and relates short particulars of the receipt from Lady HOLLAND of Dahlia seeds in 1804, which she sent home from Spain. It is evident that Mr. BUONAIUTI (whose name has often been a source of trouble to many writers, judging by their vagaries in the spelling of it) was aware of the first introduction, for, although he makes no mention of the name of Lady BUTE, he says: "The first Dahlias introduced into England were lost by taking too much care of them."

A year later RICHARD ANTHONY SALISBURY, in a paper read by him at the Horticultural Society of London (see "Hort. Trans." vol. i. p. 84), gives an historical account of the Dahlia, the best and fullest up to that time, 1808. After dealing with the Continental aspects of the flower and describing the genus, species, and varieties botanically, he writes: "I must now venture to give some account of the introduction of the Dahlias into our own land." He commences by saying that the first of the species he had described was introduced by Lady HOLLAND in 1804, quite ignoring Lady Bute and her alleged introduction in 1789. This is remarkable, for the paper is a very comprehensive one and he was an authority of no mean order. It may be observed that this paper has formed the groundwork for several later writers to build up their accounts of Dahlia history.

It will be seen that we are still confronted with the same statement,

bald and devoid of any accessory of detail, and that nobody save BUONAIUTI even hints at the Bute story. Where, then, did it come from? Before we can put our finger on the spot I should like to give one or two other references to the Bute introduction which are to be found recorded during the Dahlia Centenary proceedings in 1889.

In that year the National Dahlia Society celebrated the event some years too soon, as will be apparent at the end of this paper. In the spring of that year Mr. T. W. GIRDLESTONE, then Secretary of the N.D.S., read a paper at the Horticultural Club, in which he said: "At that time [1789] Lord Bute was English Ambassador at Madrid, and in the same year—that is just 100 years ago—Lady Bute sent seeds home to the Royal Gardens at Kew and thus first introduced the Dahlia into England." Kew, be it noted; and that apparently trivial remark will be seen to have led to the final proof of the error which has so long been perpetrated.

When the Centenary Show and Conference were held in the autumn of 1889 at the Crystal Palace, SHIRLEY HIBBERD, in his masterly style, read a paper entitled "The History of the Dahlia," which deserves to rank as the finest exposition of the subject ever yet compiled. He too says: "Lord Bute was at this time [1789] Ambassador from England at the Court of Spain, and Lady Bute, who cherished a true sympathy with floriculture, obtained some of these seeds . . . but failed to keep them beyond two or three years."

In the following year the Royal Horticultural Society held a Dahlia Conference at Chiswick (see R.H.S. JOURNAL, vol. xiii. pt. i.) and SHIRLEY HIBBERD again discoursed on "The Origin of the Florist's Dahlia." He slightly varies his previous statement, but repeats the main fact that Lord BUTE was diplomatically employed at Madrid in 1789.

In the next paper to which my attention was given I was led right up to the authority from which it was evident that all the writers since 1813 had copied the story, brief as it was, of the Bute introduction, and this will account for none of the previous writers doing so.

We find in the Transactions of the Horticultural Society, vol. iii. p. 217, a paper read by JOSEPH SABINE on October 6, 1818. It is much more lengthy and comprehensive than that by R. A. SALISBURY ten years before, and in referring to Lady HOLLAND's introduction Mr. SABINE remarks that "though this importation of seeds was the most successful as to its produce (for from it nearly all the plants then in our gardens were obtained), yet the original introduction of the first species was (on the authority of the 'Hortus Kewensis') from Spain in 1789 by the Marchioness of Bute, but it is probable that the plant so introduced was soon after lost, as I do not find any further mention of it." FRASER's *D. coccinea*, he adds, shared the same fate.

"On the authority of the 'Hortus Kewensis'"; this guarded parenthetical saving clause of SABINE's excited my keenest curiosity. Why should SABINE in 1818, at a time so close to the reputed introduction, have been so cautious? One would have thought that the

truth about an event less than thirty years old could then have easily been ascertained.

However, upon turning up the second edition of that work, which was published in 1813, in vol. v. p. 87, under the heading *Dahlia superflua*, where several varieties are given, appears the short note, "Nat. of Mexico. Introd. 1789 by the Marchioness of Bute"; and under *Dahlia frustranea*, "Nat. of Mexico. Introd. 1802 by Mr. John Fraser." The use of the specific names *superflua* and *frustranea* may be explained by just briefly saying that in 1810 M. de CANDOLLE had divided the then known varieties into two species, *D. superflua* and *D. frustranea* (see "Ann. du Muséum," tome xv. p. 307), although he adopted WILLDENOW'S name *Georgina* contrary to the view expressed in a footnote by the Professors of the Museum under whose authority the "Annales" were published.

This brings us to the original source from which every author since 1813 has derived his historical information as to the first introduction of the Dahlia into England, and it accounts for the fact that no author prior to that date ever attributed the first introduction to the year 1789. There was an absence of authority for their doing so. Mr. FRASER, it may be observed, was not, as was supposed by the "Botanical Magazine" and the "Hortus Kewensis," the original introducer of *D. coccinea* (a variety of *D. frustranea*), and he is no more entitled to be considered such than Mr. WOODFORD is of *D. rosea*, both those varieties, together with *D. pinnata*, having formed part of the Bute introduction, and therefore Lady BUTE'S name is entitled to stand in both places. At a later stage in this inquiry this will be more clearly shown.

The use of the titles "Lady" and "Marchioness of Bute" has caused some perplexity. In the year 1789 there was no such person as the Marchioness of Bute. The Marquisate was not created till 1796. This was a preliminary surprise, for how then could the Marchioness of Bute be credited with the introduction? If 1789 were the correct date, apart from those circumstances against it already mentioned in the earlier part of this inquiry, it seemed possible that the lady subsequently known as Marchioness might have introduced the flower when her title was something different. But the awkward conflict was this, that in 1789 there was a Lady BUTE who was then the wife of JOHN, third Earl of BUTE. After his retirement from his unfortunate political life he lived for many years in the country, and was greatly interested in botanical and scientific pursuits. He died in 1792, but his wife survived him till 1794. Therefore up to this point it seemed that Lady BUTE, or the Countess, as she would be correctly styled, was just as likely to have been the introducer as anyone else.

Against this it will be remembered that the introducer was said to be the wife of the British Ambassador at Madrid. JOHN, 3rd Earl of BUTE, was never this, but of course that need not have prevented his wife from corresponding with persons in Madrid and introducing the Dahlia all the same.

It became an absolute necessity to establish the identity of the two ladies. Did the Lady BUTE of 1789, or some other lady in that year who was ultimately the Marchioness of Bute, introduce the flower? That was an obstacle that caused no little difficulty, and horticultural literature failed to supply the solution.

About this time a further discovery was made that seemed to complicate the question, although it helped in another direction. During some researches by me at the Natural History Museum, Dr. RENDLE very kindly intimated that he had under his charge some old dried specimens of Dahlias that might be of service.

If time and space permitted, it would be most interesting to say something about them, but the present inquiry must be limited as far as possible to the primary question of the first introduction of the Dahlia into England—the second introduction only slightly affects it, and as these dried specimens include a number of Dahlias originally grown at Holland House early in the nineteenth century, they must be passed over, excepting three of them, which were evidently comprised in Lady BUTE'S introduction.

These three specimens were without doubt grown at Kew and thus found their way into Sir JOSEPH BANKS' herbarium, of which they formed a part. They are the same as CAVANILLES', they bear his names, and in one case the colour is described in Latin in CAVANILLES' own words.

Let us glance for a moment at these specimens of long ago. It is one of the unexplained mysteries connected with early Dahlia history that no writer has ever yet referred to them, and it must therefore be assumed that their existence was unknown, for if they had ever seen the light of day it would have settled once and for all what were the varieties included in the Bute introduction which everybody has so vaguely referred to, although they would in themselves still have left the date an open question.

The first of them to be considered is peculiarly instructive for two reasons—firstly, because of the old inscription written on the sheet upon which the flower is mounted; secondly, because the flower itself shows as clearly as CAVANILLES' figure of it does, and as THOUIN'S figure does also, that it was a semi-double variety, notwithstanding that under English and German cultivation the blooms generally came absolutely single, and, as such, were figured by most of the early nineteenth-century authorities. This peculiarity, however, is another question apart from our present subject, and I only mention it because of the claim made on behalf of HARTWEG (not Hartwig), of Karlsruhe, in connexion with the supposed raising of the Pompon Dahlia from *D. coccinea*. This specimen is *D. pinnata*, otherwise known as *purpurea*, the *Georgina variabilis purpurea* of WILLDENOW'S "Hort. Berol." tab. xciii., and of his "Species Plantarum," p. 2124, and of his "Enumeratio Plantarum," p. 899. The inscription on the sheet is as follows: "*Dahlia pinnata*, Cav. Ic. p. 56 and 80. Sent under the name of *Dahlia coeruleo-rubens*. C. G. Ortega (Lady Bute)." This colour

description is in CAVANILLES' own wording ; see his Obs. in the text to tab. 266 of the "Icones."

The second specimen is marked "C. G. Ortega (Lady Bute). *Dahlia rosea*, Cav. Ic. pp. 33-265." It is quite a single flower, but rather smaller than CAVANILLES' figure of that variety.

The third one is a much larger specimen than CAVANILLES' figure. On this appear the words "C. G. Ortega (Lady Bute). *Dahlia coccinea*, Cav. p. 3."

It will be observed that, meagre as are the details, on the first specimen is the word "sent," the importance of which will be understood in the closing remarks of this inquiry. There can be no room for doubt that, no matter what may have been the year in which Lady Bute or the Marchioness of Bute first introduced the Dahlia here, we have here in these three specimens the three original varieties that CAVANILLES received from Mexico, and that Lady BUTE, on the authority of the inscriptions on the specimens themselves, must be regarded as the original importer into England of all three. That her varieties were not later seminal varieties from the original ones seems to be clearly established. And it is furthermore quite certain that had she received these plants in 1789 before CAVANILLES had flowered and named them they would not have been marked with his names, and, as is the case with the specimen of *D. pinnata*, have been "sent" under the name of *Dahlia coeruleo-rubens*. That alone destroys every possibility of argument in favour of 1789.

Before finally leaving these specimens it may be useful to anticipate the reader's only natural inquiry, "But what does the name C. G. ORTEGA signify?" It means a great deal in the substantiation of my view, as will be seen when we come to consider the last link but one in the chain of facts that have been presented.

Having now made some considerable progress, there was still the doubt as to the identity of the lady to whom the credit should be given. It has already been stated that she was, according to some writers, the wife of the British Ambassador to the Court of Spain in 1789. After vainly searching in various directions there seemed to be only one course open to settle in a satisfactory manner this point, and that was to apply to the Foreign Office for information, for it was obviously neither the Earl of Bute nor the Marquis.

The reply received was eminently favourable, and confirmed my previously conceived notion. JOHN STUART, Viscount MOUNTSTUART (afterwards fourth Earl and first Marquis of BUTE), was appointed British Ambassador at Madrid in 1783, but only held the post for some months. He was, however, reappointed in the same capacity in 1795, apparently remaining there till 1797. The name of the British Ambassador there in 1789 was the Rt. Hon. WILLIAM EDEN, afterwards Lord AUCKLAND, who was appointed in 1787 and retained the post till July 1789, when he was replaced by Mr. CHARLES HENRY FRASER, acting as Minister Plenipotentiary *ad interim*.

This official information, it will easily be seen, destroys at once all

possibility of Lady BUTE, wife of JOHN, third Earl of BUTE, being the introducer at all, and also the likelihood of Viscountess MOUNTSTUART being the introducer in the year claimed by the "Hortus Kewensis" and subsequent authorities. The Viscountess MOUNTSTUART and her husband were absent from Madrid for the twelve years between 1783 and 1795, unless it is assumed that they made occasional visits there in the interval. It is more than probable that, owing to the death of his father in 1792 and of his mother in 1794, Viscount MOUNTSTUART had enough to do at home with the settlement of his family affairs and his accession to the earldom.

Here, it is submitted, is strong evidence that the "Hortus Kewensis," in giving the title of the lady and the year 1789 as the date, is no longer to be regarded as a trustworthy authority on the question in dispute. Between 1789 and 1813, the date of publication of the "Hortus Kewensis," there is a lapse of twenty-four years, and in that interval there is no other independent authority to corroborate the brief mention it makes.

This official information was a source of great encouragement; it showed quite clearly that Lady BUTE's introduction of the Dahlia must have occurred at some date subsequent to the one so generally and so erroneously given. But there still remained the question how that date could be definitely fixed.

In an earlier part of this paper reference was made to the Dahlia having been sent to Kew. If this were so, it seemed reasonable that the authorities there might have some record of the fact. I therefore addressed a communication to the Director, briefly stating the object of my inquiry and asking whether there was any record there of the Dahlia being grown at Kew in 1789; if so, who was the introducer and the names of the varieties.

The reply received illuminates the whole story, and is finally conclusive. There can henceforth be not the shadow of a doubt, and future Dahlia historians will be compelled to discard the old story so long unchallenged.

The Director very kindly says: "There are a few early record-books at Kew mainly dealing with exchanges of plants and seeds, and in the earliest of these, dated 1793-1809, there is evidence that between 1796 and 1799 plants (or seeds) were obtained for Kew, usually from Dr. ORTEGA, who was Director of the Botanic Garden, Madrid, from 1771-1801, by Lady BUTE (sometimes styled Countess of BUTE or Marchioness of BUTE). Included amongst the documents relating to Lady BUTE is a 'List of plants in the Hort. Madrid. wanted for Kew Gardens,' and marked in Lady BUTE's book 1798."

In this list there are three Dahlias ("*coccinea*, *pinnata*, and *rosea*)," CAVANILLES' own varieties, be it remembered, and the same ones as are shown in the dried specimens at the Natural History Museum, marked "C. G. Ortega (Lady Bute)."

"There is nothing to show," says the Director, "whether the plants were actually received; it may be safely assumed, from the

information given in AITON'S 'Hortus Kewensis,' that some were, and that the year recorded in that work is a mistake for 1798."

In the light of the dried specimens we may do more than assume it, and feel assured definitely that by some inexplicable and long unsuspected means the reversal of the actual figures, a mere printer's error perhaps, occurred and passed undetected.

One more link in the chain and my task is done. This view is further confirmed by the very man who is responsible for the mistake. As the Director of Kew further points out in his valuable communication, AITON in 1814 published his "Epitome of the second edition of the 'Hortus Kewensis.'" On p. 267 of that work, under the heading *Dahlia superflua*, and referring to the "H. K." v. p. 87, the date of introduction is actually given as 1798. By AITON naming the introducer as the Marchioness of BUTE, which, as the Director agrees, was the correct title of the lady (the wife of the eldest son of JOHN, third Earl of BUTE) at that time, but incorrect for 1789, there is the fullest confirmation that can be required.

Again, surprise must be expressed that none of the writers on Dahlia history for a century should ever have thought of consulting AITON'S "Epitome," or the altered date must have struck them; and yet that work must have been as well known and as easily accessible as the "Hortus Kewensis" itself.

In conclusion, it must be admitted that after all these years it is clearly proved that every writer on the history of the Dahlia for a century has fallen into the same trap.

They have all unquestioningly pinned their faith to the "Hortus Kewensis" without ever suspecting it to be at fault. The utter inconsistency of a new plant being introduced into Spain 1789 and arriving here the same year from the same place before it had been bloomed, named, or even described, never seems to have entered the mind of any one of them. The reader will no doubt admit that it is one of the most amazing discoveries ever made in the annals of floricultural history, for the evidence is complete and overwhelming.

* * * * *

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ECONOMIC MYCOLOGY.

By Professor M. C. POTTER, Sc.D.

[Being a Paper read in introducing the Discussion on Economic Mycology at the Meeting of the British Association (1916).]

IN introducing a discussion upon the economic aspects of Mycology, I would begin by emphasizing the real importance of this branch of Botany to the nation, and the vital necessity of a study of the causes contributing to the enormous loss of food throughout the country and Empire.

Let us consider for a moment the very large proportion of the world's commercial products which are entirely of vegetable origin. Such would include coal, timber, rubber, cotton, sugar, cereals and other grains, the fruits and vegetables, tea and coffee, cocoa, tobacco, &c., and when to many of these are added their innumerable uses in the arts and manufactures we are reminded how absolutely all life on the globe is dependent upon the chlorophyll corpuscle. Now, with the exception of coal, the plants producing the materials enumerated are all subject to the attacks of fungoid or bacterial parasites, and thus it is seen how essential it becomes that more and more attention should be directed to the study of plant pathology.

The extent of the loss occasioned by diseases of a parasitic origin is perhaps hardly realized. Some slight indication of it may be given.

With regard to wheat: for the British Empire I am not aware that any monetary estimate has been attempted of the loss caused by "rust" or other parasite, but it is certainly enormous; and in Germany, where we may look for more scientific calculation of their resources, it is known that in the year 1891 the loss to the German Empire upon the cereal crop of wheat, barley, oats, and rye was over twenty millions sterling, an amount nearly equal to one-third of the total value of the crop. In Australia the loss due to rust of wheat has been estimated at two and a half millions for the year 1890-1891.

In Germany the loss due to disease of the potato crop amounted in one year to thirty millions, and in our own country it has been computed that this crop is reduced by disease by at least *one-third* on the average. This would represent over one million tons of potatoes lost by disease per annum in England alone. In Ireland the potato crop suffered to the extent of six millions in 1879, and in 1845 practically the entire crop was destroyed through the ravages of *Phytophthora infestans*, producing a most disastrous famine throughout the country.

In Northumberland and Durham, swedes and turnips are extensively cultivated for feeding purposes, 50,000 acres being thus employed in these two counties alone. *Plasmodiophora* attack is

very common in the early stages of growth, then later on, when the reserves have been accumulated, much damage is done by Bacteria, *Fusarium*, and *Phoma*; and finally, during the storage in winter, *Botrytis* and Bacteria cause extensive decay. It is not uncommon, when the clamps are opened in spring, to find a quarter to three-quarters of the stored roots to be rotten and unfit for use. It may thus be estimated that in average years about half the crop is destroyed by these parasites. At the rate of fifteen tons an acre this gives 750,000 tons grown, and, assuming only one-third to be destroyed, this means 250,000 tons, which at 10s. a ton represents a loss of £125,000 in these two northern counties.

Losses due to destruction of timber are of a most serious nature, one might again say about one-third of the whole. *Agaricus melleus*, *Peziza Wilkommii*, *Trametes radiciperda*, and various species of *Polyporus* are some of the most destructive to forest trees, while pit-props and all kinds of worked timber suffer greatly from attacks of *Stereum hirsutum*, *Merulius lachrymans*, and other saprophytic fungi.

It will be remembered how in the 'eighties the cultivation of coffee in Ceylon entirely ceased through the ruin caused by the activity of *Hemileia vastatrix*.

Other crops, such as tea, plantation rubber, hops, gooseberry, and every kind of fruit, all pay a heavy toll to fungus diseases.

It might be mentioned that in a single greenhouse the failure of tomatoes through disease has resulted in a loss of £200, while the horticulturist is by no means immune, his difficulties in contending against mildew, damping off, and the innumerable attacks of plant parasites leading to heavy financial loss.

In view of all this it is really rather remarkable that so little interest is shown in the study of Economic Mycology. Nor can botanists be held altogether above reproach in this matter. Hitherto they have given little encouragement to the prosecution of research in Phytopathology, and problems of importance equal to any in any branch of science await solution in this section of Botany. It is unfortunate that there is scant sympathy with the technical part of the subject among botanists generally, and there is danger of its passing altogether into other hands.

In my view our ordinary botanical courses should include a wider treatment of the fungi, and while appreciating to the full the valuable results of cytological work, one may claim at the same time that it might reasonably be supplemented by study of the life-histories of the fungi from the point of view of their work in Nature. More students might thus be led to take up research upon economic lines, who would be equipped with a broad scientific training founded upon sound principles of physiology, bio-chemistry, and bio-physics. There is great danger in a narrowly technical education, and it is to be feared that at present there is not a sufficient supply of suitably qualified men to undertake the investigation of problems in the etiology of disease.

The problems are extremely complicated. There is first the necessity to establish the pathogenic nature of the attack, to isolate the causal organism, and to carry out infection experiments, where many variable factors of unknown nature enter in to baffle the investigator. Some remedial treatment must also be sought, and large questions are involved which demand the application of fundamental principles of physiology and plant hygiene. The relation of host to parasite, the reaction of both to internal and external conditions, open up a wide field of research. The therapeutics of the plant must be considered from the same point of view as animal therapeutics; and conditions of environment, predisposition, and questions affecting infection and immunity must all form the subject of definite scientific investigation.

A close study of the life-history of a fungus often reveals some weak spot where it is specially vulnerable, and a knowledge of methods of natural infection and of conditions favouring the spread of the disease will often lead to an effective means of prevention.

Telluric conditions, though little under control, play a most important part in the spread of fungoid diseases. Thus the vapour pressure of the atmosphere is a determining factor in the spread of *Phytophthora infestans*, a damp, warm atmosphere enabling the conidia to germinate and also rendering more easy the passage of the germ-tube into the plant, while a dry atmosphere places the epidermal walls of the host in a position to resist the entrance of the germ-tube and at the same time it may be fatal to the conidia. A sudden fall of temperature renders many host-plants liable to fungus attack, possibly by modifying the constituents of the cell-contents. For example, MELHUS has shown, in experimenting with radish plants, that chilling produced a marked effect upon the degree of infection secured, 95 per cent. of the seedlings becoming infected after chilling, but only 5 per cent. in those which were unchilled. In correlation with this observation, it has been noted that rose-trees often show signs of a mildew attack some ten to fourteen days after a chilling wind. MELHUS attributes this to the greater power of spore germination owing to the chilling process rather than to any effect in making the host more susceptible, but he considers this point awaits further investigation.

In this connexion attention may be drawn to the fact that in the potato, and to a greater extent in the so-called "starch-trees" (*Betula*, *Tilia*, &c.), a low temperature induces the transformation of starch into sugar, and that this process is reversed on the return to a higher temperature. Possibly other changes may take place in the plant-cell which also influence its susceptibility.

Soil aeration is one of the very important factors in plant growth too often left out of account. While it is generally recognized that a plant respire, the application of this general principle to the roots is frequently neglected. The plant-root cannot properly avail itself of any food supply unless the necessary energy is available for this purpose, and this energy is mainly derived from the respiration of the

roots. Experiments show that plants grown in a beaten-down soil are poor and stunted in comparison with those grown under similar conditions in an open soil. The effect of soil aeration as a controlling factor is too often overlooked in pot and field experiments, and it requires to be further worked out as affecting disease.

The fundamental question of food-constituents and the associated theories of manurial treatment, though much discussed, remain in a state not altogether satisfactory, and there is room for a more scientific basis of experiments.

Nitrogen may be cited as one of the most important of the food elements which is liable to abuse. Much has been written about the supply of combined nitrogen, but the harmful effect of excessive nitrogen has not received the attention it deserves. Numerous cases can be indicated in which plants are rendered specially susceptible to fungus diseases through the improper use of this element.

Potatos which have received an excessive application of nitrogenous manure show a greater development of stem and leaf, and consequently a greater amount of chlorophyll, but at the same time there is an expenditure of plastic material, and therefore less starch storage in the tubers. The quality of the potatos is thus reduced, accompanied by a greater tendency to disease, not only in the vegetative growth but also during storage.

In Sugar-beet excessive nitrogen, while increasing the weight of the crop, at the same time diminishes the sugar content and lowers the power of resistance to disease.

In the case of fruit trees, a comparison between plants treated with latrine manure and with potassium phosphate showed with the former a smaller quantity of fruit but greater susceptibility to frost ; as regards Apples, a tendency to attack by woolly aphis, and in the orange to "die-back" and insect pests.

In the raising of Gooseberry plants from cuttings it has been the aim of the cultivator to produce a saleable, stocky plant, and to induce the necessary growth nitrogenous manure is applied. Observations seem to show that the Gooseberry mildew is associated with this method of cultivation, whereas on poor soils this disease is much less frequent.

With Roses the custom of an annual mulch is followed by an annual appearance of mildew.

In Quick (*Crataegus*) the appearance of mildew has also been associated with manuring, while the surrounding hedges were free.

In the case of greenhouse plants, the prevalence of *Botrytis* and other diseases has been traced to excessive nitrogen. Similar observations have been made with regard to vegetables. These, when over-manured, are more prone to disease and degenerate in flavour. Mention may be made of a Tomato-house where the plants had been treated to a heavy mulch, with the result that the entire crop was ruined by an attack of *Cladosporium*.

With regard to such elements as potassium and phosphorus, the

evidence at present to hand indicates that these have a beneficial effect in checking fungoid ravages.

The chemical effects of lime upon the soil have received great attention, but its action in neutralizing soil-acidity is not sufficiently recognized. In the case of *Plasmodiophora* this is a most important factor. Since the middle of last century it has been noted that "finger-and-toe" is practically absent from calcareous soils, and that dressings with lime tend to check this disease. Also it has been noted that manures which tend to increase the acidity of the soil favour its development. This problem has received solution by the work of G. PORRS, carried out in the Botanical Laboratories at Newcastle and at Halle (Salle), by which it was demonstrated that alkalinity of the soil, from any cause, secured the immunity of the host from attack by the parasite. His experiments also showed that the soil calcium has not necessarily any relation to the disease. I have shown that below a depth of four to five inches the spores of *Plasmodiophora* are killed, or are at least inoperative. Hence a sufficient dressing of lime should be given to render the soil alkaline to this depth. The acidity of the soil varies from field to field, and also is not constant throughout the year. It is thus impossible to predict how much lime should be applied in any given case, and field experiments following up PORRS'S work, to test the power of lime to neutralize the acid in the soil, are much needed as a means of saving our cruciferous crops from this most destructive parasite. How far soil acidity or alkalinity are factors in other plant diseases is another of the points awaiting elucidation.

It is a matter for further research to determine how far such operations as transpiration, respiration, &c., may be modified by manurial treatment, and within what limits it may so alter the constituents of the cell-sap as to be usefully employed as a prophylactic treatment.

Great strides have been made in recent years towards a recognition of the needs of Economic Mycology, which have naturally shown how much more remains to be accomplished.

The Destructive Insect and Pests Act has been put in operation by the Board of Agriculture as a necessary means of coping with the devastating spread of certain diseases in this country. This has drawn the attention of cultivators to the prevalence of plant diseases, has shown the value of co-operation in preventing the dispersal of parasitic attacks, and has emphasized the need for the minute study of the fungus flora of the crops. For example, had *Sphaerotheca Mors-wae* and *Chrysophlyctis (Synchytrium) endobiotica* only been rigidly dealt with on their first appearance, how much destruction might have been saved!

The establishment of the Phytopathological Laboratory at Kew, in touch with the mycologists in all parts of the Empire, is another forward step which cannot fail to be of the utmost importance to our Colonies and at home. But more is required. Phytopathological

laboratories should be set up in various centres in Great Britain, these being linked up with the main central establishment at Kew. The variations of our soil and climate demand that stations should be distributed according to special local requirements. Each district creates its own problems; for instance, it would be impossible to investigate thoroughly a disease of our Northumberland crops in the South or West of England, and similarly no good results might be expected to follow from an attempt to investigate Hop or fruit diseases in the North of England. Each station should be superintended by a thoroughly qualified botanist, whose equipment, I may repeat, should be such as to enable him to deal with the important pathological problems involving a knowledge of bio-chemistry and bio-physics.

In some districts, such as Cambridge, Wye, &c., centres for pathological work are already established and valuable results have been obtained, but to cope with the manifold questions which present themselves many more investigators are wanted.

The provision made for Economic Mycology under the Board of Technical Instruction for Ireland, with its section for Seeds and Plant-disease, has been productive of great results.

Seed-testing for germination and purity might with advantage be extended to the detection of harmful fungus spores, with advice as to their treatment, and certain seed firms might well undertake the "pickling" processes which are known to be effective means of dealing with infected seeds.

It is not my purpose to enter into detailed experiments as to the benefit of "spraying." Numerous experiments testify to the valuable results obtained by spraying with fungicides in certain classes of diseases, and they have shown how the yield of Potatoes, Apples, Hops, &c., can be increased by this means. The difficulties in adopting this method, however, are great, and it is only applicable to certain cases of parasitism where the parasite or its spore-producing hypha is external to the host-plant.

I should like to point out that at the present time there is no catalogue of British fungi similar to the London Catalogue of Flowering Plants. The British Mycological Society has had this matter in view, and through the assiduity of Mr. J. RAMSBOTTOM a list of the Uredinales, Discomycetes, and Phycomycetes has now been published. The Society has received little support from botanists, and even from those who are specially interested in fungi from a technical point of view. A greater support to this Society would enable the Transactions to be extended and possibly to develop into a much-needed Mycological Journal, of which there is at present no special publication in this country.

The International Society for Plant Pathology exists, and should be a means of strengthening our hands by an interchange of ideas with workers in other countries and of gaining a greater knowledge of their activities.

In addition to the various pathological centres I have suggested,

the foundation of a central laboratory for the cultivation and distribution of pure cultures of fungi and bacteria would be a development of great value to the nation. Dr. KRAL'S laboratory fulfilled a very important function in the distribution of organisms in pure culture of pathogenic and non-pathogenic bacteria and certain fungi, and now that this supply is no longer available we find ourselves in a position similar to that created by the lack of aniline dyes, optical glass, &c. I would strongly advocate the formation of a national institution for pure cultures which would be comparable to the National Physical Laboratory, from which type specimens could always be procured and critical determinations assured, and which would be of sufficiently wide scope to serve the needs of the medical bacteriologist, the plant pathologist, agriculturist, brewer, tanner, &c. The British Empire should surely possess one such centre, instead of being dependent upon a foreign source of supply.

Before concluding, may I again refer to the great value of research in plant hygiene? A distinction must be drawn between Mycology and Plant Pathology. The mere working out of life-histories is only the preliminary step; behind this lies a whole series of researches in chemical physiology and pathology which may throw light upon problems connected with both the animal and the plant. Although the animal widely differs from the plant in having a nervous and a circulatory system, yet both obey the same laws of physical chemistry, and it may not be unreasonable to suppose that the plant may possess bodies analogous to the protective anti-bodies of the animal, so well known in medical bacteriology. Already animal pathology has gained much by botanical discoveries, and it behoves the botanist to seek in the advances of physiological chemistry, as affecting animal pathology, their significance in relation to plant diseases and immunity.

In considering the present position of Economic Mycology I have only attempted, very sketchily, to show the pressing need of further provision for the prosecution of pathological research throughout the country, leaving to others the proposal of any definite scheme by which this might be accomplished.

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REPORT OF WORK IN 1915 IN KANSU AND TIBET.*

By REGINALD FARRAR.

ON March 28, 1915, the Expedition, in the same *personnel*, set out from Lanchow, north-west for Si-ning. This is all a rolling loess country of crumpled, high, bare downs, perfectly lifeless and barren, of uniform pale-ochre yellow as far as eye can see, but for stretches of cultivation and *Zizyphus*-orchards in the stony levels of the river-valley;—take it all in all, as drear and forbidding a desert-region as you need wish to avoid, blasted with a burning summer, and blighted with the iron cold of a long, hard winter. Si-ning, the capital of the Border, and seat of the Viceroyalty of the Koko-nor, lies flat beside the Si-ning Hor, just before the right-angled intersection of four broad vales, hemmed in with low, arid convolutions of the loess fells. Only very far away in the south appear the Alps of the Kweite-Salar ranges, not visible from the town itself: the westward distance is closed by highlands running up to the ridges below the Koko-nor; and in the north, here and there over the intervening hogs'-backs of the hills, peer in April points of snow that alone suggest the presence of the Da-Tung chain.

In Si-ning a month was passed, amid the first luxuriance of the peach-blossom, and the unparalleled splendour of *Viburnum fragrans* in every yard of temple and palace and humblest cottage court. And on May 3 we set out for the mountains, hoping the season might by now be sufficiently awakened. The journey into the foothills of the Da-Tung Alps takes two long days, up through the same arid loess country, with the mountains ahead of you all the time as you proceed slowly along the dust-dry valley of the Wei Yuan Pu Hor. A golden Adonis at one point and a single clump of *Iris Tigridia* alone relieved the desolation in the first week of May. Very gradually the distance rises and rises all the way, from the starting-point of more than seven thousand feet in Si-ning, so that one has no notion of being at any considerable height at all; and the mountains, rising only some five or six thousand feet from the ten-thousand feet of their foothills, seem mere inconsiderable fells, above an undulating upland plain that might be at sea-level for all you can tell. But at Wei-yuan Pu, snuggled down among poplars in the convergent branches of the beck, under the projecting downs that sweep out upon the uplands from the Alps, you come at length upon loam and dark strata of vegetable soil, to break the infinite monotony of the loess, veiled as it is, over all this region, in solid miles of *Iris ensata*

* For explorations of 1914 see p. 47.

in that lovely pale-blue form that I spoke of as *I. "hyacinthina,"* on account of its entrancing hyacinth-fragrance.

The Da-Tung Alps run south-east from north-west. On their far side flows the Da-Tung Hor, but the mountains form no containing barrier for the river; they cut away from it at right angles in a succession of herring-bone ridges, that only from a distance give the look of one continuous wall of peaks. These peaks rise bleak and bare from the bare bleak uplands at their feet; scant scrub alone is all the wood there is on their flanks and folds, till you descend into the unique Tien Tang forest on the far side, overhanging the river. In point of fact this range has an intermediate position, boding ill for its botanical promise. Far south we have left that mountain system which descends on Western China in a magnificent series of parallel gigantic ranges, of which the Min S'an is the penultimate, and Lien Hwa S'an the last northerly effort, before the country dies down into the unrelieved dullness of the loess downs that lead to Lanchow. On the other hand, we are not far enough yet up the map of Asia for that other huge branch of the Kwen Lun, which sweeps round the northern curve of the Tibetan Highland, and develops down into China and Russia in the various ranges of the Tien S'an, the Ala S'an, and the Altai. In consequence here we have lost the opulent forest, and lavish splendours of the Szechwan-Kansu March, and have not yet ascended within reach of the no less splendid forest-flora that adorns the Altai and the Tien S'an. This region, in fact, is the last southerly reach of the northern mountain system, too far south to represent its riches, and not far enough to acquire reinforcements from the advance-guard of the southerly Flora. In consequence, this intermediate No Man's Land proves as barren as I feared, in the first moment of seeing that its outlines had that monotonous pyramidal formation which speaks but too clearly of their granitic nature. I shall never regret having explored them; but their yield, I felt from the first, could not compare with that of the earlier year; and it was only the then novelty of their lists that made the Russian explorers of the 'eighties convey so lavish and tempting an impression of these ranges. The farther north you come up the ranges of Asia the poorer grows the flora, until you have definitely got within hail of that second floral belt which fringes round the Arctic Circle, and descends into the European Alps, there to meet the ascending flora of the central belt.

In *Primula* and *Meconopsis*, accordingly, the region proved poor, and in *Gentiana* and *Saxifraga* correspondingly rich. We spent the summer in gradually decaying hope; visiting the various *massifs*, and the great abbeys that lurk in the green folds of the foothills on either side of the range. "Cheterton" is Tien-tang, Chebson is what the Russians have variously called Chebsum, Cheibsen, Choibsen, Chobsen, and so forth: the map will give the rest of the region, which you must imagine thoroughly Tibetan and aboriginal in population, but held in peace owing to its position as a long spur of wild mountain

country descending between two Chinese spheres of influence, to Si-ning and the Koko-nor on the south-west, and up the great north road to the east, that leads through Ping-fan away across the deserts into Russia. And so, if 1914 was a year of tempests and insurgencies, 1915 indemnified us by a season of perfect peace, enlivened by the real joviality and friendliness of the peasants and the monks. PURDUM was even able to take a flying visit round among the wild ranges of Kweite and the Koko-nor.

The plant-list gives details of aspects and rock. Here I need only add that our little mule-inn of Wolvesden House already stood at what I figure as ten thousand feet or more, at an altitude, at least, to which it took the heart a week to grow accustomed; while on the heights five thousand feet or so immediately overhead all motion became a constant difficulty with its bumbleings and thumpings. Too high, too bleak, too cold, too lonely, these valleys gave only a dull coppice of poplar and willow: granite reigned everywhere, and the typical granitic monotony; except for a tormented drift of dolomite, further up the pass, which erupted in huge fantastic teeth from the green alpine slopes, and immediately yielded the typical calcareous variety. The seasons, too, are hard and stern and swift at these heights. It is not till the middle of June that even the glens are awake, and the downs do not open their show till July is in. Then follows a brief and radiant summer like that of our own Alps, before the frosts and snow descend again in mid-September, just in time to catch some of the last and most glorious of the alpine flowers in their fullest splendour. No snow, however, lies even on the summits in summer, for here the snow-line is still so high that only at some eighteen thousand feet or more can you hope for it; and the only snowfields visible in summer from the Da-Tung Alps are on certain wild and rugged peaks far away due north, over old Da-Tung city. The whole region has a gaunt, cold splendour, but its starved and jejune hugeness cannot compare in beauty with the yet greater hugeness, sumptuous and luxuriant, of the Min S'an and Satanee Alps.

On September 13 I rode for the last time down Wolfstone Dene from Wolvesden House in a sparkling morning of early frost, and on the morrow made my last farewell to the friendly monks in Tien Tang, before adventuring out on the long, sad journey over the intervening passes down into the river-valley of Ping-fan, and so back again into Lanchow. Thence my journey carried me steadily southward for three weeks, over the loess lands, into that rough country of little parallel wooded ranges called the Da-Ba-S'an (spelt officially, of course, Tapa Shan, because it is never so pronounced) which shatters the converging boundaries of Kansu, Shensi, and Szechwan. For many days one traverses these ranges, which are none of them high enough to give the flora I had hoped, and are not yet far enough in the south to yield the wealth and variety of the no-higher ranges along the central Yang-dz'. For me they exist only as providing a new record for *Primula sinensis*. On their far side, at Kwang-Yuen, one

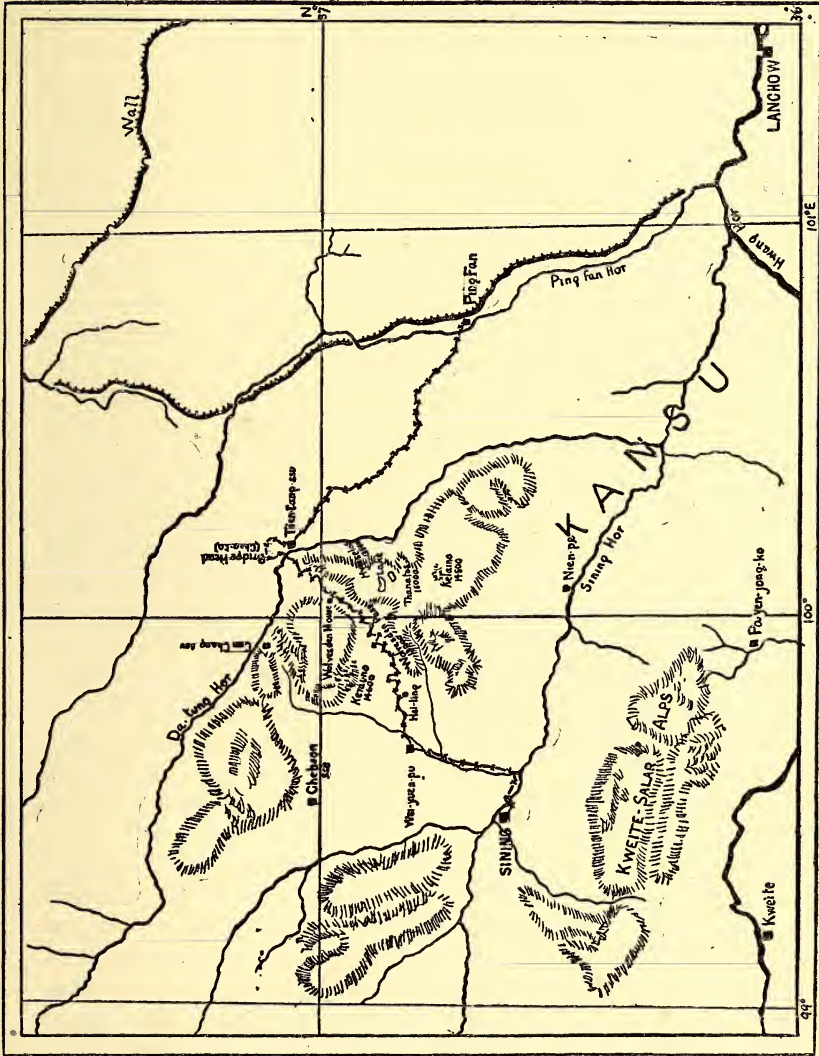


FIG. 62.—ROUGH MAP OF MR. FARRER'S 1915 JOURNEY.

comes out into the grateful warmth of the Red Basin of Szechwan ; and for yet another ten days or so we traversed rolling russet uplands terraced with rice, and peppered with dark junipers and pines as green as those of Provence, before taking a junk at Bao-ning, and thence descending in tired tranquillity down the long and frantic coilings of the Ja-ling-jang, till it reaches Chung King and merges in the Da-Hor, which only a foreigner talks of as the Yang-dz' Jang. Down this then we proceeded by one of the pot-bellied double-barrelled steamers that now ply ; and in ever-increasing sadness of conclusion, with the great Alps fading so irrecoverably remote in the distances of memory, traversed the famous and over-famous Gorges of the Yang-dz', and concluded finally in the unutterable depression of Ichang, that flat monotony of town and shore and country as far as eye can see, sullen under the grey sky, with even the dim little ranges of Hupeh dwindled into a mere ruffle along the western horizon. Having left Wolvesden on September 13, it was on December 8, after two seasons of the blessed wilderness, that we landed up once more in the capital, now feverishly preparing to become an Imperial city again.

COLLECTIONS OF 1915.

The following list gives the more important of the plants collected or seen in flower in 1915 ; if their number and tale of novelties do not equal those of the previous year I assure you that the Alps, and not their explorer, are to blame ; further, many species that were glorious novelties in 1914 prove to have so wide a range that they are the stale commonplaces of the next season.

Aconitum sp., *A. Anthora gilvum*? (F 739).—This is a very large, tall, voluminous Aconite, abundant all over the scrubby foothills of the Da-Tung, and up to ten thousand feet in the more open copses about Wolvesden House, with handsome foliage and tall dense spires of narrow squeezed flowers in a curiously attractive and rather morbid shade of dull pale lilac.

Aconitum sp. F 798 exists only, alas, in specimens and a photograph. It was a singularly fascinating thing, with a dense dwarf obelisk of very large flowers, papery-silky in texture, and in colouring suggesting smoke-grey chiffon over a sky-blue "slip," squatting close upon a low mass of magnificent glossy foliage, roundly lobed. This was a child of only the very highest stone slopes at the topmost limits of vegetation, and bloomed only at the end of August. Seed, therefore, was unprocurable, and of the plants I brought away there is no more to tell.

Adenophora sp. (F 583) may not have been distributed. Its best picture is that of an ordinary harebell, but magnified, and much stiffer. It occurred in the lower grassy places down Wolfstone Dene, and though pretty enough in its uniflorous small alpine development (in the river shingles opposite Wolvesden House) to merit painting in an emptier moment, was not worth collecting on any full scale.

Adonis coerulea (F 518) also yielded only very few and imperfect seeds. It is too leafy a little plant to be admirable, and is common all over the lower alps of the region. Its blossoms, being of a satiny mauve or violet, long puzzled me as to its name, until I discovered that in all its forms *coerulea* does indeed dry to a lovely tone of turquoise blue.

Androsace tibetica (F 533) is, of course, the same as last year's F 246, but I think better to give it a fresh number, as the regional forms of this species are so many. That of the Da-Tung represents two main lines; up at Wolvesden House it is squat and broad-leaved, with flowers especially large and fat and round; down at Tien Tang, on the hot gravelly banks, and in the parched lawns, it is of so intense a rosy crimson and rich pink that I wonder yet again to think how ever I was led to describe the plant originally as white, before I came to know it. A further fact emerges also from the imperfect information of last year, and from subsequent experience with seedlings. And that is that *A. tibetica* and *A. longifolia* cannot easily be grown in soil too poor or in positions too hot and dry. Cosseted in nice fat, well-watered pans at least, they both of them grew very yellow and sickly with me, and when *A. tibetica* flowered it was with a pallid anæmic bloom in no proportion to its lush unhealthy leafage; while *A. longifolia*, its yet more torrid cousin, was obviously dying altogether. And they both only began to pick up when got out under a hot wall, and guarded strictly from the watering-can. Without such treatment *A. tibetica* will, I think, usually prove pale and hypertrophied, and *A. longifolia*, by far the more difficult species, evidently, of the two (demanding much hotter and harder conditions), will continue as impossible of culture as I once began to fear it. It should be fully remembered that these plants are not to be venerated as typical children of the alps, like their cousinhood, but regarded as the race's special kindness for the needs of hot south-country English gardens. *A. tibetica* *Mariae* I was not able to get in seed, and for a long time the identity and whereabouts of this narrow-leaved form were a puzzle to me. But finally PURDOM found that it filled the marish flats about the Koko-nor with sheets of rosy blossom, long after the broad-leaved type had grown fat in seed at Wolvesden. (Photograph and painting secured.)

A. mucronifolia (F 319) will ere-long be distributed in propagated plants. This is one of the few triumphs of our packing, and I luxuriate in pleasure each time I see my two or three specimens in pots, thriving as heartily as if they had no more memory of their own far alps, and remember what poor straggling messes they were when, at the end of my first season, they were despatched from Lanchow in the winter of 1914, across the changes and chances of distance and posts and railways. *A. mucronifolia* abounds in the Da-Tung Alps, but lower and more especially on their rare limestone outcrops. It is not here, however, quite the same be-snowed entrancing loveliness that it is in the highest fine lawns of green on the topmost necks of the Min S'an. (Photograph.)

Anemone sp. (F 577) is a very abundant weed, low and high, throughout all the alps and their foothills. Usually it is rather ugly, with wide-sprayed heads of small white stars radiating above mounds of foliage; but the seed I got was from much better forms round Wolvesden House, where the many-sepalled white flowers were in much less disproportion to the amplitude of the foliage. Often all the blossoms turn foliaceous and become like little green roses: a development which, if it occurs with us, will be hailed with cries of rapture at Myddelton House.

Antennaria sp. (F 576) should be merely a very specially fine form of *A. margaritacea*, collected from the river shingles of the Da-Tung above Tien Tang. But I fear there may have been a confusion of number between this and F 741.

Aquilegia ecalcarata (F 588) gives universal joy, at home as in the alps, with its dance of delicate little claret-coloured flowers with their whirling skirts. Once I found a white-petticoated form of special attraction; it died on the way across Siberia, though I nursed it with the utmost care. But it might easily turn up again from seed.

A. viridiflora (F 557) lives on the hottest rocks and river-shingles of the region, at the lowest elevations. Clearly it wants a hot, dry place, or crevice of sun-baked cliffs or steps. Its milk-dashed foliage and its strange combinations of chocolate, green, and dull gold have a rare charm, to say nothing of its soft fragrance, which pervades rather than is noticeably exhaled. (Painting.)

Aster Farreri (F 582) is of course the same as last year's F 174. It abounds in the cooler hollows of long grass low down in Wolfstone Dene, and far away to the Koko-nor, in form more brilliant (as seems to me) than its first season's efforts in the Min S'an. (Photograph.)

Aster sp. (F 581) is the contribution made by the Da-Tung to that solitary-flowered group of alpine asters represented by *A. alpinus* and *A. andinus*. It is a very pretty little thing, but rather pallid, forming a sheet of soft colour over the high alps in July, beneath the fluttering lavender butterflies of the Harebell Poppy. It will appreciate the cultivation that suits *A. alpinus* and *A. limitaneus*.

Caragana sp. (?) F 513. Specially cruel is the weakness of the high and scrubby valleys of the Da-Tung in the matter of shrubs. Too northerly, too cold, too bleak, too arid, they have nothing like the multifarious luxuriance of those glorious valleys in the shadow of the Min S'an and the Satanee Alps. This *Caragana* is one of their best productions, alone of its race in loving cool damp exposures and coppice at alpine and high alpine elevations only, where it forms a flat-boughed bush, dense with long thorns, and set close with big blossoms of soft clear pink in lovely contrast to the vivid green of its handsome many-foliolated leafage in July. It is abundant on the northern folds of the Da-Tung, the highest-ascending of all shrubs there, except *Potentilla fruticosa*; and I also saw it, beyond a doubt, on the high crests of the Min S'an in 1914, though innocent of seed there.

Caragana sp. (F 514) is the dense tight little golden-flowered dome that covers all the hottest and aridest loess downs of the region in general, not, of course, ever climbing towards alpine conditions. It suggests *Ulex nanus*, but is hardly so good, though quite as prickly.

Caragana sp. (F 515) is another species characteristic of the hottest and driest places of the region, as on the torrid slopes round Tien Tang Ssü. It is a tall and very graceful loose shrub, weeping out in fine long minute-leaved sprays, beset along their length with yellow blossoms.

Carex sp. (F 732) occurs in the long grass about Wolvesden, and is interesting only for the long black tassels it develops, depending in twos or threes, from the graceful stem of some eighteen inches, high above the lustrous clump of green below.

Cerasus sp. (F 524) is a very pretty shrub or small tree, rare in the coppice about half-way down Wolfstone Dene. It has flattish outspreading boughs, from which depend in mid-May a lavish profusion of soft pale pink flowers, followed in August by little brilliant red cherries.

Cerasus sp. (F 674).—This is a smaller shrub altogether, from the ghyll by which you ascend to the downs of Tien Tang. It has rather larger blossoms, in great profusion, and of a rich warm rose, followed by diminutive white-heart cherries, and is distinctly a charmer.

Clematis sp. (F 559) belongs to the Atragene group, and is of incomparable loveliness. I only know it in the ghyll of Tien Tang, where it rambles frailly through light bushes, to the height of two or three feet, and then cascades downwards in a fall of lovely great flowers of softest china-blue, so filled with petaloid processes that they seem as double as any production of the garden. The seed, alas, is very uncertain, not having been ripe when I left, and the Lord Abbot of Tien Tang having failed to fulfil his promise of sending us on some more; so far we can only feel satisfied that we possess it in a painting and a photograph.

Colutea sp. (F 659) is a scarlet-flowered plant of the Si-ning valleys which will like hot dry places presumably. PURDOM sent me up sprays of it from one of his expeditions to Si-ning, and seed was subsequently got. Otherwise I know nothing of its size or habits.

Corydalis curviflora.—Yet again have I failed utterly to get seed of this marvellous azure loveliness, so abundant in all the scrub and coppice of the whole Tibetan March, far away up into the Altai. Nor have I a better tale of the yet more glorious *C. melanochlora* (F 254), which seems to have much the same distribution, though at much greater altitudes, only in the last and gauntest scree of the alps. Each season I sent home tubers, and each season they arrived alive, only subsequently to moulder off in some unexplained fit of dissatisfaction. Perhaps they were treated too lovingly, and made too comfortable in too soft and well-watered soil. (Painting and photograph.)

C. rosea, however, fell to my net. This is the sprawling lax plant with long compound spires of pink blossom, that occurs only in

the danker, moister, darker rocks and ravines of the alpine woodland-region. It is rather untidy and lush and lacking in stamina, yet by no means to be despised for a place where it will be happy.

C. scaberula (F 716).—Failing *C. melanochlora*, this is as good an acquisition as you could have in the race. I know no cultivated Corydal that equals it. This beauty belongs to open stony places at great elevations, most especially by the very track-sides zigzagging up to the immediate crest of Wolvesden Pass. The growth is stout, but concise, in stiff tufts of very handsome glaucous foliage, from which rise many stout, crowded, stiff spires of blossom, pale, and rich claret-coloured at the mouth, with a dark tip; very variable in light or depth of tone, but always of a strange and striking attractiveness, in their close fox-brush spires of four to six inches in July and August.

Cremanthodium sp. (F 587) is the only species of 1915 that I can attribute to this group. It is a singularly charming thing, haunting only moist shingles and shaded cliffs, preferably of limestone, at great elevations on the alps, where, in the damp corries, it makes single tufts of very handsome glossy foliage, from which rise stems of five or six inches, each hanging out one single pendulous flower in August, like a small golden Dahlia.

Daphne sp. (F 553).—The *Daphne* of 1915 differs from those of the year before in being a non-calcicole species. It is a rather ragged, round bushling of two feet or so, very profuse with terminal and lateral clusters up the stems, of blossoms which either very often vary from palest pink to ivory white, or else fade immediately. For of ivory white is their almost universal effect, their fragrance is delicious, and their resultant berries are of bright scarlet. All over these alps it abounds in the typical *Daphne* situations, amid the opener scrub and over the rougher turf in the lower region, up to ten thousand feet round Wolvesden House. (Photograph.)

Delphinium sp. (F 570, *D. Pylzowi*?) is a remarkable Delphinium, forming, at its richest, mounded masses nine inches across and six in height, covered with very large flowers of richest violet, standing out solitary on their long peduncles. On Wolvesden Pass it luxuriates in the stony earthy open track-sides to such an extent that the clouds of purple in which it mists the upper reaches are visible from far below and far away; while when you ascend and find the azure spires of *Meconopsis Pratii* ascending profusely amid the purple, you realize a colour-effect of unsurpassed audacity and unsurpassed success. But one cannot answer for these alpine Delphiniums in cultivation after the grievous behaviour of that glorious F 253 (*D. tanguticum*), which, in the upmost shingles of the Min S'an, was solitary-flowered and fluttered close over the surface of the scree, but in cultivation seems to have developed a stem and a stature hardly less than that of F 570, its cousin. *Delphinium* sp. (F 611) may be some close relation of *D. grandiflorum*. It abounds in the hayfields at Bridgehead, about where you cross the river to go to Tien Tang, and its tall stems are loosely set with large azure flowers in August.

Dracocephalum Purdomii (F 571) stands close to *D. bullatum*. It makes a specially fine effect in the Da-Tung Alps (where it is universal in all the alpine region) when it forms into drifts in the damp flat mud-shores beside some of the little alpine becks; and from the mass of bullate leaves arise in July the copious profusion of six-inch stems with their tiers of large dark-violet dragons' heads. Just opposite Wolvesden House, among the alder coppice, the collateral becks were full of it, and alternative beds of butter-yellow Lousewort made a notable contrast, assisted by yet other beds of the dimmer yellow *Corydalis dasyptera*. (Painting and photograph.)

Ephedra sp. (F 572) was evidently also sent in 1914 as "unknown seed" (F 483). We now know it for a denizen of dry rocks and river shingle-flats, where it forms close masses of wiry horse-tail foliage, unnoticeable in leaf or flower, till in August they become a solid sheet of colour, with their abundance of rosy-scarlet bloomy fruits, in beauty hardly to be surpassed. Evidently hot, dry, poor places are indicated.

Erysimum sp. (F 521, 522).—It is possible that neither of these is *Erysimum* at all, and it is certain that they cannot both be. F 521 is the rarer of the two, and I know it best high up in the grass in one fold of the fell above Wolvesden House, in Southerly Valley, at some 12,000 feet or more. It flowers in a dense mass of lilac-violet flowers, tucked close upon the rosette and deliciously fragrant of cloves; in development the system a little lengthens, and the pods are very long and quite narrow, hardly to be recognized as having belonged to so concise a beauty as had squatted so tightly there in June. F 522 is perhaps even more charming. (Photograph.) Here the whole growth is softly downy, and the stalk rises to some five inches before unfolding its head of much warmer rose-pink blossom, differently, but no less ravishingly scented, and in their tight round heads, on stalwart little stems, making one always think of some fine sturdy *Primula*, as they perk up everywhere in early July from the sere brown turf of the highest lawns and bottoms. This also is local, but more abundant and widely distributed in the alps about Wolvesden. Both species had much better be treated as monocarpous, though 522 is perhaps less certainly and invariably so, at home, than its predecessor. And F 522 differs from the other in having fat round-oval pods, on stems and footstalks no more developed than in flowering time.

Gentiana.—In this great race the northerly ranges of the Da-Tung are conspicuously more abundant than the southerly ones of 1914. *G. Przewalskyi* occurs commonly on the lower loess, though in much less handsome and sapphirine form than about Choni (F 303). There is a much larger counterpart, flopping and straggling, with cream-white flowers, which abounds also in the lower regions (photograph); high up there is a straw-yellow annual star, also seen last year; and many monocarpic little things that often sheet the fine moist alpine lawns in constellations of pale blue or mauve or electric blue, from May to August. The last flower of the whole year was even a *Gentian*, a

suffruticose thing, with fringy soft-pink flowers on long willowy sprays, that began to abound in the rough grass of the waysides in Northern Szechwan in October and November, but of which the collected plants, which were all that was possible, entirely refused to survive the trans-Siberian journey. Of those collected the principal are :

Gentiana sp. (F 579) belongs to the *Macrophylla* group, I believe, and is a species of many slender uprising stems from a wide mass of limp and glossy narrow foliage. In August the 9-12 inch stalks unfold their clusters and terminal heads of narrow tubular blossoms in such profusion that, though these never open very effectively the show produced by the mass of their solid sapphire-blue opaque exteriors is as attractive as anyone could desire. This likes the grassy open situations affected by *G. cruciata*, and is not uncommon at some nine to ten thousand feet in the open stony lawns of the Da-Tung valleys. (Photograph.)

Gentiana sp. (F 750) is, as I discover from the proofs of "The English Rock Garden," almost certainly *G. triflora*, and a remarkably handsome plant, with whose multitudes the high alps of the Da-Tung turn all of soft water-blue in August. It may be figured as a very large *G. Pneumonanthe* of eight inches or so, with very much bigger trumpets, clustered towards the tops of the stems, and in colour of soft pale blue. It does not look as if any difficulty should attend its culture in a cool climate and cool vegetable soil. In the Serchim range below the Koko-nor a perfectly dwarf species or form of this is found, creamy-white with big, baggy, erect bells. But of this there is no certain seed. (Photograph.)

Gentiana sino-ornata is F 807, and, as I have seen it, incomparably supreme above all the most beautiful of its race. Its glory on the high grassy passes and alps of the Da-Tung in the end of September is something positively stupefying. Seed there was obviously none to be got, and only two plants survived the tremendous journey home. But *G. sino-ornata* has already been introduced (I hope in as good a form as that of the Da-Tung), so I need not deplore the lack ; meanwhile I have it also in a photograph and a painting, for part-proof of the praise I give it in the text of "The English Rock Garden," now that I have clearly realized its marvellousness with my own eyes.

Hypericum sp. F 757 is certainly *H. patulum Henryi*, which abounds throughout the Da-Ba-S'an as you get into their ranges towards Szechwan.

Iris sp. F 497 is *I. Bungei*. Amid a dense clump of long glossy leaves, very narrow, and dark green, suggesting those of *I. graminea* or *I. prismatica*, lurk spidery thin flowers of purple, not in themselves very remarkable, but illustrious in the intensity of their violent violet fragrance, more acute than even in *I. reticulata*, and haunting all the hot air in June on the blazing loess down about the mouth of Tien Tang ghyll. (The only place where I ever saw it, the clumps dotted among the course tufts of grass.) (Painting.)

I. ensata (F 496), on the contrary, sheets all the loess region of these parts in one ocean of green, which in the end of May becomes a pale sea of blue, washing up even into comparatively alpine bays at ten thousand feet. For its form is far better than elsewhere—generous in shape and of the loveliest, softest blend of milky blue and lavender and cream and white, yet further enhanced by its delicious fragrance of hyacinth. In front of the Tien Tang Abbey itself, the huge level lawn was one solid sheet of the Iris, and to walk through it is to be transferred to Holland in hyacinth time. I think hard, hot, poor soil in a hot place will give us our best chance of getting the best out of this *I. ensata*, which, in richer, damper places, tends to run to leaf and rarity of bloom. Albinos occurred to me several times, and once a form with flowers of darkest sapphire velvet; otherwise, but for minute differences in shape, the species is wonderfully stable. (Painting.)

I. Potaninii (F 500) I only saw once, on the ledges of one hot dolomite cliff, facing the full sun, at the foot of Wolvesden Pass. It is like a little Iris of the *Chamaeiris* group, forming neat tuffets from which spring almost scapeless the small Flags, with sharply tucked-under falls, in tones of straw-yellow or musty purple. In the same cushion, though not probably from the same roots, you will get the two colours; the purple-flowered is slightly larger, the straw-yellow distinctly the prettier. (Painting.)

I. tenuifolia (F 499) is the most beautiful of the year. Its wide old grassy hassocks do not love the loess, but delight in the open loamy green lawns of the cool alpine foothills, especially about the folds of the fell in which Chebson Abbey lurks. Here, in May, it was lavish with its large and lovely flowers of rich blue, each on what seemed a stem of six inches or so, but all of which was nothing but the preposterous tube of the flower, for actually in the ground developed the fat rosy pods, just protruding their pink bulges sometimes, but often, it is evident, lurking undiscovered for years in the heart of the clump, nursing what still seems good seed. *I. tenuifolia* seems slow of growth even at home, where the clumps show masses of dead leafage-stumps, and even hassocks of dead matter from which spring scant sprouts. Nor does it seem certain either in flower or seed. The species has an enormous range, and the specimens already in cultivation hail from Quetta, not a land of promise so far as our gardens are concerned. So that their unalterable sulkiness need not give any rule for the behaviour of a fresh stock from so far away, and from conditions so absolutely different as the cool high downs of Chebson, far up on the northernmost limits of Tibet. (Painting.)

I. Tigridia (F 498) ranks second to *I. tenuifolia*. It haunts only the torrid amphitheatre of cliffs and loess-banks behind Tien Tang Ssü, loving to grow on the rim of the steep breaks, sprouting from under some slight covert of scrub in a tuffet of short greyish foliage from which stand up the beautifully-balanced little flower-de-luces in blended tones of amethyst, claret, and blue-violet, on stems of three or four inches, in May-June. The seed had mostly fallen when next

I returned to Tien Tang, so that its quantity leaves much to be desired, and possibly many desiring; as for its prospects in cultivation, one can but hope.

Incarvillea sp. (F 509) is almost certainly *I. grandiflora*, and the same as F 89 and F 268 (though this cannot be taken yet for sure). Anyhow this is a very handsome species, from rocks and open banks up to ten thousand feet in the Da-Tung Alps, scattered through the range, but not so abundant as the earlier numbers last year. As seen, it was always monocarpic, and a finer, more exotic, gaudy thing could hardly be imagined. (Painting and photograph.)

Isopyrum sp. 504 should by all obvious rights be *I. grandiflorum*. But in that case what becomes of last year's plant, also presumably *I. grandiflorum*? For, while that was a pretty pallid thing enough, this, with *Gentiana sino-ornata*, stands out not only as the loveliest thing in the year, but almost in all the years of my collecting anywhere. In the granitic, volcanic, or calcareous cliffs of the Da-Tung range, from eleven thousand feet upwards, it forms great tufts of fine glaucous foliage, from which float in June the most glorious big flowers of richest lilac purple, in size and colour suggesting a glorified *Anemone nemorosa Allenii*, but of inimitable silken texture. It is invariably restricted only to cool shady aspects and cold shaded faces of the cliffs; and only at its topmost limits is found out on the open boulders, though even there for preference on the cooler faces, and dwarfed and compacted with the elevation. And it is as rigidly saxatile in habits as *Phyteuma comosum*. I was fortunate in getting an abundance of seed (indeed, it was the "clou" of this year's collecting), as such a plant will be none too easy to raise, I suspect, and likely to prove pernicky even afterwards as to its position and the processes of getting it there. (Photograph and painting.)

Lancea tibetica was sent under two numbers, as F 541 and F 670. In neither case was the seed satisfactory, having, by the necessities of our movements, to be collected in pods still immature. It is the little thing I talked of in 1914 as *Mazus* sp., and abounds all up the March, evidently, for choice, in bare open banks and flats at mid-alpine elevations, where it ramifies into lax carpets of dark-green rosettes, in the midst of which nestle in July the rich violet-purple helmets of the blossom, giving place to fat pods that in time blush to a deep varnished crimson, as they very slowly come towards their ripening.

Leontopodium.—The common Flannel-flower of the European Alps has its absolute counterpart in the high lawns of the Da-Tung. But I only sent two members of the race. Of F 741 I doubt whether it should rightly be *Leontopodium* or *Antennaria*. All over the loess region, from Wei-yuan Pu throughout the foothills of the alps, and up to ten thousand feet, it everywhere forms, in the short-cropped stretches of grass, wide, perfectly flat, and tight scabs of silver grey, with innumerable rosettes of foliage, from which, on stems of barely an inch, unfold a galaxy of small Edelweiss stars in June, and on

sporadically throughout the summer. Poor, hot, dry soil should best qualify it to maintain these laudable habits with us, in which case it should prove a very useful acquisition. A more conducive carpet for *Crocus* could hardly be conceived.

Leontopodium sp. F 740 is an absolutely distinct plant, very abundant throughout the lower warmer stretches of the alpine region, on hot banks, river-shingles, and so forth, ascending on to the high moorland passes between Tien Tang and Ping-fan. From the perennial woody stock there springs each year a sheaf of straight, undivided, elegant stems, set with grey-white foliage, very narrow, and in effect like slender shoots of rosemary, unfolding at the top each one single Edelweiss of great size, almost as brilliant in silver as the foliage, and with narrow pointed rays in unwonted profusion. This, of itself, would be sufficient beauty; but every portion of the shoot, when rubbed, exhales in intensity exactly the lemon-scent of *Aloysia* or *Eucalyptus citriodora*. Poor pebbly treatment will certainly keep this in strictest elegance of habit.

Ligustrina amurensis will not be yet to be distributed, I think. This is the giant privet or white lilac that has such sacred associations all up the March that no monastery lacks its specimen. Apart from the stately arborescent habit and the huge panicles of creamy-white and the unfading, undarkening clear green of its tall pyramidal masses of foliage, *Ligustrina* also has the beautiful ruddy peeling trunk of a cherry. There should be no more doubt about *Ligustrina*'s hardiness in England than about its beauty. One wonders, though, never to see it. The famous Holy Tree at Gumbum Abbey is a specimen of this, hallowed through ages by a variation, on either side the midrib of each leaf, which figures a character from the Scriptures, rather in the form of the Greek Eta. These leaves are in such high value as relics, and so widely diffused, that the Blessed Sign is sometimes believed to be only visible to the eye of faith: thus to account for the number of leaves extant that do not show it to profaner vision.

Lloydia sp. F 527 is certainly the same as F 93 of last year, and now stands certified as *Lloydia alpina* var. It is the more ravishing a little rock-fairy the more one sees of it; and in the Da-Tung range is very much more abundant and in finer character than in those of the Min S'an and Satanee. It is always, however, incurably saxatile (except at one point in the ghyll above Tien Tang), and should prove the especial beauty of cool limestone cliffs; not showy, indeed, but of ineffable refinement and charm, spoken for by both painting and photographs, made in the rocks above Tien Tang, with monks and acolytes standing round in a ring with their purple skirts extended, so as to keep off the wind, and for a moment arrest the dance of those delicate fairy bells. It has my most special regard, and the true *Lloydia tibetica*, for which I long took it, proves a very poor stolid affair of the upland lawns, gawky and small-flowered, and never venturing into the rocks which are the only refuge of *Lloydia alpina*.

Lonicera sp.—None of those sent this year must be looked forward

to. I have already animadverted on the general ugliness of the Da-Tung shrubberies; and in these *Lonicera* and *Ribes* played too dishonourable a part. The only floral hope of this year lies in F 788, a very remarkable little prostrate Honeysuckle, and almost the only thing not collected in flower that I mean here to make mention of. This was seen but once, at a turn of the track, floundering over rocks up in the Red Basin of Szechwan, where in November it immediately attracted attention with its frail flopping sprays of lucent dark-green foliage, each one of which was crowned with rich terminal heads of bloomy blue-black berries of rare attractiveness.

Meconopsis.—From the tragedy of having no new Poppies to record this year I hurry to those I did see, leaving to its fortunate possessors among my diligent readers the promises not obscurely held forth by F 735, that unclaimed splendour of the *Prattii* group, whose fuller history awaits the moment of its proclamation as *species nova*.

M. integrifolia, as usual, abounds in the alpine scrub at about 10,000–12,000 feet. But, though very magnificent and universal, I cannot say it is as abundant in the Da-Tung as in the southerly ranges. You may always count on seeing it. You will not always see a huge show of it. However, it is very notable; on one occasion, ahead of me up in the scant low scrub, it was one day so splendid from afar that I took it for baby donkeys. In the Da-Tung it has a tendency towards a form, much more refined than the type, with only one flower, or few at the most. This year, however, I concluded not to bother my friends with any more seed of it. (Painting and photograph.)

M. Prattii, renumbered as F 706, in case of regional differences, is the one and only Prickly Poppy of the Da-Tung Alps. After long search I utterly disbelieve that original record of *M. racemosa* from the neighbourhood of Chebson Abbey, which in itself is so far out from the foothills of the alps that no blue Poppy could possibly be found there at all; while my utmost search among the classical specimens of PRZEWALSKY in the Petrograd herbarium showed me no grounds for thinking that anybody really had ever claimed to find a blue Poppy near Chebson. The authentic specimens of *M. racemosa* all hailed from the next range, that of the Kweite-Koko-nor Alps; while in the Da-Tung the one Prickly Poppy—leaving F 735 aside for the moment (and it is certainly not *M. racemosa*)—is universally the creamy-anthered *M. Prattii*. This, in these ranges, is not so stiffly saxatile as in the Min S'an, and luxuriates also out in the opener, stonier places of the grass-alps, in a way quite foreign to the southerly ranges. On Wolvesden Pass I saw an ugly albino, subsequently eaten by yaks; and, on a high cliff, three lovely specimens of a rose-pink variation; otherwise the type did not vary, unless in the form of the seedling leaves, sometimes, in their first year of development, of a quite astonishing rotundity and fatness of outline. Personally I thought the *M. Prattii* of the Min S'an lovelier than the laxer, more ephemeral-looking form of the Da-Tung; but this may merely be my sentiment for the former region; in any case it is odd that between

two such remote distribution-centres for *M. Prattii* there should intervene the Kweite-Koko-nor region, given over exclusively to the possession of typical *M. racemosa*—and without doubt the district responsible for the original specimens, by false tradition (though not by the actual labels) attributed to the neighbourhood of Chebong Abbey in the flanks of the Da-Tung. (Painting and photograph.)

M. quintuplinervia (F 118).—I had thought I knew the Harebell Poppy from last year's experience. Now I realize that in the Min S'an and Satanee ranges it is a mere outlier, comparatively poor; while in the Da-Tung it has its very focus of distribution, abounding incredibly from 10,000 feet upwards, first in the cool mossy folds of the fells, amid scant scrub, and then right over all the face of the alps, in such profusion that never have I anywhere seen a picture of comparable glory. It is a very stable species, but I got two beautiful albinos, and several forms of almost turquoise blue; none of these survived the journey, but their occurrence yields hope that similar beauties may appear from seed—of which that of the Da-Tung contrasts favourably with the first year's lot, in that it is germinating like cress, whereas that of 1914 proved most recalcitrant and uncertain. Of all the *Meconopsids* I know, I give the crown for well-bred perfection of loveliness and serene charm to the Harebell Poppy, with a faint reservation in favour of the Dainty Poppy. But *M. lepida* (F 123) is only monocarpic, and I cannot yet hear that a single one of the painfully few seeds I was able to get has hitherto revisited the light of day. (Painting and photograph.)

Meconopsis sp. (F 735) is the problem I spoke of. It is certainly close to *M. Prattii* and *M. racemosa*, but its huge pods with blackwarded retrorse spines and big seeds to match, no less than the whole habit of its seedlings, arouse suspicion that nothing less than a new species may here be lurking. In one fold only of the grassy alps was this found, and its azure flowers aroused no special emotion in PURDOM, who had the luck to happen on it; it was only later that its seed-vessels caught his attention as he returned that way in autumn. Nothing, otherwise, is known about the plant; its fuller history shall be unfolded when it proves to deserve one.

M. racemosa (F 736) (F 691 is the list number of the undoubtedly genuine *M. racemosa*).—This is quite uncertain, and may very possibly prove only *M. Prattii*. As I have said, I have no record whatever, and believe no record, of *M. racemosa* in the Da-Tung Alps. Therefore the provenance of this seed almost certainly gives the lie to any notion that it can be *M. racemosa*. Nor do I remember that PURDOM was able to get any ripe seed of the genuine *M. racemosa*, deep azure and golden-anthered, from the ranges of Kweite and Koko-nor, where it replaces *M. Prattii*. Therefore, in this uncertainty, judgment must be suspended on this lot of seedlings until they have a little further unfolded themselves from obscurity. (Photograph of the true species from the Kweite Alps.)

Oxytropis spp. 529, 540, 543.—Here again there has been a confusion between three species, all of which have been sent. One, from

the stretches of the river shingles, from the Si-ning Hor and the Da-Tung Hor, is remarkably handsome, with stalwart tufts of silky, grey-green foliage, and large, stout heads of very brilliant purple flowers in May and June; the second shares the same tastes, and is so exactly suggestive of *O. pyrenaica* that I hesitate to promise a distinct species in this tangled and minutely-differentiated race; while the third flops in frail elegance from the loess-cliffs, in a veil of small pale lavender blossom in June.

Papaver nudicaule (F 687) is wild, in a very pretty orange form, in the screes of the Kweite Range; but I never saw it in the Da-Tung, and could get no certain seed. What I send is the form cultivated in the gardens of all the local abbeys, possibly hailing, in its remote origin, from a source as distant as Reading, but a fine brilliant development, often running to double flowers of blazing scarlet-orange.

Phaca sp. (F 705) is an unusually brilliant thing, of quite uncertain name. On the highest alps of the Da-Tung, and in the uppermost rocks, its fine tufts of ferny foliage nestle, and up come spikes of eight inches or so, in July, laxly clothed in blossoms of blazing rose-crimson which lift it very high among the rare Pea-flowers desirable for the rock-garden. Equally uncertain in its attribution to *Phaca* is F 738, from the same sweeps of alpine turf, but evidently another species, hardly so brilliant as the last and not so striking, but yet with qualities and charms. This more recalls *Phaca astragalina* of our own Alps.

Potentilla Purdomii (F 517) was not known by this name till I saw it thus labelled at Chelsea Show in 1916. Evidently PURDOM had got it unbeknownst, on his former expedition for VEITCH. We certainly both thought of it as *Geum* in 1915, when we came upon it gilding the greener level stretches of flat and rather damp lawn high in the upmost sweeps of the alps with a solid sheet of its yellow flowers. Individually the flowers are not, as a rule, large enough for the length of their stems, but their abundance makes up for this, and the profusion of the stems themselves. They are eight or nine inches long, spraying all round the rosette of lovely foliage, weakly lying out and ascendent, producing a violent glare of gold with the unanimity of their abundant blossom. In the specimen exhibited by Mr. ALLGROVE the stems were much more erect than I have ever seen them in nature, and the whole effect by no means what it was in the sunlit flats of the alps. My own seed, however, was sedulously collected from only those forms marked down in bloom as having the largest flowers and the most of them. Massed, accordingly, in conducive spots, I expect this plant to prove a favourite.

Primula Farreri (F 560) is the grand novelty of the season in this or any other race. It haunts only the dark and sunless crannies in the highest sunless combs of the Da-Tung summits, whether on limestone or granite, and is a magnificent species of the *Nivalis* group, thick-stocked as any leek, with large dark foliage, heavily powdered with white meal beneath, and large clusters, just emerging on eight-inch scapes, of very large flowers, of intense fragrance, pale lavender blue,

fading to grey by degrees from the ten-lobed vague white blur that radiates from the intense clarety black eye of the tube's mouth. It is always a striking, strange, and artificial-looking plant, local and scattered, never widespread, but sometimes occurring in impregnable colonies up on the cliffs (especially when calcareous), and often solitary in crevices that look incapable of containing it; but invariably in corners that never get the sun, in cool, dank, moist vegetable soil, lodged in the chinks. From experience, though, I judge *P. Farreri* to have a strong and hearty temper, and hope good things of it in careful cultivation, if only the none too abundant seed will condescend to germinate and thrive. Meanwhile we have speaking likenesses, both plain and coloured.

P. gemmifera is F 562, 563, 168! 121! In other words, it swallows up everything hitherto known as *P. acclamata* sp. nova. Little blame either to Professor BALFOUR or to me, seeing that the classic description of *P. gemmifera* not only assigns it to a wildly impossible place in the family, but also, apart from other misleading details, declares the plant to be annual and produce bulbils. How should one, in this, recognize a *Primula* that is certainly perennial, and never produces bulbils of any sort? However, the awful conclusion leapt on me, when in Petrograd I went through the Chinese collections, and under *P. gemmifera* found an old friend that I should have greatly preferred to meet in some other context. And at the same time Professor BALFOUR, in Edinburgh, was arriving at the same sad conclusion. So back into *P. gemmifera* go all my forms of *P. acclamata*. In any case, my own *P. gemmifera*, dug out from beneath this accumulation of errors, is no less lovely a thing than when we proclaimed it as *P. acclamata*; infinitely variable, indeed, but never in the least like the *P. gemmifera* of Pax. It seems to have an enormous range, and in the Da-Tung abounds throughout the alpine zone, high up on the alps being specially stalwart and wholly powderless, while down in the beck-beds of Wolvesden it develops a slenderer form with very prognathous flowers and the scapes all white with meal. Of both I have paintings and photographs; as of the minor form by the trackside on Thundercrown in 1914, and the Min S'an type of the same year. And, whatever you may call it, *P. gemmifera* is among the supreme treasures of the family, rivalled only by *P. stenocalyx* in the group of *P. farinosa*.

P. Reginella (F 561) is the other novelty of 1915. And yet no other *Primula* has been more often collected and mixed up with others. It was left for my specimens at last to determine this as a real new species, after it had for years been reduced to a subordinate part in others of the race. It is a great deal of the true *P. Pumilio*, on that plant's unique original sheet at Petrograd; it has also been much of *P. tibetica*, of *P. diantha*, and even of *P. sibirica*. In point of fact, *P. Reginella* stands quite apart, and is indeed a Little Queen of loveliness in the Auriculata group, a tiny compressed wee thing, in strongest possible contrast to my other novelty, the gross and gorgeous *P.*

Farrevi with small golden-eyed flowers of a rose as brilliant, almost, as in *P. rosea*, jewelling the scant brown turf of the Da-Tung, very locally, on only the gauntest summits and arêtes, at some 15,000 feet, in June. The whole tiny sprout of glossy spoon-shaped foliage is always and everywhere powderless, by which, among other details, it can always be differentiated at a glance from *P. tibetica*. And, being so wee, not an inch in height, with these lovely little glowing sparks of blossom, it must adorn the choicest bog-bed only, in company of such gems as the high-alpine Gentians. *P. Reginella* yielded me an albino, a painting, and a photograph *in situ*.

P. sibirica (F 507) is not yet distributed, and is quite uncertain in name. I do not believe it can be really any form of *P. sibirica* at all, though the saccate tails of its bracts at once put it alongside, and differentiate it from, the perfectly tailless-bracted *P. Reginella*, of which otherwise it looks but an elongated vulgarized version from lower elevations. For this plant (which shares with the *ex-acclamata* the honour of being *P. gemmifera* in the Petrograd herbarium), from a similar scant clump of two or three lucent-bladed spoon-shaped leaves of rich green, sends up a spindly stem of some five inches or less, carrying three flowers or so, round and fairly large, of fulminating rose-pink with a golden eye. It is not a thing of dazzling merit, though really pretty; but the reason of its not having been collected in quantity sufficient for distribution is much more prosaic. For it grows only in the fine emerald-green lawns which occasionally occur in the beck-glens of the range, not only high above Wolvesden, but also low down, at the débouchure of the torrents and fading rills upon Tien Tang, Hsi-ling, and Chebson, with the result that the yaks, browsing there, have nipped off every seeding stem long before August, and no trace of the plant is left. It bequeaths us, though, a painting and a photograph.

P. sinensis (F 734) was the solitary event of the Da-Ba-S'an range, and offers little besides the hope that, from so far north of its first station at Ichang, it may prove hardier than we have yet known it: unless it be the romance that having so far been supposed rigidly restricted to the region above Ichang in the gorges of the Yang-dz' Jang, we here find it recurring many hundreds of miles distant and many a weary week's journey away out in the north-west towards Tibet. Of course no flowers, and only painfully few seeds, were lingering when I passed the range between Chow Tien and Ming-jang-jo in November; I can only record that *P. sinensis* loves exactly those same arid calcareous cliffs, crannies, and grottos that are specially frequented, in just such other cliffs across the world, by *P. Allionii* in the rosy limestones of San Dalmazzo di Tenda.

P. stenocalyx is F 502, 503, and that F 195 sent in 1914 under the apparently mythical empty name of *P. cognata*. And, take it all in all, I expect *P. stenocalyx* to prove by far the most important of the medium-sized Primulas yet introduced from China—judging at least from the extraordinary vigour and heartiness and health of the

plant in cultivation, the zeal with which it germinates and grows and flowers, and goes on flowering and growing, without fad of any sort in any decent situation. As for its beauty, few can rival it. The rosette is neat as that of *P. farinosa*, and often wonderfully daisy-like; while the three to four-inch stem unfolds in June a large head of noble large lavender blossoms, sweetly scented, and with a white eye! I know none to beat, and few to equal, *P. stenocalyx* in its own particular line. It abounds all through the alpine region, too, giving clear sign of its healthy nature; from the hot loess banks and cliffs (in slight shade only, from their aspect) about Tien Tang, in the hot valley of the Da-Tung, not only up through all the rocky outcrops of the mountain coppice up to Wolvesden, but higher yet and higher, right out on to the alps themselves, where in the crags and corries and chines it ascends imperturbably to the very summits themselves—quite the most widely-ranged *Primula* I have ever met—and often disappointingly so to eyes hungering for a different species from that one thought one had said good-bye to four thousand feet below. Imagine finding *P. Palimuri* on the crest of the Matterhorn; the profusion of *P. stenocalyx* is yet more grotesquely catholic. And thus this plant also has been the mother of confusions. Besides probably being *P. cognata*, there is little doubt that in the course of her huge range she has also been *P. leptopoda* and *P. Biondiana*. One source of confusion my own researches brought to light. For while, up to ten thousand feet, *P. stenocalyx* is absolutely powderless in scape and rosette and foliage, at higher elevations this form is abruptly and without transition replaced by another absolutely identical in every way but that the scapes and the reverse of the rather stiffer leaves are clothed in a dense vesture of white meal, which yet further enhances the beauty of those loose dwarf heads of big blue-purple white-eyed blossoms, the size of *P. carniolica's* on a stem shorter than that of *P. farinosa*. In cultivation I have already spoken of its outrageous vigour; I will only add that so diverse are the great rosettes that develop from its packets that no one can easily believe they all spring out of seed of the same species. It gave me one poor and one magnificent albino; also copious photographs of both forms, and a rather inadequate painting. I hope to end the confusion round this name by calling the valley form, without powder, *P. stenocalyx genuina*; while the powdered high-alpine development stands as *P. stenocalyx dealbata*. It is interesting to find that from the earliest seedling stages the differentiation of powder or no powder holds invariably good. The solitary convincing exception was that one specimen, in a frameful of typical *P. stenocalyx genuina* (the lot sent home as *P. cognata*, F 195, in 1914), has turned out no less typically *P. stenocalyx dealbata*.

P. tangutica excludes *P. Maximowiczii* in the Da-Tung, abundant and often gigantic in the scrub of the alpine valleys. But I grow more and more firm in my conviction that there is no solid distinction between the two; they are merely two named developments of an ugly dowdy aggregate—so really ugly, indeed, that I carefully refrained

from getting a single seed of *P. tangutica*. You will raise more than you want of it out of the lots labelled *P. Maximowiczii* of the first year. In point of fact, the whole species is so dingy that, unless luck has served you with a really good red form, you will have far more pleasure with the Cowslip and the Primrose. I lack words, for my own part, decently to express my disgust with *P. Maximowiczii* (which I never saw in flower on the Chinese alps), and my complete contempt for *P. tangutica*, which I did. Its very best is pale-green reflexed stars, dark mahogany-coloured outside, and with a fine rim of yellow to the rays. I have seen it three feet in height.

P. urticifolia (F 531) is, on the contrary, a perfect jewel, to the libel against which in PAX I was just in time to propound my palinode in the text of "The English Rock-garden." This wee lovely treasure is confined absolutely to dark, dank, and cool chines on the rare limestone outcrops of the Da-Tung range, and there precisely suggests a hybrid of *P. minima* and *P. bella*. It will be a delight of the highest rank for those who can give it the umbrageous and calcareous crannies it seems to claim.

P. Woodwardii swallows up *P. blattea*, as it was first called, and is therefore F 116 of 1914. I add nothing to the description, except that in the Da-Tung this plant is of hotter vinous purple in the flower, and occasionally wears powder on its scape. In cultivation, of all my Primulas of 1914, this proves, not only the heartiest and easiest in growth so far, but also develops an elegance of beauty and a white eye unknown to it at home. The confusion of names is none of mine. I was originally let know that this was *P. blattea*, and that *P. Woodwardii*, a chance seedling from Be-ling seed, would pretty certainly have to retire ultimately into *P. blattea*. From which I concluded that *P. blattea* was the published authoritative name, and that *P. Woodwardii* never would be. On the contrary, letters got lost meanwhile across Siberia, and only after using '*blattea*' do I learn that *P. Woodwardii* is the published valid name, and that thereby the slightly less irrelevant title of *P. blattea* is swept out into the limbo of things that never have existed, or, anyhow, that never "did have ought to." I trust, and confidently believe, that the superb merits of *P. Woodwardii* may earn for me and it a measure of pardon for the confusion in which we have both been implicated, by the uncertainties of the British learned and the Siberian posts.

Primula sp. 694 exists for us only in a plant which only problematically survives its fearful journey home, though lugged by me with exquisite pains through all the douanes of Siberia, Russia, Finland, and Sweden. PURDOM brought it back from the Koko-nor alps, as a rare occurrence there on Serchim; it had a look of *P. Woodwardii* rather than of *P. tangutica*, but its capsule presented what seemed like aberrancies from either. And there is no more to be said of it for the moment.

Primula sp. (F 733) is in hopefuller case. Seed was got, and is coming well. This again, though, is but a problem, from Purdom's visit to the alps down across the Si-ning Hor, while I was busy with

the advance seeds in the Da-Tung. This he found in a marish grassy hollow on Kweite Pass, and I have nothing to say of it but that this also does not quite look as if it belonged either to *P. tangutica* or *P. Woodwardii*. Neither of this, of course, nor of its predecessor, was any trace of flower remaining when the plant was found. Otherwise the tale would be plainer.

Groups of *Primula* represented :

Auriculata—farinosa.	<i>P. sibirica</i> (?), <i>P. stenocalyx</i> , <i>P. gemmifera</i> , <i>P. Reginella</i> .
Sinensis.	<i>P. sinensis</i> .
Valis—Maximowiczii.	<i>P. Woodwardii</i> , <i>P. tangutica</i> , <i>P. Farreri</i> .
Soulei.	<i>P. urticifolia</i> .

Rosa sp. (F 544) is, I think, the best of the year's shrubs. I only saw it at one point, in the shingles of the Da-Tung Hor, where it makes its great sweep round from Bridge-head towards Tien Tang. Here, in the hot stretches and gravelly steeps, the Rose made fine elegant bushes of five feet or so, slender and graceful, with small-folioled greying foliage, and bloomy young shoots of pink. The flowers are very profuse, very fragrant, and of clear rich rose, all along the sprays and arching boughs in small clusters, followed by no less brilliant a show of glossy vermilion berries, bead-shaped, and shedding their calyces so quickly that they look more like some Cotoneaster's. It is a shrub of quite particular charm, obviously in the alliance of *R. Webbiana* and *R. Willmottiae*, but, as it so far seems, distinct from both.

Rosa sp. (F 774) is probably that little fine many-flowered rose with long, narrow haws, sent in 1914 as F 84, not uncommon in the lighter open scrub all down the March of Kansu.

R. sp. (F 755), on the contrary, does not begin to appear till you are down over the border in Northern Szechwan, where, in company with that pervasive glory of all those regions *Rosa* sp. F 291 (only met with in 1914 in the farthest western extremity of its distribution), it occurs much more rarely amid the shrubbery on the long high hill-tops of the Red Basin. This also is a big rampant rose, with high-arching boughs. The flower is unknown, but red fruits are borne in loose clusters along the boughs, and the infrequent leaves are large-folioled and very handsome, dark leathery green, and clothed on their reverse with a dense soft velvet of pubescence. (I know it as the Velvet Rose, accordingly.)

Rosa sp. (F 783) is that lovely Golden Rose which I failed to get seed of in 1914, but which last year PURDOM captured on his way down through the Western March to meet me on the Szechwan frontier. The round dark fruit appears to fall untimely, a trick I had not suspected, but had attributed its disappearance to birds. Its shape and colour lead me to believe that this conjectural species is after all *R. xanthina* (though I see Mr. BEAN is inclined to deny that *R. xanthina* has any high claim to be recognized as existing at all). On the other hand, it is assuredly not the much more pallid *R. Hugonis* that I had thought it at one time. And so I leave it; those bending

green-leaved sprays, bowing beneath their long burden of great golden blossoms, will soon earn it recognition when it shows them. The species seems a very local one, extending from the hot downs of Kiai-jo away to the Tibetan Border, and up the Nan-Hor Valley as far as Kwanting, a plant of the drier, warmer lower region, not ascending into the alpine conditions of the Satanee coppice, or the forested folds of Thundercrown.

Rosa sp. has no discoverable number, yet I am perfectly certain that abundant seed was sent, discovered, after washing, under some unsuspected other species. It is the most interesting, perhaps, of the lot—a small, scant, low shrub, not seen at all until you begin the ranges of the Da-Ba-S'an south of Lo-yang. Its flowers are, of course, not yet known, but appear to be borne singly; its outstanding peculiarity lies in its fruits, which are so large that for a long time I took them for galls—thick-rinded amber pomegranates that they look, flushing with red tones, and dingy with dark stiff bristles. Their fleshiness, the clear pale yellow of their colour, give them the effect of being real edible fruits, which they by no means are; and altogether their strange beauty, if they adequately repeat it in the garden, will promote this Rose to a high place of its own in the family. But remember that nothing from Northern Szechwan must have its hardness too rashly presumed in England.

Salix sp. (F 621) may be nothing of any interest. It is a small grey willow of fine delicate foliage, mimicking the Olive in the shingle-beds of the Da-Tung Alps; from whose boughs I combed a bagful of soft white fluffs in August, on the chance of their proving acceptable.

Saussurea sp. (F 596) belongs to the topmost screes of the high alps, where nothing else can live. Its fine grey-webbed rosettes suggest *Campanula speciosa*, and then comes a stocky spike, webbed about in weeping networks of crystal, most strange and beautiful to see, though the capitules of blossom themselves are perfectly inconspicuous, of a dull white, adding and detracting nothing, in the lovely little obelisks of glistening frost-threads.

Saxifraga sp. (F 574) I should guess to be either *S. atrata* or *S. egregia*. It is the best of these regions, where Saxifrage is more abundantly represented than further in the South; and is a very remarkable thing, with leathery rosettes recalling those of *S. stellaris* but darker and harder, sending up a loose spike of some four to six inches, with scattered white stars again suggesting those of *S. stellaris*, but much larger and finer, and specially conspicuous in the fat large ovary of darkest maroon-purple, almost black, which makes the most striking of contrasts with the petals. This strange plant abounds all over the alpine region, blossoming in July, and in the valleys liking cool, moist exposures in the banks, while out on the open alps above it flourishes everywhere in the turf. Well grown and not parched, it will give great pleasure.

Senecio sp. (F 574) was this year collected in quantity sufficient

to distribute. It belongs to damp grassy flats far out in Drokwa-land across the Border, with one or two stray outlying stations in the Tibetan highlands verging upon China. The tall stem rises from amid strap-shaped foliage, and hangs out a succession of tasselled Hamameloid yellow flowers. I myself have not seen it in bloom, and I am told that it resents any but the most careful transplantation in all stages, ardently desires damp, and is itself in all stages no less ardently desired by slugs.

S. sp. (F 744) is another very beautiful species of similar situations, at its finest in the grassy plain below Chebson Abbey, but occurring throughout the region, even up to Wolvesden. Here the glaucous foliage is splendid, as in the *Senecio* formerly called *Senecillis carpatica*, and the two-foot stem erupts near its top into a raceme of very large golden flowers in August. I have not yet seen any of its race to equal this in general impressiveness and brilliance of blossom.

S. sp. (F 752) is pretty certainly *S. sagitta*. This is among the rather coarse commonplaces of this commonplace family, of which China in late years has been so painfully fertile. *S. sagitta*, however, has its merits, when from the wide drifts of its arrow-headed foliage, almost universal in the lower alpine region, rise in August the tall three-foot stems, unfolding their dense snaky spire of small yellow blossoms.

Serratula sp. (F 742) is very close to F 432, and only differs from that sumptuous weed in being dwarfer, not more than eighteen inches high at the most. Otherwise F 432 gives its perfect picture.

Stellera sp. (F 93) abounds as whole-heartedly in the Da-Tung Alps as in those of the Min S'an, and had this last year, therefore, yielded an unparalleled harvest of seed. It is never an alpine plant, loving the hot open loess downs at a mere 9,000 feet or so.

Trollius pumilus (F 519) was only sent in 1914 in small quantities. 1915 yielded a vast harvest, and should provide well for the world. It is specially abundant in the Da-Tung Alps, and a spectacle of unbelievable glory immediately round Wolvesden House in the green lawns. It gave a citron-coloured variety, and, down in the Dene, beside the Holy Well of the Buddha, the holy influences of the locality produced two specimens of an absolutely pure ivory-white form which is one of the loveliest things I have ever seen in the race. *T. pumilus Perfectissimi* exists still (I hope) in the two original specimens lured alive across China, Russia, and Europe with pains that I would not have deployed on any infant; and there are also photographs and paintings of form and type.

Trollius sp. (F 532) is quite a distinct species, though of the same habit and situations, hailing from the grassy plains in which the extinct becks debouch westward of the range upon Hsi-ling and Chebson. It is rather smaller, though, and starrier in flower, with different foliage, and seed-heads refreshingly devoid of that stickiness which is such a mark of *T. pumilus*. It should be watched with care as it deserves.

Viola sp. (F 505) (*V. chebsonensis*) is a far exile from the Europe that no doubt originally gave it birth. For it is a form of *V. tricolor*, the prettiest I have ever seen, which must have been handed across China from abbey to abbey, in different developments, since first some friendly foreigner gave seed to Pu-to or Wu-tai or Peking; till now this very attractive little pansy clings in the crannies of all the cloisters and yards of Chebson Abbey, away over the broken boundaries of Tibet.

Viola sp. (F 547) is the yellow alpine violet that here replaces *V. biflora* on a finer scale in the upper mountain region of the Da-Tung. It has the advantage of an ample tufted habit, of very handsome dark hepaticoid foliage, and of a radiant display of innumerable brilliant golden violets; so I hope the none-too-abundant seed may fare well, and that the plant will take kindly to some cool and shaded stony corner of the rock-garden.

Zinnia elegans is F 768, and without doubt a garden-escape. But in some of the beck-shingles in Northern Szechwan it drew my attention by the emancipated elegance of its habit, and by the profusion, on the pyramidal wildened plants, of smaller flowers than we know, in far greater daintiness of build, and of a wonderful velvety soft blood-colour that I have never met before. Seen thus, it was a charming thing, hardly to be recognized as owning any kinship with the repulsive stiff artificiality that is such a horror in gardens that admit it.

Here, then, ends the list of my best-known and most interesting flowering plants of 1915. Let it be remembered, though, that this list makes no pretence at dealing with the further large quantity of striking but uncertain stuff collected out of flower or from unknown sources, and therefore awaiting cultivation before we can give them names or pronounce upon their merits. However, though many of these I do not doubt will prove of interest and value, it is on the flowering plants of the summer alone that for the present I can base my hopes of having contributed something of use to the garden. That the list is short I feel dreadfully aware; at the same time, O gardener, you will find that it contains no weed; and how easily could I, had I chosen, have swelled out the catalogue to fatness by burdening you with germs of all the worthless rubbish of which the Da-Tung Alps, like all others, are full! But I have remained faithful to my promise and passion for quality; though I confess I should have been better pleased with 1915 had its mountains provided me with quantity also.

CONTRIBUTIONS FROM THE WISLEY LABORATORY.

XXX.—EXPERIMENTS WITH BACTERIZED PEAT, OR HUMOGEN, IN 1916.

By F. J. CHITTENDEN, F.L.S.

IN the earlier experiments with bacterized peat, or humogen, already reported,* only the first sample received caused increased growth such as was claimed for it. Other trials carried out with other samples and with various garden crops on a considerable scale outdoors gave practically negative results. As further inquiries were received, and in the hope that progress had been made in producing a standard article, a further small trial of the material obtainable in the season of 1916 was made.

The site of the experiment was a piece of sandy ground which had recently been in grass and which had been deeply dug in the preceding autumn, but not manured since 1914, when it received, while under grass, a dressing of steamed-bone flour and sulphate of potash. The ground was divided into twenty-four plots, each measuring twelve feet by three feet, and separated from its neighbours by paths one foot wide. Six different treatments were arranged so that each treatment was repeated four times, the plots receiving similar dressings being scattered over the site in order to overcome any inequality in soil. (See plan, fig. 63.)

Treatment A.	Plots 7, 9, 18, 24	had nothing added.
" B.	" 1, 12, 15, 22,	received a dressing of 12 oz. of bacterized peat (equivalent to $\frac{1}{2}$ ton to the acre).
" C.	" 2, 11, 17, 20,	received 24 oz. bacterized peat (1 ton to the acre).
" D.	" 3, 6, 16, 21,	received 48 oz. bacterized peat (2 tons to the acre).
" E.	" 4, 5, 14, 23,	received 96 oz. bacterized peat (4 tons to the acre).
" F.	" 8, 10, 13, 19,	received 28 lb. pig manure, equivalent to 20 tons to the acre.

The peat for the experiment was kindly presented by Messrs. Sutton, of Reading, and was, we understand, manufactured at Manchester. The peat and pig manure were lightly forked in, and on June 1 twelve grammes of French breakfast radish were sown on each plot. The seed germinated well on plots A, B, and F, but on all the others far less regularly, as will be seen from the table giving the final results. The only possible explanation of the comparative failure of germination on these plots is that something in the peat actually poisoned the young seedlings,† for the germination on the other plots was very even. That it was not merely a case of delayed

* CHITTENDEN, F. J., "Report of Experiments with Bacterized Peat, or Humogen," JOURNAL R.H.S. xli. pp. 305-326.

† Cf. l.c. p. 321, where it is shown that young radishes suffered badly in pots to which peat had been applied.

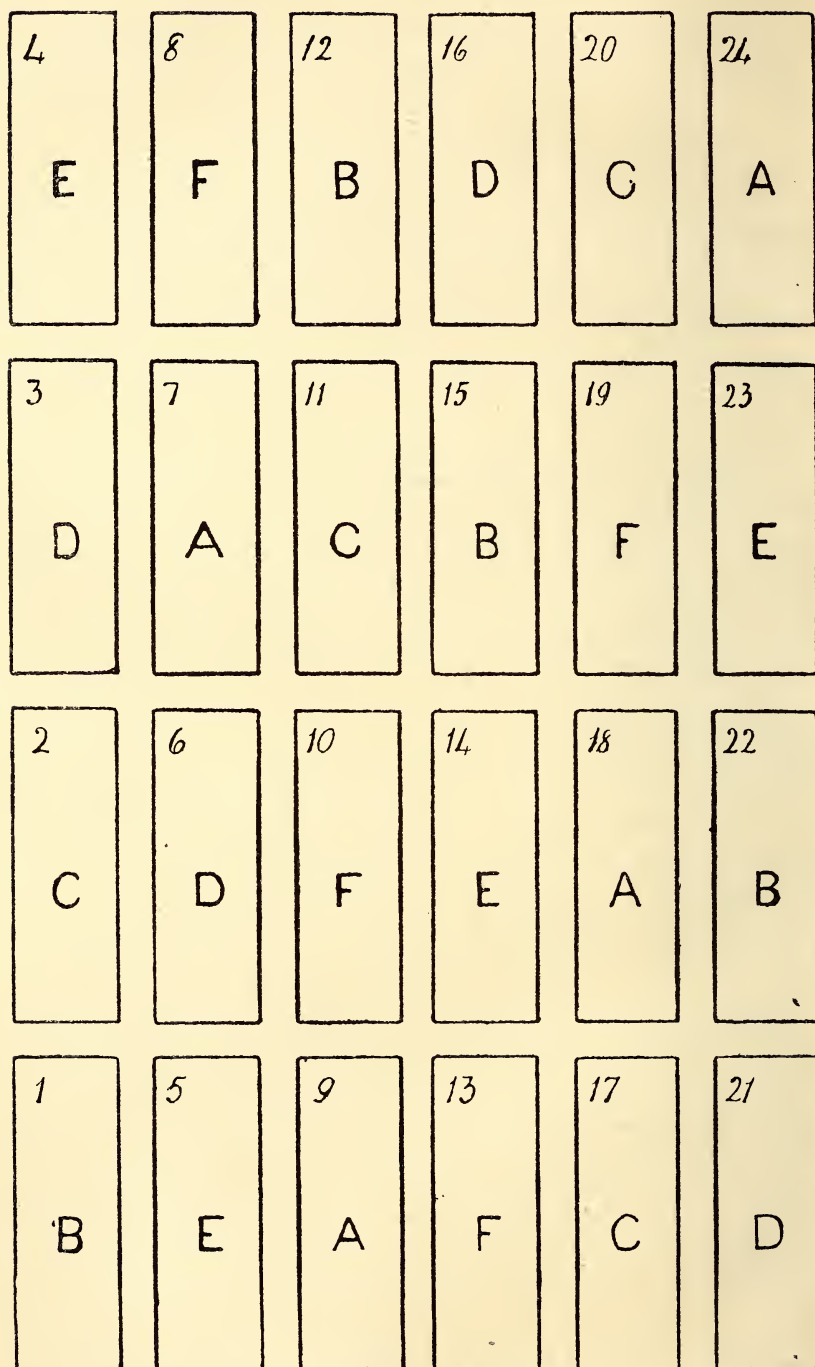


FIG. 63.—PLAN OF TRIAL OF BACTERIZED PEAT, 1916.

germination is shown by the fact that no radish seedlings appeared on the plots subsequent to the harvesting of those present at the end of the experiment, though the plots remained fallow well into the autumn.

The weather subsequent to the sowing was favourable to the growth of the radishes, and good crops were obtained from the plots dressed with pig manure when all the radishes were pulled and weighed on July 19.

The results are shown in the following table :—

Treatment.	Plot.	No. of plants.	Gross weight.			Average weight.		
			Tops.	Roots.	Complete plant.	Tops.	Roots.	Complete plant.
			Grammes	Grammes	Grammes	Grammes	Grammes	Grammes
A. No dressing	7	272	1,300	2,440	3,740	4.8	8.9	13.7
	9	210	920	1,770	2,690	4.4	8.4	12.8
	18	211	900	1,700	2,600	4.2	8.0	12.2
	24	227	740	1,480	2,220	3.3	6.5	9.8
Total . .		920	3,860	7,390	11,250	4.2	8.0	12.2
B. $\frac{1}{2}$ ton humo- gen to the acre.	1	203	1,120	1,910	3,030	5.5	9.4	14.9
	12	201	930	1,780	2,710	4.6	8.9	13.5
	15	229	760	1,720	2,480	3.3	7.5	10.8
	22	214	1,010	1,590	2,600	4.7	7.4	12.1
Total . .		847	3,820	7,000	10,820	4.5	8.3	12.8
C. 1 ton humo- gen to the acre.	2	212	1,035	1,940	2,975	4.9	9.1	14.0
	11	235	850	1,620	2,470	3.6	6.9	10.5
	17	196	830	1,650	2,480	4.2	8.4	12.6
	20	169	800	1,690	2,490	4.7	10.0	14.7
Total . .		812	3,515	6,900	10,415	4.4	8.5	12.9
D. 2 tons humo- gen to the acre	3	155	860	1,640	2,500	5.5	10.6	16.1
	6	202	1,005	2,000	3,005	4.9	9.9	14.8
	16	152	660	1,380	2,040	4.3	9.1	13.4
	21	137	480	1,540	2,020	3.5	11.2	14.7
Total . .		646	3,005	6,560	9,565	4.6	10.8	15.4
E. 4 tons humo- gen to the acre	4	106	690	1,320	2,010	6.5	12.5	19.0
	5	141	845	1,540	2,385	6.0	10.9	16.9
	14	123	520	1,040	1,560	4.2	8.5	12.7
	23	58	200	370	570	3.4	6.3	9.7
Total . .		428	2,255	4,270	6,525	5.5	9.9	15.4
F. Pig manure, 20 tons to the acre.	8	250	2,480	3,830	6,310	9.9	15.3	25.2
	10	286	2,580	4,020	6,600	9.0	14.0	23.0
	13	226	1,870	3,250	5,102	8.2	14.4	22.6
	19	181	1,780	2,660	4,440	9.8	14.7	24.5
Total . .		943	8,710	13,760	22,470	9.2	14.5	23.7

Inspection of this table shows that the number of plants and the total weight of the crop steadily fell with successive additions of humogen, while a light dressing of pig manure raised the total crop to nearly double that on the no-manure plot. The fall is due to the successively smaller number of plants that succeeded in establishing themselves with the successively heavier dressings of humogen. The lightest dressing gave a slight falling off in number and gross weight, but its effect was almost negligible. The weight of humogen added here was that recommended in the publications of the patentees. But heavier dressings proved more detrimental.

It is not surprising that the *average* weight of the plants rose with the heavier dressings of humogen, for the plants on the plots had greater space, and, as we have shown elsewhere,* the greater the space available, the greater, within limits, the average weight of the plants.

We can but conclude that humogen as available for our experiments in the latter part of 1914, and in 1915 and 1916, failed to justify its claim to great value as a manure.

* CHITTENDEN, F. J., "On the Influence of Planting-Distance on the Yield of Crops," JOURNAL R.H.S. xli. p. 89.



FIG. 64.—A WONDERFUL CATTLEYA SKINNERI ALBA.
The scale at the bottom of the figure measures a metre.



FIG. 65.—BERBERIS RUBROSTILLA.

NEW OR NOTEWORTHY PLANTS IN THE SOCIETY'S GARDEN.—I.

I. BERBERIS RUBROSTILLA.

Berberis rubrostilla which belongs to a section of the genus which has long been represented in our gardens for *B. sibirica* from the Altai Mountains of Siberia was introduced by PALLAS in 1790 (figured in Bot. Reg. t. 487), and *B. concinna* was figured in the Bot. Mag. t. 4.744 in 1853 from plants raised from seeds collected in the Lachen valley of the Sikkim Himalaya. The latter has a rather doubtful reputation for hardiness in some districts, but other species of more recent introduction appear to be quite hardy and are well worthy of cultivation. The section includes *B. angulosa* from Nepal and Sikkim (often grown as "*B. sp. Thibet*"), *B. macrosepala* also from Sikkim, *B. kumaonensis* from the Kali valley of Kumaon, *B. dictyophylla* from Yunnan, *B. diaphana* from Szechwan, and *B. minutiflora* and *B. yunnanensis* from Yunnan. *B. rubrostilla*, however, surpasses them all in the beauty of its large and striking fruits, which are almost sealing-wax red in colour, gradually deepening from a somewhat transparent white in September, and hanging at least until Christmas. Their curious shape and graceful poise are easily seen from the illustration (fig. 65), in which also the form and arrangement of the leaves and spines are well brought out; but the illustration fails to show the contrast between the green of its narrow leaves, the bright red of its berries, and the purple and grey of its twigs and branches. It is a shrub with erect and arching branches, at present about 3 feet in height. It received a F.C.C. when shown at Vincent Square in November 1916.

Some doubt attaches to its origin, but it is hoped to clear this up by raising seedlings; it was grown from seed sown at Wisley at the end of 1912, and was the only plant of its kind raised. It has proved to be perfectly hardy, and has grown well under the same conditions as suit most other Berberises.

A technical description of the plant follows:

Berberis rubrostilla (affinis *B. concinnae*).

Frutex 1-1.5 metralis; ramuli juniores rubrofusci, leviter nitens, deinde purpureo-cinerei, glabri, angulati, vetustiores cinerascens; internodia 1.3-1.7 cm. longa; spinae tripartitae, graciles, patentes, rigidae, 1.6-1.8 cm. longae, fulvae, subtus sulcatae; folia decidua, ad 10 fasciculata, sub-coriacea, oblanceolata vel angustato-ovata, apice rotundata plerumque mucronata, basi sensim in petiolum brevissimum vel ad 5 mm. longum attenuata, margine integra vel utrinque spinoso-dentata, spinulis paucis ad 2 mm. longis, petiolo excluso 1 x 0.5-2 x 0.6 cm. magna, supra viridia paulo nitentes, subtus eximie glauca, leviter papillosa; nervis reticulatis subtus post anthesin elevatis; inflorescentiae racemosae vel paniculatae ad 2 cm. longae (pedunculo nudo ad 0.5 cm. longo

incluso), 2-4 florum, flores raro solitarii, glabrae; flores non vidi; pedicelli fructiferi ad 5 mm. longi, fusci, basi bracteis linearibus acuminatis brevissimis suffulti; fructus in mense Novembri maturi, satis magni, ovati, scarlatini, acidi, circiter 15 × 9-10 mm. magni; stylus nullus, stigmatibus latissime peltiforme; semina 2-4.

Origin doubtful. Raised from seed in the gardens of the Royal Horticultural Society, Wisley.—F. J. C.

DIANTHUS × LINDSAYI.

In 1911 the late Mr. ROBERT LINDSAY, of Murrayfield, Midlothian, sent one or two plants of a hybrid pink, which he had raised, to Wisley. It was planted on the new rock garden and has grown there ever since, proving a striking addition to its family, on account of the freedom with which it produces its Tyrian rose flowers on stems about four inches in height rising from a vigorous turf of grey foliage. Mr. Lindsay raised the plant by crossing *Dianthus plumarius* with *D. neglectus*, and the hybrid shares with the latter parent the buff outer side of the petals, which contrasts so strangely and pleasingly with the bright colour inside. The name is given in honour of the raiser, to whom our gardens are indebted for several good things, and who will long be remembered for his care of the celebrated Botanic Gardens at Edinburgh.

The plant is a little difficult to keep going, but the following notes by Mr. Sarsons, foreman of the rock-garden, will minimize the difficulty.

"*D. Lindsayi* is a beautiful thing but difficult to keep, as it seems apt to go off during damp weather in winter. I find that it does best on the Wisley rock garden when planted in a crevice or behind a stone on the top of a slope in a well-drained position, in half shade and in soil composed of good loam, leaf mould, and grit. During the flowering season it makes much growth, which, when large enough, if taken off and treated as cuttings, will root very freely. The cuttings should be put in a sandy compost (all sand is excellent for the purpose if damped over several times during the summer day) in a close frame. Pot up when rooted into small pots, keep in a close frame for a few days, then gradually harden them off. Keep in a cold frame during winter and plant out early in spring, putting the roots well down. I have never found any seed on the plant."—F. J. C.

ECONOMIC VALUE OF CERTAIN VEGETABLES.

By FRED STOKER, M.B., F.R.C.S.(Ed.), F.R.H.S.

[Being a short lecture delivered to the Acton Allotment Holders' Association,
1917.]

IN the short time at my disposal it is manifestly impossible to go anything like fully into the subject of this lecture, so I must be content with, as it were, a few headlines which, if they serve to interest in this vast question, will be amply justified. I will endeavour to make my remarks as concise and practical as possible, and I will ask any critic to be indulgent, and keep in mind the difficulty of condensing the science of vegetable dietetics into a quarter of an hour's chat.

A food may be defined as a substance which, when absorbed by the body, either supplies material to make good tissue-waste, or which supplies energy, or serves both of these functions.

If a food stuff is analysed it is found to consist of:—

Nitrogenous bodies—Proteids (Albuminoids).
Carbohydrates.
Fats.
Mineral salts.
Water.

Of these the proteids, mineral salts, and water, acting together, can alone make good tissue-waste.

The proteids also have another valuable property, viz. that of producing energy, which property they share with the fats and carbohydrates. In brief, then, the proteids are double foods in that they both make good tissue-waste and supply energy, while the fats and carbohydrates supply energy alone.

It is therefore evident that proteids are indispensable, whilst the other two great groups, though of great advantage, can, on a pinch, be done without.

There are substances in foods which are neither tissue-formers nor energy-producers, but which cannot well be dispensed with. I refer to the mineral salts and indigestible residue. The former are required for the body chemistry and the latter plays the important part of ballast—that is, a sufficient bulk of material to stimulate intestinal action.

It is important to bear in mind that there are many substances in food which, although they consist of carbohydrate, fat, or proteid, are quite useless to the body, as the carbohydrate &c. are in an indigestible or unabsorbable form. The core of a pear is an illustration, or the rind of a pomegranate.

Again, though a certain diet may contain a sufficient amount of absorbable proteid, fat, and carbohydrate to maintain health it will not necessarily do so. It is known that the presence of chemical bodies known to chemists as aromatics is essential to health—such are found readily in beef and other meats. Indeed, it is entirely to them that beef-tea and meat extracts owe their properties. I merely mention this fact as a warning that a purely vegetable diet is not best fitted to preserve health.

The term energy, in speaking of foods, is used in its mechanical sense. This energy is convertible into heat in the body, and by means of it the body can perform work. A simple illustration may be given: During its growth, a tree collects its energy from the sun heat. It is cut down and burnt. In the burning its energy is reconverted into heat; this heat may be used to generate steam, which can do work in the shape of driving a piston. Instead of a tree let us take a potato; it too collects energy from the sun heat, it is eaten and burnt up in the body, giving off heat which is used to produce the energy necessary to enable that body to do work.

The unit of energy as applied to food is called the big calorie and represents the number of litres of water which 1 gramme of the tested food when burnt will raise 1° C. in temperature.

It is necessary briefly to mention this point as all calculations on food values are based on it.

The energy values of the chief constituents of food are:

Proteid	.	.	.	.	4·1 C.
Carbohydrate	.	.	.	.	4·1 C.
Fat	.	.	.	.	9·3 C.

The proteids and carbohydrates are quicker in action than the fats, but have not their staying power, so to speak.

In deciding which are the best vegetables to grow for food supply, we must consider the following points:

- (1) Their food value as expressed in calories.
- (2) Their digestibility and absorbability in the human body.
- (3) Their economic value, gauged by their tests.
 - (a) Expense of seed, growing, and harvesting.
 - (b) Proportion of land to size of crop.
 - (c) Time required for crop to reach maturity.
 - (d) Plant food in soil used up.

In allotment work we may consider (a) and (d) to be fairly constant, but (b) and (c) must be constantly kept in mind; e.g. it is obvious that, if an acre of land will provide 6 tons of potatoes or 1½ tons of peas, the potatoes are the best crop to grow, even though the food value of peas is greater than that of potatoes.

In offering you the following list I have calculated the units of value whilst keeping all these points in view. Also, I have only estimated for the absorbable part of the food, and, in the case of leguminous

plants, have subtracted the weight of the pods from the total crop weight.

In estimating the unit of value I have devised this formula, which I am quite aware is open to criticism but which I think answers its purpose :

Crop per acre \times Energy value of 100 grammes in Calories.

Time required for crop to reach maturity in weeks

$$\text{or briefly } \frac{C \times E}{T}$$

E.g. in Potatos :

$$\begin{aligned} \text{Average crop per acre} &= 6 \text{ tons} \times \text{Energy value } 83.75 \\ &= 507.6 \div \end{aligned}$$

$$\begin{aligned} \text{Time to reach maturity} &= 20 \text{ weeks.} \\ &= 25 \text{ Economic Units.} \end{aligned}$$

	Tons per acre *	Weeks Time	Calories
Potato	6	20	83.75
Beet	8	18	41.9
Parsnip	12.5	26	32.8
Carrot	12.5	22	34
Green Peas	1	21	85.1
Dry Peas	$\frac{1}{4}$	—	307.84
French Beans	4	16	39.8
Broad Beans	1.3	18	90
Onion	7	8	10
Turnip	13.5	8	10

	Economic Units	Order in List
Potato approximately	25	(1)
Carrot	19.3	(2)
Beet Root	18.6	(3)
Parsnip	15.9	(4)
French Beans	9.9	(5)
Onion	8.8	(6)
Broad Beans	6.5	(7)
Green Peas (Podded).	4.2	(8)
Dry Peas	3.9	(9)

Green vegetables have comparatively very little food value, but are valuable as ballast and for their contained salts.

* On a low allotment yield basis.

REPORT OF CONSULTING CHEMIST FOR 1916.

By Dr. J. A. VOELCKER, M.A., F.L.S.

DURING the year 1916 thirteen samples were sent direct by members for analysis, and, in addition, several matters, forming subjects of research at the Wisley Gardens, were examined from the chemical side.

The samples sent by members comprised :

Manures	2
Water	1
Soils	9
Injured orchid plants	1
	<hr/>
	13

1. *Manures*.—These were samples of two manures used by a fruit-grower, but presented no particular features of interest.

2. *Water*.—The one sample sent was from a much-polluted supply, and decidedly hard in character.

3. *Soils*.—Some of the samples sent brought out, on analysis, features that may be worthy of notice.

(a) Soils containing magnesia in excess.

I have previously drawn attention to cases where magnesia has been found present in soils in excess of lime, and have pointed out the coincidence of this with unsatisfactory practical results. The following are two further instances in point :

(Soils dried at 100° C.)	A	B
	%	%
Organic matter and loss on heating	8·23	6·04
Oxide of iron	4·83	3·44
Alumina	4·88	4·48
Lime	·23	·36
Magnesia	·53	1·66
Potash	·26	·73
Soda	·31	·41
Phosphoric acid	·31	·08
Sulphuric acid	·08	·09
Insoluble silicates and sand	80·34	82·71
	<hr/>	<hr/>
	100·00	100·00
	<hr/>	<hr/>
Nitrogen	·307	·230

A was a granitic soil from the Grampians. It had abundant vegetable matter, but the amount of lime was very small, and the need of liming the land was further accentuated by the fact of magnesia being present in excess. The quantity of potash was not large, but the soil was distinctly rich in phosphoric acid.

B was a soil from Worcestershire, a red clay loam, with clay sub-soil. In this there was more than four times as much magnesia as

lime. The soil, further, was distinctly poor in phosphoric acid, though rich in potash.

(b) Hop soils. Two samples of soil from Kent, intended for growing Hops on, gave the following analyses :

(Soils dried at 100° C.)	A	B
	%	%
Organic matter and loss on heating	3·64	3·46
Oxide of iron	3·00	3·55
Alumina	1·56	2·09
Lime	·73	·56
Magnesia	·33	·56
Potash	·16	·33
Soda	·27	·24
Phosphoric acid	·34	·47
Sulphuric acid	·06	·09
Insoluble silicates and sand	89·91	88·65
	<hr/>	<hr/>
	100·00	100·00
	<hr/>	<hr/>
Nitrogen	·187	·201

For Hop soils, both of these were deficient in organic (vegetable) matter, and not nearly as rich in nitrogen as they should be, so that manuring with farmyard manure, shoddy, or other nitrogenous organic substance would be very desirable. They were both exceptionally rich in phosphoric acid, but poor in potash, more especially A. B was somewhat deficient in lime—and, it will be noted, there was as much magnesia as lime present.

4. *Injury to Plants (Orchids)*.—Some Orchid plants were sent me, together with the soil and other materials used in potting, as it had been observed that injury seemed to appear after the plants were potted. The leaves presented a spotted appearance, and in other cases had turned quite yellow. On inquiry it was ascertained that the plants were exposed at times to the fumes from the heating furnace, and it was thought that the fumes might have caused the damage. Chemical examination of the leaves, however, did not give support to the belief that there had been injury from sulphur fumes or the like, nor was there anything unusual as regards the potting material, except that some brick rubble used was considerably impregnated with salt. Advice was given to have this material well washed before using it, and also to have the plants examined to see if the injury were due to any fungus or similar attack.

5. *Sugar-beet*.—A sample of several roots of Sugar-beet sent me gave on analysis :

	%
Water	79·92
Sugar	14·80
Crude fibre	4·02
Other carbohydrates &c.	·60
Mineral matter	·66
	<hr/>
	100·00

The roots were well shapen, free from fang, and decidedly well grown.

The percentage of sugar is not high for a good season, but the past was not one tending to give roots rich in sugar.

Other investigations conducted on behalf of the Society concerned the comparison of different varieties of Parsnips ; the effect of spraying Gooseberries with " Burgundy mixture," and the determination of the amount of copper left on the berries ; and the analyses of soils used respectively for Tomato and Narcissus growing. As these form part of the researches carried on at the Wisley Gardens, they are not dealt with in detail here.

PARADISE APPLE STOCKS.

BEING THE FIRST REPORT OF THE WORK IN PROGRESS AT THE
WYE COLLEGE FRUIT EXPERIMENT STATION, EAST MALLING.

By R. G. HATTON, M.A.

I. *Introduction.*

THE custom of grafting fruit trees upon various root systems other than their own is of ancient origin. The question of which is the most proper stock to use for individual varieties under different conditions has been matter for much speculation even from those early times. The very prominence which VIRGIL gives to it in his legendary account of grafting is proof of the importance attached to the choice of a stock, and ever since, amongst horticulturists, the matter has been one for discussion, often of minute detail. The inequalities of growth, cropping power, and vitality in fruit trees of the same variety, were evidently as patent to writers of the seventeenth and eighteenth centuries as they are to us to-day. The state of affairs is so concisely summed up by a "Lover of Planting" * that a passage is worth quoting :

"It's manifest that amongst Trees of one kind, in the same orchard, you shall have some one of them bear better fruit than any of the rest sometimes; and it's not known what to impute this excellency more probably to than that the stocks they were grafted on might be . . . some better, some worse. So that to conclude it cannot be amiss to be so far curious about the stocks you graft. . . ." Barely a century later THOMAS HITT † was enjoining growers of fruit that "if they buy their trees of nurserymen, they should diligently inquire upon what stocks they were propagated. For stocks are in some measure a sort of soil to the kinds of trees raised on them."

And yet it is very doubtful to-day whether fruit-growers have progressed much further in their knowledge of the best choice and selection of stocks upon which to work trees. Most fruit-growers are convinced that, as regards the tree itself, its period of maturity, its actual vigour, and even its constitution are largely affected by the stock on which it is worked. As regards the fruit, it appears equally probable that its quality, embracing degrees of colour, size, and flavour, may be likewise influenced. Yet there exists very little, if any, reliable data upon these facts, which open up a whole vista of possibilities for progress of economic importance. It must be added that until fruit-

* "A LOVER OF PLANTING," *The Compleat Planter and Cyderist* (1685).

† THOMAS HITT, *A Treatise of Fruit Trees* (1757).

growers have "put their house in order" very little reliable data can be collected.

Through neglect of studying the tree as an individual great economic loss has resulted. It was realization of this fact that determined the line of the present investigations on Fruit Tree Stocks. Until the question of the relationship between stocks and scions has been investigated, information on other cultural matters is liable to be vitiated. The immediate task was to deal with the root system.

The present report deals with the results so far obtained in one section of the work, the investigations of the Paradise Apple Stocks.

II. *Paradise Stocks. The Problem briefly stated.*

The question which presented itself at the outset of these particular trials was by no means new, though it bore a new aspect.

Fruit-growers have regarded the Paradise stock as a dwarfing stock for bush and various forms of garden trees. Trees worked on the Paradise were expected to be remunerative early, owing to the precocity induced by the dwarfing stock. Whilst it was realized that various new types of so-called 'Paradise' had been introduced into common use since the days of the 'Paradise' and "creeper apple tree," frequently mentioned by seventeenth and eighteenth century authors, no very clear idea was generally held as to what these various 'Paradise' were, what their vigour and special utility. It is true that DUHAMEL DU MONCEAU* had expressly pointed out that, in his comparison of the 'Doucin' and "Le Pommier nain de Paradis," degrees of "dwarfingness" existed. LINDLEY † had emphasized the aspect of soil suitability in his remarks about the Doucin stock, which was "most generally, in our nurseries, called the Paradise stock, although widely different from the Pomme Paradis of the French, a sort not worth growing in this country." LOUDON ‡ reinforced these two aspects when he quoted DUBREUIL as recommending "the Doucin for clayey and light soils," and when he lays down rules for the choice of stocks "where an occupier of a garden has only a short interest therein," and "where a plantation is made on freehold property, or with a view to posterity." Furthermore, he hinted at the question of disease resistance in relation to the root system, whilst other writers touched on the question of their influence on flavour and the ease with which certain stocks and scions formed a "callus." Yet a critical and comparative study had never been kept up to date, and the distinctive values of new types of 'Paradise' were not commonly determined. Growers became too ready to accept 'Paradise' whatever it might be without further inquiry. The following pages illustrate the truth of this statement, and support, even more than might be expected, the fact that very

* DU MONCEAU, *Traité des Arbres Fruitières* (1768).

† G. LINDLEY, *Guide to the Orchard &c.* (1831).

‡ LOUDON, *Encyclopædia of Gardening* (1835).

striking differences and relative values are likely to show themselves in the various types of so-called "dwarfing stocks."

Though it is impossible to give any final judgments at present, it was thought worth while to issue a statement of the results so far obtained.

These results warn fruit-growers and nurserymen of errors which are occurring in the raising of young fruit trees—errors which bid fair to be of far greater moment to the maturing tree than has heretofore been realized. It is hoped that the following facts may reinforce the injunction of THOMAS HITT, and be the basis upon which really valuable comparative facts may be collected with regard to the best uses of the various Paradise stocks, and the wider question of the whole relationship betwixt stock and scion.

The first essential in dealing with this question was to collect the various forms of Paradise in common use at the present time. This was undertaken with the full knowledge that previous collections had been made, but it was felt that unfortunately the work had never been carried to its logical conclusion.

III. *Previous Undertakings of a Similar Nature.*

Literature current about the middle of last century bears witness to a reviving interest in questions pertaining to the stock and scion. From about 1840 articles appeared intermittently in the *Gardeners' Chronicle* upon the subject. In 1863 there appeared an article on "Seedling Apples" by THOMAS RIVERS, which gave details of the raising of his Paradise stocks, and in 1864 an account was published of a bush plantation of Apples on the "English Paradise Stock" at Mr. RIVERS' nursery. The whole tone of the article goes to show that this was then a most uncommon sight. One passage is perhaps worth quoting: "The trees are at present scarcely three feet in height; they are planted as many feet apart each way, and all of them are bearing fruit."* One wonders what this very dwarfing stock was, and how far the precocity may have been aided by transplanting. From this time onward great interest was directed towards the Paradise stock, its origin and its varieties. The year 1869 marks the culminating point, when the matter aroused very keen controversy. The series of articles in the *Gardeners' Chronicle* in that year are chiefly interesting as showing:

(1) That there was then very great difference of opinion as to the respective values of the various forms of Paradise stock.

(2) That there was even then considerable doubt as to their identification and true nomenclature.

(3) That various new seedling 'Paradise' stocks were being raised and tested by several nurserymen.

(4) That the name 'English Paradise' was being used somewhat indiscriminately for "surface-rooting seedling apples" raised in this country.

* *Gard. Chron.* 1864, p. 799.

(5) That no very satisfactory conclusion was arrived at as to the original habitat of the true French Paradise.

However, two interesting results arose out of the controversy. Attention was drawn to the possibility of identifying various types by means of a detailed botanical description, and the idea was mooted of planting comparative trial plots of trees worked on the 'French,' 'Doucín,' and 'English' stocks.* Ultimately the correspondence elicited an article from M. J. DECAISNE on the 'Paradise Apple,' † in which he bears witness to the state of affairs in France when he says: "The flowers sent to me [those of Mr. SCOTT'S Paradise stock] correspond to those of the Paradise Apple of some nurseries, and to those of the Doucín of others."

Meanwhile the general interest in the stock question was being reflected in two quarters—the Gardens of the Royal Horticultural Society at Chiswick and in the commercial nurseries.

The Royal Horticultural Society's JOURNAL of 1872 bears witness to the fact that Mr. A. F. BARRON had been trying various grafting experiments in 1867, though he does not seem then to have specialized on Paradise stock. However, two years later there appeared in the *Gardeners' Chronicle* ‡ a preliminary account of a collection of Paradise stocks collected at Chiswick by Mr. BARRON. Five types of Paradise are there mentioned by name. The general remarks are interesting as showing the striking tendencies to variation in growth and precocity of the unworked stocks, but the particular descriptions of these are too meagre to be very useful for identification purposes. The article foreshadowed a report by Mr. BARRON.

The JOURNAL of the R.H.S. vol. xi. (1889) contains an article by Mr. BARRON entitled "Experiments in Grafting Apples at Chiswick, 1875-84." The article is very brief. It starts by enumerating the various types of Apple stocks by name, which were collected at Chiswick, together with the sources whence they came. They were received from both English and French sources, and they were:

1. The French Paradise or Pommier du Paradis—identical from English and French sources.
2. Rivers' Miniature Paradise and Pigmy Paradise—which Mr. BARRON considered identical.
3. English Nonsuch (Rivers').
4. Broad-leaved English (Rivers').

* The principal articles referred to appeared in *Gard. Chron.* 1869, as follows:

Pp. 6,	Apple Stocks,	T. RIVERS.
Pp. 51,	"	W. ROBINSON.
Pp. 79,	"	J. SCOTT.
Pp. 110,	"	T. RIVERS.

At the time, the idea of quoting the botanical descriptions of M. CARRIÈRE, editor of the *Revue Horticole*, was ridiculed in the following words: "The idea of giving a botanical description of an Apple Stock is most erudite—most imposing"; but it is to be hoped that it will be realized to-day that this lack of attention to accurate detail in the past very largely accounts for the present lack of knowledge. M. CARRIÈRE'S descriptions are most useful, and it is greatly to be regretted that we have not equally good descriptions of more of the various forms.

† *Gard. Chron.* 1869, p. 442.

‡ *Gard. Chron.*, April 25, 1874.

5. Two which were identical with one another, but which were neither 'English' nor 'French,' received from Mr. SCOTT of Taunton. These are evidently the 'Scott's Paradise' mentioned in the *Gardeners' Chronicle*, 1874.

6. English Paradise, True.

7. Doucin—identical from an English and French source.

8. Dutch Paradise (from Haarlem).

9. Pommier Franc or Free Stock.

10. Crab.

In all, Mr. BARRON received eighteen collections.

Thus he names eight Paradise types. His list indicates that there is some confusion in nomenclature, but he does not describe the characters of the various types. The article proceeds to tell us that eighteen trees—representing stocks from the eighteen collections—were grafted with 'Blenheim Orange.' Then follows a "Table showing the Number of Flowers produced in each Year from 1878 to 1882 on the Different Stocks." The Doucin and the French produced the greatest number of flowers. The French, relatively to the size of the tree, had more flowers; the Doucin was more vigorous. The French showed signs of canker, and together with the Miniature and Pigmy was weaker in growth; though all the trees were "vigorous bush trees 10 to 15 feet high, growing in a natural manner." The tree on the Free stock had no blossom. These seem to be the main conclusions of the trial. Unfortunately we do not know what all the actual stocks were, and we have no means of identifying them with those at present in use. Moreover, the trial was on such a limited scale as to make the results of little value. However, it is interesting to note that trials were made experimentally.

Work was also being carried out by nurserymen, especially in the direction of making collections of Continental forms of Paradise and of raising new surface-rooting seedlings. Foremost amongst these workers * was the late Mr. THOMAS RIVERS. In 1870 he wrote: "I have at this moment a full collection of all the Paradise stocks known in Europe." † He then proceeds to enumerate briefly what the collection comprised, in all "14 kinds of Paradise stocks." This collection must have been very interesting and valuable, for it seems to have possessed several types of Paradise which are completely lost to-day, and of which there is no detailed description.

Much more recently Dr. U. P. HEDRICK, of the New York Experiment Station, carried out some experiments with Dwarfing Apple stocks, and he compiled from European books brief notes on the "six stocks . . . most commonly used in the Old World in dwarfing Apples"; ‡ but these descriptions are in too general terms to form any useful clues to actual identification. Moreover, the conditions

* The names of the late Mr. J. SCOTT of Taunton and the late Mr. PEARSON of Nottingham also appear in this connexion.

† *The Miniature Fruit Garden*, T. RIVERS, 16th edition, p. 74.

‡ See *Dwarf Apples*, by U. P. HEDRICK, *U.S.A. Experiment Station, New York, Bulletin* 406.

prevailing in his trials with the 'French' and 'Doucin' stocks are hardly applicable to this country, though the account is interesting.

It seemed quite clear, then, that the present work would have to start from the very beginning in its method of classification, and that it was highly desirable once and for all to put on record detailed descriptions of the various types before attempting to judge their merits.

IV. *Beginning of the Work. The Collection.*

Our investigations began in November 1912. They were undertaken in collaboration with Prof. B. T. P. BARKER, M.A., of the Agricultural and Horticultural Research Station of Bristol University at Long Ashton, Somerset. Long Ashton was to specialize, in the first place, upon the 'Free' and 'Crab' Stocks, whilst East Malling dealt with the 'Paradise' forms. The work at East Malling was initiated by Mr. R. WELLINGTON, the Director of the Station. The original scheme and the subsequent isolation of Paradise types was primarily his work. On his shoulders fell the brunt of the initial difficulties. When war broke out in August 1914, Mr. WELLINGTON joined the forces and asked the present writer to continue the investigations. Though the work had not then been under weigh long enough to make possible the detailed comparative study of types, and though further types were yet to appear, Mr. WELLINGTON left behind invaluable notes and records for the use of which he gave free permission. His only anxiety was for the continuation of the investigations and the issue of the report thereon. At the same time the continuity of the whole experiment was safeguarded by the retention of Mr. J. AMOS, the foreman-assistant and recorder, whose able and untiring services bridged over a critical period and who rendered the greatest help in collecting the facts for the present report. In addition, the writer is indebted to Mr. H. WORMALD of Wye College Research Department, who has frequently given his aid and advice on botanical matters.

The majority of nurserymen in the British Isles were approached and asked to send samples of the various kinds of Paradise used and grown by them. The invitation, in most cases, met with a ready response, and a considerable collection was thus obtained. As it became evident that many nurserymen "bought in" their stocks from abroad instead of raising them personally, the collections were added to by further samples from representative nurserymen in Holland, France, and Germany. In all 71 collections * were obtained from 35 sources. The British sources numbered 29, † the French 3, the Dutch 1, and the German 1. This last source, however, furnished 20 collections. Each collection was numbered as it arrived, and was planted out separately. Most samples contained twelve stocks purporting to represent some specified variety, named by the nurseryman. Three stocks out of

* Including one true collection of 'Northern Spy' (not a Paradise type).

† The thirty British sources were from fifteen different counties, either noted for fruit-growing or nursery work.

each collection were planted out by themselves with the object of forming them into "cordons," and of so obtaining early fruiting. The fruiting characters, it was thought, would afford an additional aid to classification and a possible clue to origin. The other nine stocks of each collection were planted out in rows 6 feet apart and 4 feet in the rows, a distance which guarded against any possibility of mixture. The idea was to form these stocks into permanent "stools" from which to raise a sufficient quantity of the various types for further experiment. The German collections arrived a year later, but were treated in the same way.

V. Preliminary Winter Examination. Early Conclusions.

The stocks planted out during the winter of 1912 were not "headed back" in the following spring, but were allowed to establish themselves first, so that they might eventually furnish the stronger stools. The result was that but little young wood was made during the growing season of 1913, nevertheless a preliminary summer and winter examination in 1913 established several important facts:

(1) That though in the majority of cases all the stocks sent from one source under a specific name were similar, a large minority were not. Many groups of nine stocks purporting to be similar contained two or more quite distinct types.

TABLE I.—SUMMARY OF NAMES IN COMMERCIAL USE FOR PARADISE STOCKS.

Name.	Number of Times Used.	Number of Times Rightly Used.
Broad-leaved English Paradise	21	3
Broad-leaved English Ameliorate	1	—
English Paradise	5	Often used for Doucin
Paradise	6	—
Nonsuch Paradise	4	4
Rivers' Paradise	1	Presumably same as Nonsuch
New Paradise	1	Same as Nonsuch
Doucin	5	4
Doucin d'Angers	1	1
Doucin Improved	1	1
French Paradise	3	2
Paradis Jaune de Metz	1	1

(2) That though some twelve names in all seemed to be in use in the trade, yet the same name was frequently applied to very different forms of 'Paradise.' For instance, the most vigorous and the most dwarfing types came to us under the same name of 'Broad-leaved English Paradise.' Table No. I. gives the actual names used, the number of times each was used, and the number of times it was rightly used.

(3) That there were at least eight types of Paradise stock in use

in this country alone, and that each of these types was in the possession of more than one nurseryman at least.

(4) That as there appeared to be considerable variations in size of leaf, tendency to "feathering" &c., even in individual types, a very strict and detailed method of classification was required from the outset.

Thus the preliminary examination demonstrated very clearly the need for this work, and supplied ample justification for the very detailed methods which it was proposed to follow. One instance is sufficient to demonstrate the misapprehensions under which fruit-growers are suffering. 'The Broad-leaved English Paradise' is without doubt the most popular amongst growers to-day. It is the most asked for. Whilst we nominally received it in twenty-one collections called 'Broad-leaved English,' we actually received it only three times as a true sample. In the majority of cases the 'Doucin' was sent as the 'Broad-leaved.' What the respective merits of these two Paradise stocks may ultimately be proved to be, we are not yet in a position to say, but that the stocks are very easily distinguishable and possess widely different characters will be shown. Moreover, it is clear that the respective root systems of these two stocks, after four years of normal growth, develop along strikingly different lines, and it seems probable that this must affect the maturing tree. Yet growers to-day are largely planting trees on stocks that are not guaranteed as true to name, and which are, moreover, not infrequently mixed with several other varieties of 'Paradise.' It will at once be realized how difficult it is to make any progress in the comparative study of relative growth, hardiness, and economic value generally until this initial matter is set in order.

VI. *Cultural Methods Adopted.*

Though all the collections of samples did not arrive the same year, the general treatment adopted was uniform. Each collection, after being numbered and entered in the record book, was planted out as before described, and allowed to stand for one year. The following spring each stock was cut back to within two or three buds of the ground level. This caused the stocks to send out numerous shoots, which were moulded over several times during the summer. This was a simple method of forming stools, and of encouraging the young shoots to send out adventitious roots, where they were layered or moulded up. (Figs. 66 and 67.) These rooted shoots or layers, when severed from the parent plant at the end of the growing season and after leaf-fall, have afforded the means of multiplying each collection for the purpose of obtaining sufficient quantities of each type. The process has formed a very useful means too, as will be seen later, of judging comparative rooting vigour.

Stocks treated in this way form permanent stools, and continue to send up a new supply of shoots yearly.



FIG. 66.—A PARADISE STOOL EARTHED UP.

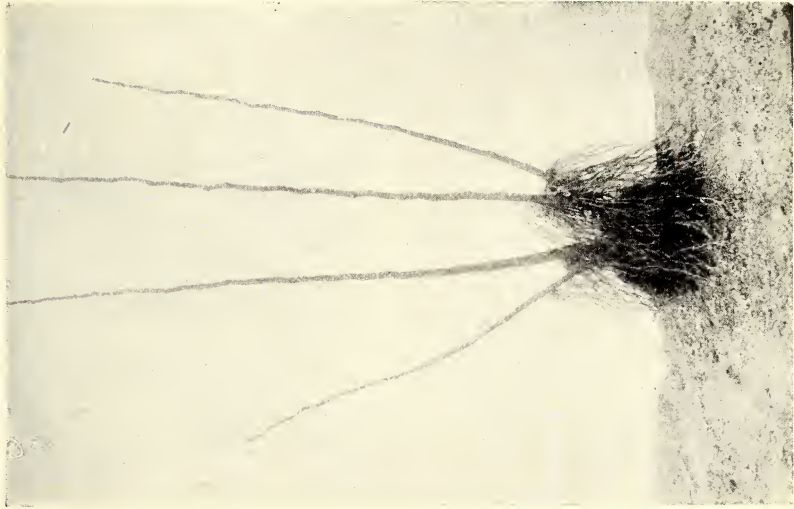


FIG. 67.—PARADISE STOOL WITH EARTH REMOVED
SHOWING ONE-YEAR ROOTED LAYERS.

[To face p. 368.]

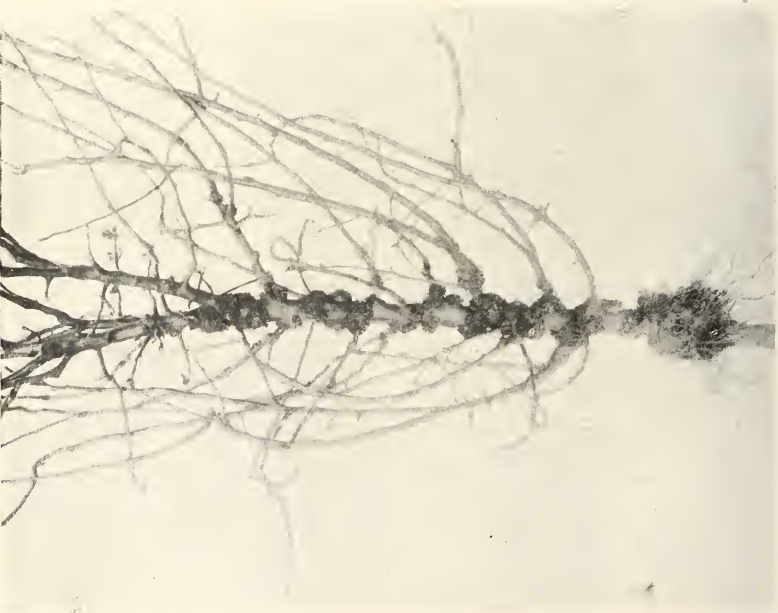


FIG. 68.—A SEEDLING 'FREE' STOCK.
Showing 'burr-knots.'

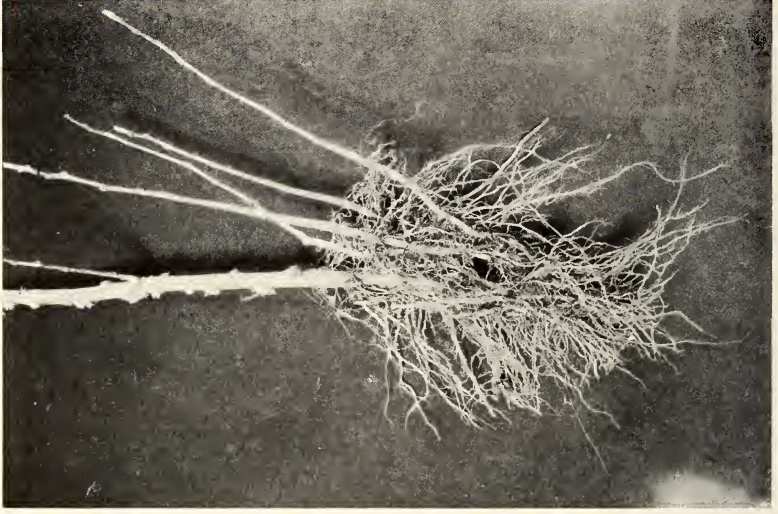


FIG. 69.—TYPE III. PARADISE.
Showing 'suckering' tendency. Small 'burr-knots' are also visible on main stem.



FIG. 70.—PARADISE STOCK, TYPE I,
'BROAD-LEAVED ENGLISH PARADISE.'
One year's growth on stool.



FIG. 71.—PARADISE STOCK, TYPE II,
'DOUCIN.'
One year's growth on stool.



FIG. 72.—PARADISE STOCK, TYPE III.
One year's growth on stool.



FIG. 73.—PARADISE STOCK, TYPE IV.
One year's growth on stool.



FIG. 74.—PARADISE STOCK, TYPE V.
'DOUTCIN AMÉLIORÉ.'
One year's growth on stool.



FIG. 75.—PARADISE STOCK, TYPE VI.
'RIVERS' NONSUCH PARADISE.'
One year's growth on stool.



FIG. 76.—PARADISE STOCK, TYPE VII.
One year's growth on stool.



FIG. 77.—PARADISE STOCK, TYPE VIII.
'FRENCH PARADISE.'
One year's growth on stool.

VII. *Methods of Classification. Useful Characters.*

It was evident that, in order to distinguish individual types with any certainty, minute periodical examinations must be made, both when the stocks were in full leaf, and also during the dormant season when bud and stem characters would become more obvious. Besides this, general observations were made as to the various times of bud-breaking, leaf-fall, and blossoming (in the case of the Cordons), and as to liability to disease. The main characters taken thus fall into two groups, those evident in the dormant season, and those belonging to the growing season. These characters are as follow :

A. THE CHARACTERS IN THE DORMANT SEASON.*

(a) *General habit of growth.*

1. Strong or weak, determined by the average length of the annual leading shoots.
2. Stout (rigid) or "whippy" (flexible), largely determined by the average circumference of the annual leading shoots.
3. Degree of vigour, determined by the average number and character of annual shoots.
4. "Clean," *i.e.* without lateral branches, or "feathered," *i.e.* with branches or spines. "Spines" implies short, stiff thorn-like branches.

(b) *Wood.* The fruit-grower's term for the surface of the stem or branch. The wood described is of one-year growth.

1. Colour. Relative degrees of colour and shade appear most useful.
2. Surface. Smooth or "hairy." The term "pubescent" applies to short hairs or "down."

Shiny or dull: really only another symptom of absence or presence of pubescence or the amount and quality of it.

3. Lenticels, *i.e.* the small whitish spots of various shapes found on the surface of the shoot, and serving for the admission of air into the stem. Number and conspicuousness, shape and size.
4. Internodes, *i.e.* the length of stem betwixt two nodes. A node is the point of insertion of a leaf; in winter this is indicated by a bud.

(c) *Buds.*

1. Size, *i.e.* length and breadth.
2. Shape, *i.e.* outline and apex.
3. Compactness—the bud-scales on some buds are packed tightly (imbricated), of others more loosely, giving a ragged appearance.

* This paragraph serves in place of a glossary for the terms used in describing characters of the Dormant Season (cf. Table III. p. 377).

4. Colour refers only to the actual colour of the bud scales, which is often nearly obscured by hairiness.
5. Pose or Angle of Insertion, *i.e.* the bud's position in regard to the stem, whether "addressed" (closely pressed to it) or "patent" (spreading).
- (d) Production of "Fruit-buds" on one-year wood, *i.e.* those buds which are plump and downy and spreading, such as one would expect to be blossom-buds.
- (e) Production of "Root-knots" on one-year wood, *i.e.* the incipient adventitious roots which appear singly or in clusters on the stems or branches of certain varieties of apple known to root freely from layers or cuttings.*

The general habit of growth, as exhibited in stoutness or "whipiness," in the tendency to send out drooping laterals or stiff spines or "feathers," is a great aid to identification.

In several types the character of the surface of the current year's shoots is very distinctive. Three or four types may be recognized by wood colour, and in conjunction with the number and conspicuousness of the lenticels most types can be easily separated. In one case at least the lack of hairiness (pubescence) on the shoot is very characteristic. The length of the internode appears to be too variable to serve as a guide.

The buds prove very constant for each variety. Shape, colour, contour, and degree of hairiness are perhaps the most important characters. A number of buds of each variety have been measured, and the relation of length to breadth has been found very regular.

B. THE CHARACTERS OF THE SUMMER OR GROWING SEASON.†

- (a) *General habit of growth.*
- (b) *Wood*, and lenticels, as already described for the winter classification.
- (c) *Leaf Blade (Lamina).*
 1. Size, individual and relative.
 2. General shape. The exact meaning of the terms used, *i.e.* ovate, elliptical, lanceolate, and circular, will be found defined in any botanical dictionary.‡ It seemed desirable to adhere to standard terms and not to attempt to find more popular synonyms.
 3. Length.
 4. Breadth.
 5. Base, whether rounded or narrowing, and whether the blade of the leaf is exactly symmetrical on both sides of the leaf-stalk.

* Some of these characters are fully described in Table VI., the "Vigour Table" (p. 386), instead of in Table III., "Winter Descriptions."

† This paragraph serves in place of a glossary for the terms used in describing the characters of the Growing Season (cf. Table IV. p. 378).

‡ For example, *A Glossary of Botanical Terms*, B. D. Jackson, London, 1906.

6. Apex or tip, whether acute, *i.e.* sharply pointed, or acuminate, *i.e.* drawn out to a long gradually diminishing point.
7. Margin, which is variously "toothed." Serrate when the margins are saw-like, biserrate when each tooth is itself notched, and crenate when the teeth are rounded.
8. Surface, whether flat or crinkled, convex or concave.
9. "Pose" or angle of position, both of leaf-stalk and face of leaf in relation to the stem.
10. Colour of upper and lower surfaces.
11. Hairiness of upper and lower surfaces.

(d) *Leaf Stalk (Petiole)*.

1. Shape, whether furrowed (with a single channel), round, or flat.
2. Length in relation to blade of leaf.
3. Colour.

(e) *Stipules* (small leaf-like growths at the base of leaf stalk).
Size, margin, and shape.

Of these summer or leaf characters, some proved very useful for purposes of identification. The general shape and apex of the leaf, together with its surface and pose, formed the best guides. Mere size of leaf is apt to be misleading, but when large, medium, and small leaves were collected and measured from each type it was found generally that the relative length and breadth were very constant.* The length and shape of the leaf-stalk is another fairly constant additional guide to identification, and in two instances the very long stipules afford an immediate clue. In the Comparative Table IV., showing the characters as seen in summer, the chief clues to identification have been printed in italics, whilst the minor details are in ordinary type.

VIII. *The Collections. Results of Examination.*

The British collections afforded eight distinct Paradise types varying very considerably in vigour and habit. They included:—The Broad-leaved English Paradise; the Doucin; Rivers' Nonsuch Paradise; the Doucin Amélioré or Improved Doucin; the French Paradise, and three other types, the identity and origin of which are at present uncertain.

The British collections, in addition to the eight Paradise types, included two very mixed samples, both called Broad-leaved English Paradise. One of these samples appeared very like a batch of free stocks, and except in one instance they did not send out adventitious roots when layered. In this one exception, the stool produced well-rooted stocks, but of a type which has occurred nowhere else. The history of the other very mixed sample is slightly different. It contained six stocks of an identifiable Paradise type, one resembling

* See Table V. p. 382.

a free stock, which would not root when layered, and two of a type which layered readily, but which has not appeared in any other collection. These two uncommon types, whilst they are not included in the present descriptions, are being kept under observation. The 'Northern Spy' was also sent named amongst the British collection.

The French collections also comprised the Doucin, the Doucin Amélioré, and the French Paradise, together with one of the aforementioned types at present not identified. These collections afforded one new type which has only recently been introduced into England—the Paradis Jaune de Metz. In all, the French collections, then, furnished five types—only one being a new type.

The collection from Holland afforded two types—the Doucin Amélioré, and one of the unnamed English and French types, but it included no new type.

Thus, until the collections from Germany arrived early in 1914, nine distinct recurring types had appeared, eight of these in more or less common use in England, and one coming into popularity (the Jaune de Metz). These are the types dealt with in detail in the present report.

The German collections included six out of the nine types already met with. They did not contain the Broad-leaf, the Nonsuch, and one other unnamed English type; but six new distinct types have appeared amongst this collection of samples, sent under the names of various numbered strains of Doucin or Paradise. As these new types do not appear to be in use in England, a description of them is not included in the present report, but as several of them appear very vigorous and healthy they are being propagated for future trial. Thus we actually have no fewer than fifteen distinct types of 'Paradise' isolated, in addition to various other types that layer readily. It is important and interesting to note that from no foreign source did we receive the true Broad-leaved English Paradise, Rivers' Nonsuch Paradise, or one other English type—Type VII.

The complete record of the Paradise collections may be stated as follows:

Received.		Classified.	
Number of English collections	} 42	{ Number true	26
" of French collections		{ " mixed	16
" of Dutch collections	} 7	{ Number true	6
" of German collections		{ " mixed	1
" of Dutch collections	} 1	{ Number true	—
" of German collections		{ " mixed	1
" of German collections	} 20	{ Number true	13
" of German collections		{ " mixed	7
—			—
70			70

The number of true collections was 45; of mixed collections, 25; and four of these included 3 or more types

IX. *Comparison of the Various Sources.*

From the above table the conclusion might be drawn that the Dutch and English sources were least reliable, that the German sources were only very slightly more accurate, but that the French sources were considerably better. To a certain degree this appears to be true, though it must be remembered that some of the English collections were "bought in" from foreign sources—chiefly from France. The seven French collections, of which six were true, came from three different nurseries, and thus should be fairly representative. At the same time it must be remembered that we cannot obtain certain most valuable types of Paradise at all from French sources. Moreover, this accuracy in the French stocks is not always maintained. A personal experience may be given: two years ago I obtained 10,000 Paradise stocks from a French source. I inquired for a true strain of Broad-leaved English Paradise, being unaware at the time that it was not grown in France. However, I was assured that the stocks were all the true Broad-leaved English, and in due course they were planted out. A subsequent examination of this stock bed has revealed the fact that the bulk of these Paradise are the Doucin. This initial mistake was doubtless due to the confusion in names, the 'Doucin' being frequently termed 'English Paradise' in the trade. Further, a casual examination of this stock bed readily brought to light no fewer than three other types of Paradise, including the Doucin Amélioré, the French Paradise, and a considerable admixture of another type, hereafter to be described (Type III.). There is every reason to believe that this experience is not exceptional. I think it is often the custom for nurserymen with a large export trade abroad to buy in the stock of smaller growers to meet their orders. If this is the case, it affords a ready means for creating probable mistakes. So long as it is possible to find at least four varieties of Paradise amongst a bed of 10,000 Paradise stocks—which were guaranteed as true—there is not much hope of making any real progress towards greater economic uniformity in our plantations. The French nomenclature appears to be more accurate and uniform than our own, with the exception of the 'Doucin' and 'English Paradise' being synonymous terms.

As regards the German collections, although they came to us from a single source, we were given to understand that they were a fairly representative collection, brought together from various sources. Hence they should be representative of the condition of affairs in Germany, which is very similar to our own. Their collections were numbered, generally, rather than named, so that it is impossible to tell whether they possess any satisfactory nomenclature.

X. *Isolation of the Nine Types.—The Comparative Tables.*

When once the principal distinguishing features of each type had been ascertained, it became fairly easy to sort out the mixtures by a series of systematic examinations. For the initial purposes of classification the various trade names were dropped, and as each type was segregated, it was simply numbered. Thus the types have been known as Types I: to IX. Since at least three types—one of which is very frequently found—are as yet unidentified and did not come under any recognized trade name, it is essential to retain this method of numbering in this Report. At the same time, whenever the identity of a type seems certain and the nomenclature satisfactory, the actual name of the type will be added to the numeral.

Table II. gives an "historic" summary of the nine types as found in the collections. It also gives the names under which each type was received and shows the different mixtures of one type with another. It is worth noticing how certain mixtures of two types constantly recur.

Perhaps the most outstanding feature in this table is the frequency with which the name Broad-leaved English Paradise occurs, despite the fact that it was only received at all in six collections, and then only in two cases was the collection true. It is frequently mixed with the Nonsuch Paradise. Though the two stocks (Types I. and VI.) originated from the same source, there is no reason whatever for any confusion between them, as their characteristics are most distinct and their general habit very different.

The next point to notice in the table is the prevalence of the Doucin stock. Though it has been sent true in the great majority of collections, yet trade names for it are very erratic and misleading. This is a matter of considerable importance, as the true Doucin seems to possess marked individual characters and is perhaps farthest removed in its rooting system from any of the other 'Paradise' types, as will be seen later. Hence it is important that it should be known under its true name. When mixed it is generally to be found in company with Type III.

Type III. is a remarkable case which shows clearly the necessity for such standardization work as the present. It will be observed that though this type appears to be, and undoubtedly is, one of the most widely used and distributed amongst Paradise stocks, yet it was never sent as a true sample under a separate name. It frequently appears mixed with Types II. and VIII., from both of which it differs very considerably. It is this same type which was recently discovered so plentifully mixed with the 10,000 'Doucin' stocks from France, that have already been referred to.

Types IV. and VII. show a somewhat puzzling record. Type IV. was received true from only one English source, whilst it appeared in another mixed English collection. It is remarkably distinct from

TABLE II.

Type.	No. of Collections received.	Origin.	Pure Collections.		Mixed Collections.		Collections where in small minority.			Proper name.
			Number of.	Name sent under.	Number of.	Name sent under.	Number of.	Name sent under.	Type with which mixed.	
I.	6	English	2	Broad-leaved English Paradise	1	Broad-leaved English Paradise	3	Nonsuch Paradise	VI.	Broad-leaved English Paradise
II.	32	English French German*	21	B.-lvd., English (9) English (4) Paradise (3) Doucin (5)	8	B.-lvd., English (4) Paradise (2) Doucin d'Angers (1) Doucin (1) B.-lvd., English (1)	3	B.-lvd., English (2) English (1)	I., III. & VII.	Doucin
III.	11	English French German	—	—	2	B.-lvd., English (1) French P.	9	B.-lvd., English (3) Doucin (2) French P. (3) Paradise (1)	II., V.* & VIII.	—
IV.	5	English Dutch German	3	B.-lvd., English (1) Paradise (2)	2	B.-lvd., English (1) Doucin (1)	—	—	—	—
V.	13	English Dutch French	5	B.-lvd., English (1) Doucin (1) B.-leaved English Ameliorate (1) Paradise (1)	2	Paradise (1) Doucin (1)	6	B.-lvd., English (1) French (2) Doucin d'Angers (1) Paradise (2)	II., III. IV. & VIII.	Doucin Amélioré or Improved Doucin
VI.	7	German English	4	Imprd., Doucin (1) Nonsuch P. Rivers' P. New P. Paradise	3	Nonsuch Paradise	—	—	—	Rivers' Non-such Paradise
VII.	2	English	1	Doucin	1	English Paradise	—	—	—	—
VIII.	5	English French German	3	French Paradise (1) Paradise (2)	1	French Paradise	1	French Paradise	III. & V.	French Paradise
IX.	5	French German	4	Jaune de Metz (1) Parad. Metzger (2) Parad. Gelber (1)	1	Paradise Gelber	—	—	—	Paradis Jaune de Metz

* The stocks from Germany came as numbered strains of Doucin or Paradise, except Type IX.

any of the other Paradise types, but though the growers, from whom it was received as a true sample, remember having used it for at least fifty years, they are unable to trace its origin. Moreover, they do not know its real name, for they sent the stock as a special strain of Broad-leaved English Paradise, from which stock it is so far removed as to bear no close resemblance to it. This stock appears to be in common use at least in Holland and Germany. It constituted the bulk of the Dutch collection and of several German collections. It may thus be possible to establish its identity.*

Type VII. was similarly received true from only one English source. The growers have possessed it for a very long time and believe that it originally came from France. Although they still have the stock true, they have given up using it commercially, as the main demand is for trees worked on the 'Broad-leaved English.' Type VII. also appeared in a mixed collection from one other English source—where it can be remembered for a good many years—but its origin is again forgotten. In the foreign collections this type is entirely absent.

Table II. shows that Type V., the 'Doucin Amélioré,' is very widely distributed, especially as a minority in mixed collections of types, though it has only once appeared under its true name.

Type VI., Rivers' Nonsuch, appears more widely distributed amongst English nurserymen than the Broad-leaf (Type I.), with which it is unfortunately not infrequently mixed.

Type VIII., the French Paradise of to-day, seems not to be extensively used in this country, though it is one of the principal stocks on the Continent. The Table (II.) shows that it is universally recognized by its true name.

Type IX., the Paradis Jaune de Metz, seems to show a similar history, though so far it has appeared from no English source direct.

XI. *The Comparative Tables III. and IV.*

Table III. shows a comparison of the nine types during the winter season. In all cases the descriptions (see p. 369) refer to characters of the growth made during the preceding summer. The buds, which are the main help in winter identification, are much more variable in size, shape, and angle of insertion on wood two and three years of age, hence it is advisable as far as possible to identify from "one year" wood. Even on one-year bedded stocks there is nearly always a certain amount of young growth available for identification purposes.

The method by which these descriptions were compiled was such that any very noticeable variations should have become obvious. Each winter, from the time the collections were planted (1913), the annual growth of every stool has been examined and described in detail if any variation seemed to appear from the characters laid down

* Mr. E. A. BUNYARD showed me in his own garden a bush he had received from Germany as *Malus pumila*. This I discovered to be identical with our Type IV. Paradise. I am indebted to Mr. BUNYARD for several literary references to Paradise Stocks.

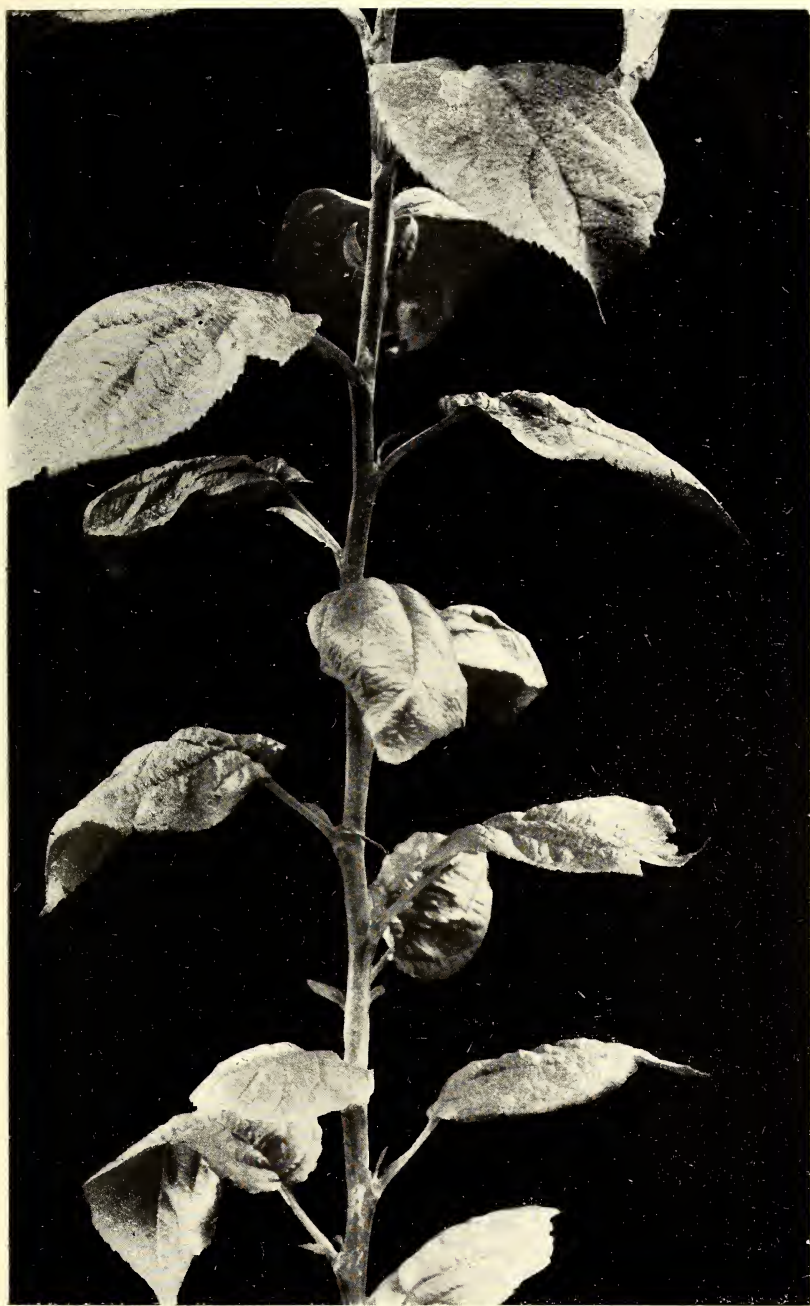


FIG. 78.—PARADISE STOCK, TYPE I. SHOWING SUMMER CHARACTERS.
'BROAD-LEAVED ENGLISH PARADISE.'

[To face p. 376.]



FIG. 79.—PARADISE STOCK, TYPE II. SHOWING SUMMER CHARACTERS.
'DOUCIN.'

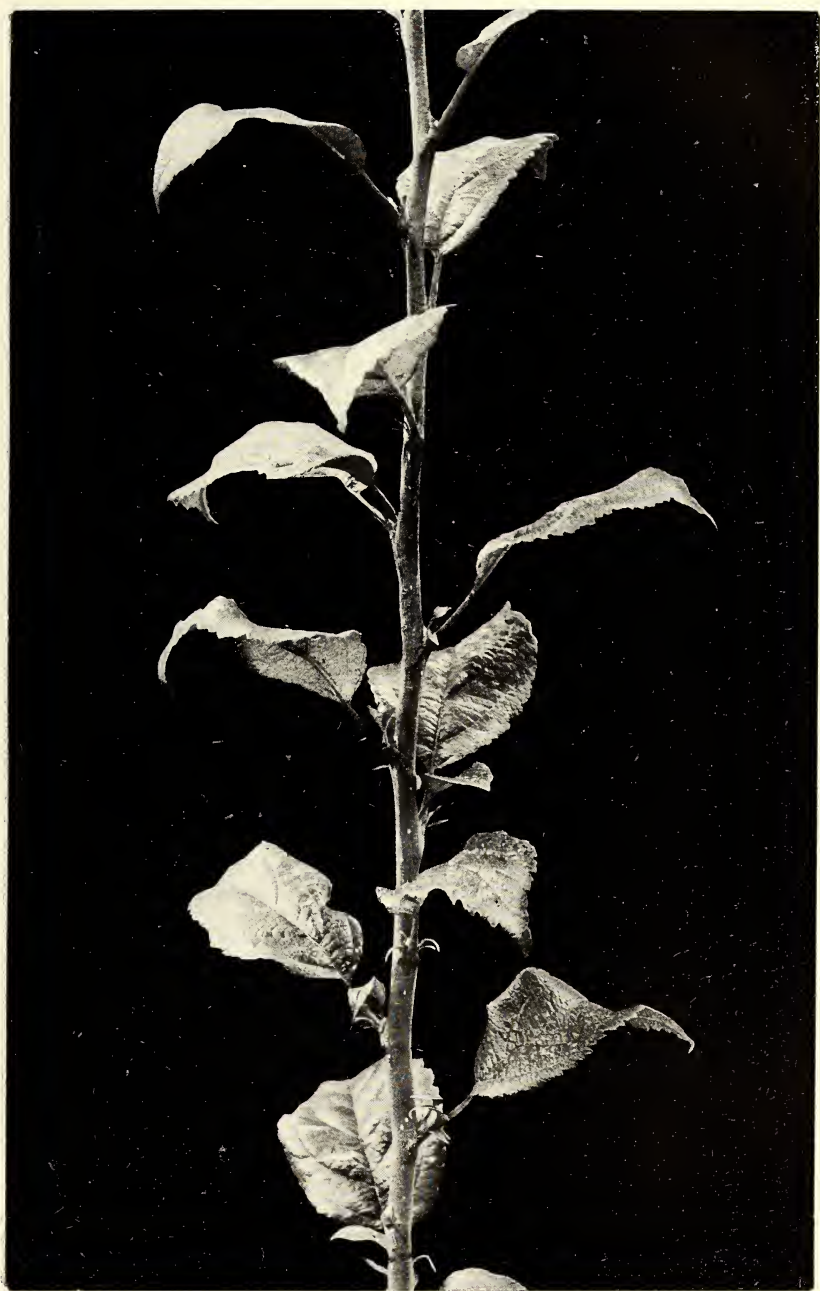


FIG. 80.—PARADISE STOCK, TYPE III. SHOWING SUMMER CHARACTERS.

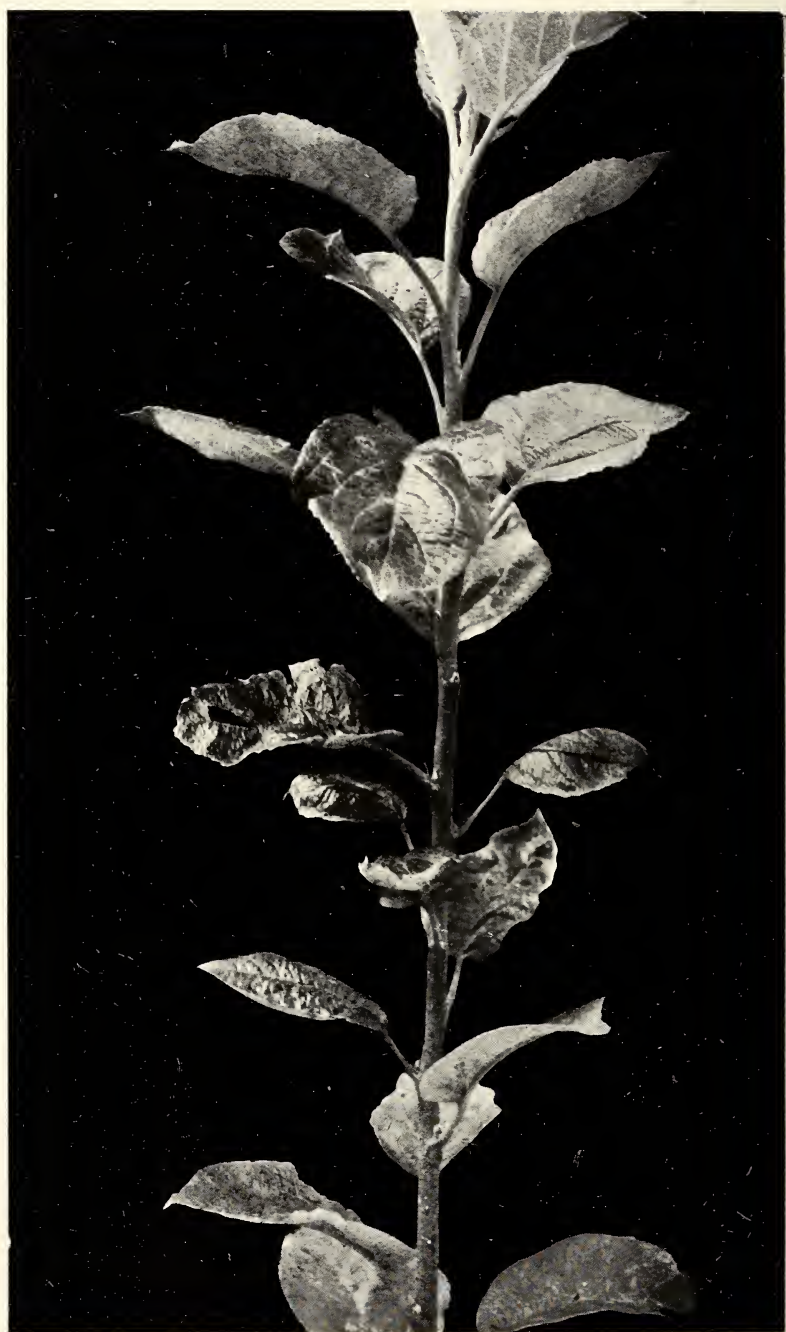


FIG. 81.—PARADISE STOCK, TYPE IV. SHOWING SUMMER CHARACTERS.



FIG. 82.—PARADISE STOCK, TYPE V. SHOWING SUMMER CHARACTERS.
'DOUCIN AMÉLIORÉ.'



FIG. 83.—PARADISE STOCK, TYPE VI. SHOWING SUMMER CHARACTERS.
'NONSUCH PARADISE.'

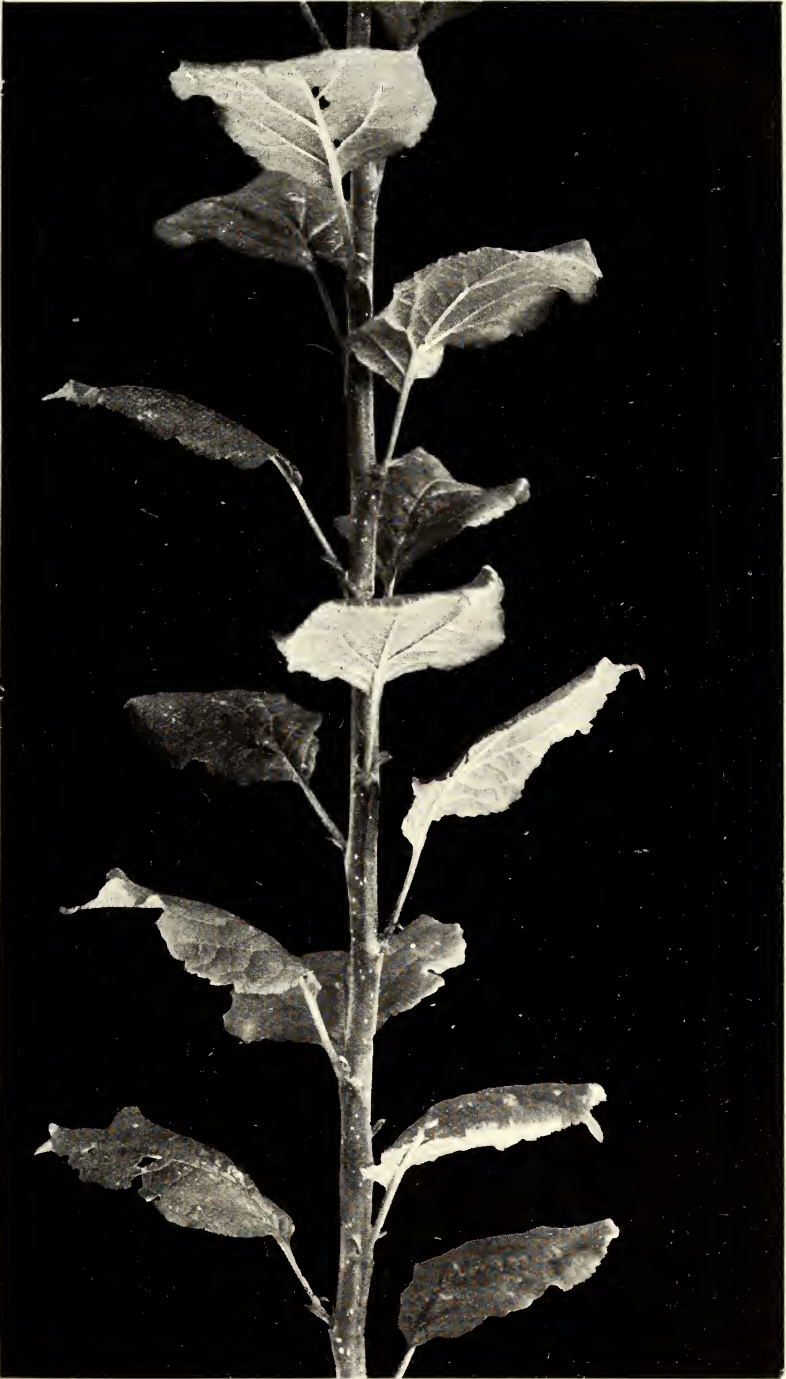


FIG. 84.—PARADISE STOCK, TYPE VII. SHOWING SUMMER CHARACTERS.



FIG. 85.—PARADISE STOCK, TYPE VIII. SHOWING SUMMER CHARACTERS.
'FRENCH PARADISE.'

[To face p. 377.]

TABLE III.—WINTER CHARACTERS (see p. 369).

	Type I.	Type II.	Type III.	Type IV.	Type V.	Type VI.	Type VII.	Type VIII.	Type IX.
Wood Colour	purple-brown	brown to light brown at base	dark purple-brown	light yellow-brown to green-brown, with reddish patches	dark reddish purple, bright	light yellow green, reddish brown patches	reddish purple	dark reddish purple	light reddish-brown to green-brown, patchy
Hairiness	very much grey pubescence	some grey pubescence at apex, rather patchy	very much grey pubescence	much grey pubescence	some grey pubescence, somewhat scattered	much grey pubescence	much grey pubescence, hairs short	almost glabrous, little grey pubescence	some grey pubescence
LENTICELS	numerous	very numerous and conspicuous	very few	few, very inconspicuous	very few, large, conspicuous	numerous, inconspicuous	medium	numerous	few
Buds Size	large	large	large	small	medium	large	medium, small for stoutness of wood	medium, large for stoutness of wood	medium to large
Length	longer than broad	considerably longer than broad	considerably longer than broad	very slightly longer than broad	slightly longer than broad	longer than broad	short	considerably longer than broad	longer than broad
Breadth	broad	broad	broad	medium	broad	broad	slightly broader than long	medium to narrow	broad
Shape	flattish, obtuse	slightly plump, sub-obtuse	flattish, sub-acute	plump, sub-acute	flattish, sub-acute	flattish, obtuse	flattish, obtuse	slightly plump, sub-acute	slightly plump, sub-obtuse
Compactness	moderately compact	very ragged scales	ragged scales	very compact	moderately compact	moderately compact to very slightly ragged	compact	moderately compact to very slightly ragged	moderately compact to slightly ragged
Colour	red-brown	dark red-brown	dark red-brown	dark red-brown	reddish	red-brown	blackish-brown	reddish	dark red-brown to blackish-brown
Hairiness	almost covered with light grey hairs	many grey hairs	completely covered with light-grey hairs	slightly hairy	very slightly hairy	almost covered, light grey hairs	moderately covered with grey hairs	very slightly hairy	many grey hairs
Pose (angle of insertion)	very closely adpressed	closely adpressed	closely adpressed	very closely adpressed	closely adpressed	closely adpressed	very closely adpressed	moderately closely adpressed	moderately closely adpressed
TRDE NAME	Broad-leaved English Paradise	Doucain	Uncertain	Uncertain	Doucain Amé- lioré	Rivers' Nonsuch Paradise	Uncertain	French Paradise	Paradis Jaune, de Metz

TABLE IV.—SUMMER CHARACTERS (see p. 370).

Type :—	I. (Broad-leaved English)	II. (Douchin)	III.	IV.	V. (Douchin Amélioré)	VI. (Rivers' Nonsuch)	VII.	VIII. (French)	IX. (Jaune de Metz)
(i) GENERAL HABIT :									
<i>Growth</i>	<i>very strong and vigorous</i>	<i>very strong and stiff</i>	<i>strong and whippy</i>	<i>short and sturdy</i>	strong and moderately sturdy	<i>strong, very stout and vigorous</i>	<i>very strong and whippy</i>	moderately strong and whippy	medium strong and sturdy
<i>Feathering</i>	not much branching	<i>much spined</i>	often branching, few spines	seldom branched	sometimes branched, seldom spined	sometimes spined	seldom branched	sometimes branched	sometimes spined
<i>Number of suckers (annual)</i>	medium to few	medium	many	few to medium	very many	medium to many	many	many to very many	few to medium
(ii) WOOD :									
<i>Colour</i>	<i>dull purple-brown</i>	<i>dull, brown-purple</i>	<i>dull, dark purple</i>	<i>dull, light yellow-brown</i>	<i>reddish purple, bright</i>	<i>dull, light yellow green</i>	<i>dull, reddish purple</i>	<i>dark, purple-brown, nearly glabrous</i>	<i>dull, greeny-brown, patchy</i>
<i>Hairiness</i>	much grey pubescence	some grey pubescence	much grey pubescence	much grey pubescence	some grey pubescence	much grey pubescence	much grey pubescence	some grey pubescence	much grey pubescence
<i>Texture</i>	smooth, covered with fine markings	v. rough, small split fissures in epidermis	rough, small fissures in epidermis	very rough, small fissures in epidermis	smooth, no markings	smooth, covered with fine markings	smooth, covered with fine markings	smooth, covered with fine markings	smooth, few markings
(iii) LENTICELS :									
<i>Number</i>	many	<i>very many</i>	<i>very few</i>	medium to few	<i>very few</i>	many	medium	many	<i>very few</i>
<i>Conspicuousness</i>	not very conspicuous	<i>very conspicuous</i>	conspicuous	not conspicuous	<i>large, very conspicuous</i>	conspicuous	<i>large and conspicuous</i>	not very conspicuous	not conspicuous
<i>Shape and colour</i>	light yellow	elliptical to circular	elliptical to circular	circular to elliptical	circular light yellow	circular to elliptical	circular light yellow	elliptical to circular	circular to elliptical
(iv) LEAVES :									
<i>Size</i>	<i>large</i>	medium	medium to small	medium to small	medium to small	<i>large ovate</i>	medium to large	medium to small	medium to large
<i>Shape</i>	<i>ovate to broadly elliptical</i>	<i>broadly elliptical</i>	<i>ovate lanceolate</i>	<i>broadly ovate to almost circular</i>	<i>broadly elliptical</i>	<i>longer than broad</i>	<i>slightly lobed</i>	<i>elliptical</i>	<i>ovate</i>
<i>Length</i>	longer than broad	longer than broad	<i>much longer than broad</i>	slightly longer than broad	longer than broad	<i>considerably longer than broad</i>	longer than broad	much longer than broad	longer than broad

<i>Breadth</i>	<i>broad</i>	medium	medium	very broad compared with length	medium	very broad compared with length	medium
<i>Base</i>	slightly rounded lamina equal	slightly narrowed lamina unequal	slightly rounded lamina equal	slightly rounded lamina equal	slightly rounded lamina equal	narrowing lamina equal	very slightly rounded lamina equal
<i>Apex</i>	abruptly acuminate	abruptly acuminate	abruptly acuminate to acute	gradually acuminate (intermediate between I. and III.)	abruptly acuminate to acute	very gradually acuminate	gradually acuminate to acute
<i>Serration</i>	regular, acute	regular, biserrate, obtuse	regular, serrate, usually obtuse	regular, obtuse	regular, serrate, usually obtuse	regular, serrate, obtuse	regular, serrate, obtuse
<i>Surface</i>	crinkled and convex	slightly crinkled, usually flat to very slightly convex	crinkled, slightly concave, soft and fleshy	almost flat, slightly convex	crinkled, slightly convex and recurved	almost flat, slightly concave	crinkled and convex
<i>Pose in relation to stem</i>	leaf, almost horizontal on stalk, sloping outward	leaf, drooping on stalk, sloping much outward	leaf, horizontal on stalk, somewhat upright	leaf, very drooping on stalk, almost horizontal	leaf, very drooping on stalk, sloping outward	leaf, erect on stalk, upright	leaf, somewhat erect on stalk, upright
<i>Colour</i> (above)	dark green	dark green	medium green	dark green	light green	dark green	dark green
<i>Colour</i> (below)	light green	light green	light green	light green	lighter green	light green	light green
<i>Hairiness</i> (above)	few hairs	many short hairs	very many hairs	very few hairs	few hairs	almost hairless	few hairs
<i>Hairiness</i> (below)	many short hairs	many short hairs	many short hairs	some hairs	some hairs	few hairs	many short hairs
(v) <i>LEAF STALK</i>	deeply furrowed	slightly furrowed almost flat	furrow almost obsolete, roundish	slightly furrowed, almost flat	furrow well marked	slightly furrowed	v. slightly furrowed
<i>Shape</i>	medium	medium	long	medium to short	medium	short	nearly round
<i>Length</i>	very slightly reddish	reddish-brown at base	very slightly red to green	bright red	very slightly red to green	very reddish including midrib	very reddish including midrib
<i>Colour</i>	very large, serrate, lanceolate acuminate	small, entire, very narrowly lanceolate	small, entire, narrowly lanceolate	very small, entire, narrowly lanceolate	very large, faintly serrate, lanceolate acuminate	very small, entire, narrowly lanceolate	small, entire, narrowly lanceolate
(vi) <i>STIPULES:</i>							
<i>Size, margin, shape</i>							

NOTE.—The characters printed in italics will be found the most ready aids to identification.

TABLE IV.—SUMMER CHARACTERS (see p. 370).

Type.—	I. (Broad-leaved English)	II. (Doucin)	III.	IV.	V. (Doucin Améloré)	VI. (Rivers' Nonsuch)	VII.	VIII. (Frecoeb)	IX. (Jaune de Metz)
(i) GENERAL HABIT:									
Growth	<i>very strong and vigorous</i>	<i>very strong and stiff</i>	<i>strong and whippy</i>	<i>short and sturdy</i>	<i>strong and moderately sturdy</i>	<i>strong, very stout and vigorous</i>	<i>very strong and shippy</i>	<i>moderately strong and whippy</i>	<i>medium strong not sturdy</i>
Feathering	<i>not much branching</i>	<i>much spined</i>	<i>often branches, few spines</i>	<i>seldom branched</i>	<i>sometimes branched, seldom spined</i>	<i>sometimes spined</i>	<i>seldom branched</i>	<i>sometimes branched</i>	<i>sometimes spined</i>
Number of suckers (annual)	<i>medium to few</i>	<i>medium</i>	<i>many</i>	<i>few to medium</i>	<i>very many</i>	<i>medium to many</i>	<i>many</i>	<i>many to very many</i>	<i>few to medium</i>
(ii) WOOD:									
Colour	<i>dull purple-brown</i>	<i>dull, brown-purple</i>	<i>dull, dark purple</i>	<i>dull, light yellow-brown</i>	<i>reddish purple, bright</i>	<i>dull, light yellow-green</i>	<i>dull, reddish purple</i>	<i>dark, purple-brown, nearly glabrous</i>	<i>dull, greeny-brown to reddish-brown, patchy</i>
Hairiness	<i>much grey pubescence</i>	<i>some grey pubescence</i>	<i>much grey pubescence</i>	<i>much grey pubescence</i>	<i>some grey pubescence</i>	<i>much grey pubescence</i>	<i>much grey pubescence</i>	<i>some grey pubescence</i>	<i>much grey pubescence</i>
Texture	<i>smooth, covered with fine markings</i>	<i>rough, small split fissures in epidermis</i>	<i>rough, small fissures in epidermis</i>	<i>very rough, small fissures in epidermis</i>	<i>smooth, no markings</i>	<i>smooth, covered with fine markings</i>	<i>smooth, covered with very fine markings</i>	<i>smooth, covered with fine markings</i>	<i>smooth, few markings</i>
(iii) LENTICELS:									
Number	<i>many</i>	<i>very many</i>	<i>very few</i>	<i>medium to few</i>	<i>very few</i>	<i>many</i>	<i>medium</i>	<i>many</i>	<i>very few</i>
Conspicuousness	<i>not very conspicuous</i>	<i>very conspicuous</i>	<i>not very conspicuous</i>	<i>not conspicuous</i>	<i>large, very conspicuous</i>	<i>not very conspicuous</i>	<i>large and conspicuous</i>	<i>not very conspicuous</i>	<i>not conspicuous</i>
Shape and colour	<i>elliptical light yellow</i>	<i>elliptical to circular light yellow</i>	<i>elliptical to circular light yellow</i>	<i>elliptical light yellow</i>	<i>circular light yellow</i>	<i>elliptical light yellow</i>	<i>elliptical light yellow</i>	<i>elliptical light yellow</i>	<i>circular to elliptical light yellow</i>
(iv) LEAVES:									
Size	<i>large</i>	<i>medium</i>	<i>medium to small</i>	<i>medium to small</i>	<i>medium to small</i>	<i>large</i>	<i>medium to large</i>	<i>medium to small</i>	<i>medium to large</i>
Shape	<i>ovate to broadly elliptical</i>	<i>broadly elliptical</i>	<i>ovate lanceolate</i>	<i>broadly ovate to almost circular</i>	<i>broadly elliptical</i>	<i>ovate</i>	<i>almost circular slightly lobed</i>	<i>elliptical</i>	<i>medium to large ovate</i>
Length	<i>longer than broad</i>	<i>longer than broad</i>	<i>much longer than broad</i>	<i>slightly longer than broad</i>	<i>longer than broad</i>	<i>considerably longer than broad</i>	<i>longer than broad</i>	<i>much longer than broad</i>	<i>longer than broad</i>

Breadth	<i>broad</i>	<i>medium</i>	<i>narrow</i>	<i>very broad compared with length</i>	<i>medium</i>	<i>medium</i>	<i>very broad compared with length</i>	<i>narrow</i>	<i>medium</i>
Base	<i>slightly rounded lamina equal</i>	<i>slightly narrowing, lamina unequal</i>	<i>narrowing, lamina unequal</i>	<i>slightly rounded lamina equal</i>	<i>slightly narrowing lamina equal</i>	<i>slightly rounded lamina equal</i>	<i>slightly rounded lamina equal</i>	<i>narrowing, lamina equal</i>	<i>very slightly rounded, lamina equal</i>
Apex	<i>abruptly acuminate</i>	<i>abruptly acuminate</i>	<i>very gradually acuminate</i>	<i>abruptly acuminate to acute</i>	<i>gradually acuminate (intermediate between I. and III.)</i>	<i>regular, biserrate obtuse</i>	<i>acute</i>	<i>gradually acuminate</i>	<i>abruptly acuminate to acute</i>
Serration	<i>regular, biserrate, acute</i>	<i>regular, biserrate, obtuse</i>	<i>deeply biserrate, acute, irregular</i>	<i>regular, serrate, usually obtuse</i>	<i>regular, biserrate obtuse</i>	<i>regular, biserrate, acute</i>	<i>irregular, biserrate, obtuse</i>	<i>regular, serrate, obtuse</i>	<i>regular, serrate to biserrate, obtuse</i>
Surface	<i>crinkled and convex</i>	<i>slightly crinkled, usually flat to very slightly convex</i>	<i>crinkled, recurved, thin and rigid</i>	<i>crinkled, slightly concave, soft and fleshy</i>	<i>almost flat, slightly convex</i>	<i>slightly crinkled, convex and recurved</i>	<i>crinkled and slightly convex</i>	<i>almost flat, slightly concave</i>	<i>slightly crinkled and convex</i>
Pose vs relation to stem	<i>leaf, almost horizontal on stalk, sloping outwards</i>	<i>leaf, drooping on stalk, sloping much outwards</i>	<i>leaf, erect on stalk, upright</i>	<i>leaf, horizontal on stalk, somewhat upright</i>	<i>leaf, very drooping on stalk, almost horizontal</i>	<i>leaf, very drooping on stalk, sloping outwards</i>	<i>leaf, erect to horizontal on stalk, v. upright</i>	<i>leaf, very erect on stalk, upright</i>	<i>leaf, somewhat erect on stalk, upright</i>
Colour (above)	<i>dark green</i>	<i>dark green</i>	<i>dark green</i>	<i>medium green</i>	<i>dark green</i>	<i>light green</i>	<i>dark green</i>	<i>dark green</i>	<i>dark green</i>
(below)	<i>light green</i>	<i>light green</i>	<i>light green</i>	<i>light green</i>	<i>light green</i>	<i>lighter green</i>	<i>light green</i>	<i>light green</i>	<i>light green</i>
Hairiness (above)	<i>few hairs</i>	<i>many short hairs</i>	<i>many short hairs</i>	<i>many short hairs</i>	<i>very few hairs</i>	<i>few hairs</i>	<i>few hairs</i>	<i>many short hairs</i>	<i>many short hairs</i>
(below)	<i>many short hairs</i>	<i>many short hairs</i>	<i>many short hairs</i>	<i>many short hairs</i>	<i>some hairs</i>	<i>some hairs</i>	<i>some hairs</i>	<i>few hairs</i>	<i>many short hairs</i>
(v) LEAF STALK:									
Shape	<i>deeply furrowed</i>	<i>slightly furrowed almost flat</i>	<i>slightly furrowed almost flat</i>	<i>furrow almost obsolete, roundish</i>	<i>slightly furrowed, almost flat</i>	<i>furrow well marked</i>	<i>medium furrowed</i>	<i>slightly furrowed</i>	<i>v. slightly furrowed</i>
Length	<i>medium</i>	<i>medium</i>	<i>medium</i>	<i>long</i>	<i>medium to short</i>	<i>medium</i>	<i>long</i>	<i>very reddish</i>	<i>medium</i>
Colour	<i>very slightly reddish</i>	<i>reddish-brown at base</i>	<i>very reddish at base</i>	<i>very slightly red to green</i>	<i>reddish red</i>	<i>very slightly red to green</i>	<i>reddish, often along midrib too</i>	<i>very reddish including midrib</i>	<i>very reddish including midrib</i>
(vi) STIPULES:									
Size, margin, shape	<i>very large, serrate, lanceolate acuminate</i>	<i>small, entire, very narrowly lanceolate</i>	<i>small, entire, narrowly lanceolate</i>	<i>small, entire, narrowly lanceolate</i>	<i>very small, entire, narrowly lanceolate</i>	<i>very large, faintly serrate, lanceolate acuminate</i>	<i>small, faintly serrate, lanceolate acuminate</i>	<i>very small, entire, narrowly lanceolate</i>	<i>small, entire, narrowly lanceolate</i>

Note.—The characters printed in italics will be found the most ready aids to identification.

for a recognized type. Thus for a period of three and in some cases four years every stool of each type has annually had to stand the test of the type description. In the main the characters of the dormant period have been constant. Whilst the actual shade of wood colour may vary slightly from year to year according to seasonal conditions, yet the relative tones appear to remain constant, and are generally a good guide. Buds show very little variation on "one year" wood, except possibly in their angle of insertion on the stem. This feature varies mostly with the position of the bud upon the shoot and with the vigour of the individual shoot. Buds are less likely to be closely adpressed towards the middle and base of the shoot, especially on sturdy wood.

It should also be mentioned that wherever somewhat general terms are employed in the identification tables, terms such as "numerous" or "few," "large" or "small," "longer than broad" or "broader than long," these terms represent actual facts ascertained through a long process of taking measurements and counts. These measurements and counts have been recorded, but, except in one instance, namely, that of the relative "Leaf Measurements" given in Table V., it seemed better not to risk confusion by allowing such minute details to preponderate. It is sufficient to say that the terms chosen to describe any character are such as to express as nearly as possible the relationship of one type with another and the degree of "constancy" that can be looked for in any particular character.

Table IV. serves the same purpose in summer as Table III. does in winter (see p. 370). Both these tables have been carefully tested as a means to identification by a friend who was not cognizant of the nine types, but who was handed them mixed up together in one bundle. Within a very short space of time all the shoots had been rightly numbered according to type, so that it is hoped, with some confidence, that these two tables may prove similarly useful to those concerned in the subject. Both Tables may be criticized as being needlessly detailed and exhaustive, but it was felt that all previous descriptions had erred so much on the other side that they afforded no infallible guide to identification.*

* Some of the best descriptions I have yet seen are those quoted in the *Revue Horticole* (Dec. 16, 1916) in an article on "Le Pommier Paradis" by M. GÉROME. In comparing the distinctive characters of the French Paradise and the Doucin, M. GÉROME gives the descriptions of two French botanists as being the most useful. Here are the descriptions:—

Paradis. "Feuilles vertes en dessous, d'abord pubescentes sur les nervures, puis glabres; bourgeons velus non tomenteux. Pédicelles glabres ou pubescents, ainsi que le tube du calice; fruit très acerbe."

Doucín. "Feuilles blanches tomenteuses en dessous même à l'état adulte; bourgeons tomenteux. Pédicelles pubescents tomenteux ainsi que le calice; fruit à saveur douce." (G. DE SAINT-PIERRE, "Flore des environs de Paris.")

The second description, which takes into account characteristics of growth, considerably aids the above.

Paradis. "Arbre peu élevé à rameaux épineux; feuilles adultes glabres sur les deux faces; fruit très acerbe."

Doucín: "Arbre assez élevé à rameaux peu ou point épineux; feuilles adultes tomenteuses en dessous; fruit douceâtre" (M. l'Abbé COSTE, "Flore illustrée de la France").

Up to the present, except in a very few instances, we have had no blossom or fruit to aid us, and the remaining characters of leaf and bud just quoted in the footnote would not carry us far in an identification of mixed types. Moreover, from the second description of vegetative characters the fact becomes apparent, read side by side with the present records, that certain characteristics may vary according to the district. The Doucin has proved at East Malling the most "feathered" or "spiny" of all the types. Hence the necessity is proved for taking the widest possible survey of all characters, if this work is to give any common ground for comparison.

XII. *The Actual Value of the Present Figures and Measurements.*

The characters in Table IV. were compiled in an exactly similar manner to those in Table III., except that the observations were made during the growing season. Every stool has been repeatedly subjected to critical examination. The shoots described are the long shoots of the current year's growth, whilst the leaves are from similar wood. It is of course realized that the stools from which these characters were collected are very strong and healthy, being in their first full vigour and having been planted on good ground. However, it appears quite true to say that whilst actual measurements of strength and size may vary as the stools become older, the relative strength and vigour are likely to be maintained. Within a period of four years it has already become noticeable that as the stools grow older they send up more numerous shoots annually, whilst they tend to be slightly less strong individually, but the various types have maintained, with little exception, their relative number of suckers and degree of strength. This fact is very well illustrated in Table V., which gives the average measurements of the leaves of each type. First typical or medium-sized leaves—chosen from average shoots of known measurement—were selected from the middle of such shoots and measured. These afforded the ratio between length and breadth of leaf-blade on individual types and between one type and another. They also took into account the relative length of petiole and apex. The largest leaves were then chosen from the most vigorous shoots. They were similarly measured, and it was found that in nearly all cases the proportions remained closely similar. If there proved to be any deviation, it was generally in the form of an exaggeration of an already existing tendency. For example, in Type VI. the tendency in the medium leaves is towards length (6.2 cm.) considerably exceeding breadth (4.0 cm.); when the largest leaves were measured this tendency was exaggerated, the average length (9.3 cm.) greatly exceeding the breadth (6.4 cm.). In Type VII., where the leaf normally tends to approach the circular form, the roundness is almost complete in the largest leaves. Their average length is 7.7 cm., and breadth 7.2 cm., as against 5.9 cm. and 4.8 cm. in the medium leaves. Similarly in Types V. and VIII. shortness of leaf-stalk is accentuated. Finally, quite small leaves were taken off weak one-year bedded layers of the

various types, yet even these leaves maintained their relative characteristics. Thus it may be hoped that these tables faithfully represent a permanent relationship between characteristics in individuals and between type and type. It is in this light that they should be read.

TABLE V.—AVERAGE LEAF MEASUREMENTS IN CENTIMETRES.*

—	Leaf-blade maximum length.	Leaf-blade maximum breadth.	Length of petiole.	Length of apex.	Ratio of length of blade to petiole.	Leaves.
Type I. (Broad-leaf)	9·4	7·0	2·1	·8	1:4·4	Large
	6·7	4·6	1·5	·7	1:4·3	Medium
	5·2	3·6	1·6	·3	—	Small
Type II. (Doucin)	8·8	5·7	1·8	·7	1:4·8	Large
	5·9	3·9	1·3	·6	1:4·5	Medium
	4·9	3·0	1·5	·2	—	Small
Type III.	8·1	5·3	1·5	1·2	1:5·6	Large
	6·0	3·3	1·4	1·1	1:4·3	Medium
	5·1	2·6	1·5	·9	—	Small
Type IV.	6·7	5·3	1·7	·7	1:4·0	Large
	4·9	3·6	1·5	·5	1:3·3	Medium
	3·4	2·4	1·1	·2	—	Small
Type V. (Doucin Amélioré)	6·1	4·1	1·1	·8	1:5·7	Large
	5·1	3·4	1·0	·9	1:5·0	Medium
	4·2	2·5	1·1	·4	—	Small
Type VI. (Nonsuch)	9·3	6·4	2·0	·7	1:4·6	Large
	6·2	4·0	1·4	·6	1:4·3	Medium
	5·9	3·9	1·7	·6	—	Small
Type VII.	7·7	7·2	2·3	·7	1:3·4	Large
	5·9	4·8	1·9	·4	1:3·1	Medium
	5·5	4·1	2·0	·4	—	Small
Type VIII. (French)	8·1	5·1	1·2	1·3	1:7·0	Large
	5·9	3·2	1·0	·9	1:5·8	Medium
	4·5	2·4	1·0	·5	—	Small
Type IX. (Jaune de Metz)	8·4	6·1	1·7	·8	1:4·9	Large
	6·1	3·9	1·4	·5	1:4·5	Medium
	No leaves available for these measurements.					Small

The Illustrations and the Tables.—If Figures 70 to 77 and 89, *i.e.* the photographs of the nine types grown as stools, are studied side by side with Table IV., section (i) General Habit, and the descriptions of the Pose in Relation to Stem in section (iv) Leaves, they will be found to show most strikingly the very obvious superficial differences of growth and leaf-pose.

Figures 78 to 86 show the various summer details; Table IV., section (iii) Lenticels, section (iv) Leaves, section (v) Leaf Stalk, and section (vi) Stipules are all well illustrated, the surface and pose of leaf being well brought out.

* N.B.—Measurements were in all cases taken to the nearest millimetre and the averages were also calculated in the same way.

Figures 87 and 88 afford all the details for studying leaves, leaf stalk, and stipules. The leaves chosen for these two photographs—which show upper and under surface—were average type leaves, so that they might give a good idea of the relationship of leaf size in the various types. The separation of Paradise types being completed, it was possible to observe the following details relating to vigour :

XIII. *Other Observations.*

A. TERMS USED IN THE VIGOUR TABLE.

Height.—This refers in the case of the stools to the average height of the annual growths from the point of moulding up to the extreme terminal bud.

In the case of the four-year-old cordons, the height of the main stem or leader—*i.e.* four years' annual growths—was taken.

Stoutness.—In the case of the annual shoots or layers from stools the girth was measured about the position where stocks are usually budded or grafted after planting (about 10 cm. from ground level). By this method stocks are often graded in the nursery and are catalogued as so many millimetre stocks.

In the case of the four-year-old cordons the girth was measured at a uniform distance of 6 cm. from the ground level.

Toughness of Wood.—This characteristic, being very noticeable in severing or breaking the shoots from the parent stool, was recorded as possibly being of some utility.

Feathering takes the two forms of "branching" or "stiff spines." A "clean" stock is of course preferable for "working." The word "working" signifies budding or grafting upon a stock.

Layers.—Every annual growth or shoot from the parent stool is here referred to as a layer. The words have been used synonymously. A layer, strictly speaking, implies a growth "layered" or bent out and earthed over (moulded up) for the purpose of encouraging adventitious rooting. As all the annual growths on the stools were thus treated they are called "layers."

Season.—There are very notable differences in earliness of bud-breaking or starting into growth and of lateness of leaf-fall. This is reflected too somewhat in the immaturity or development of the adventitious roots. It is at present impossible to say how far an early or late stock would affect the scion worked thereon.

Blossom on Cordons.—So far there has been very little bloom and no set of fruit on the cordons. I have seen the Doucin fruiting at the John Innes Horticultural Institute at Merton, and the Jaune de Metz at the Royal Nurseries, Maidstone, but so far our specimens have not fruited.

Suckers from Roots.—This term is used in distinction from the growths, shoots, or layers coming from the old wood of the parent stool. These suckers are the growths which originate direct from the roots. It is often said that these suckers arise from injury to

the roots in digging &c., but they also arise naturally and seem especially characteristic of certain varieties.

Liability to Disease.—Notes were taken on this point both as an aid to looking after the nursery-bed, and in the hope of eventually selecting certain root systems possessing some degree of immunity in this country to disease. In Australia “resistant” stocks are used, but those varieties do not prove “resistant” here.

B. THE DESCRIPTIONS OF ROOT CHARACTERS INCLUDE :

The Number and Position of the Roots.—Sometimes the roots appear in clusters, at other times almost singly.

On some types this adventitious rooting is almost confined to the base of the shoot, on others it appears as far as the shoots are earthed up.

Sometimes the best rooting appears on the “heel” of old wood, whence the young growth has arisen.

Adventitious roots are those which do not arise from the original root of any seedling. Since Paradise stocks are normally raised from layers and not from seed, all the roots produced by this method are adventitious roots. In contrast, the original or primary root of the commercial “free stock,” which is raised from seed, is not adventitious.

The Quality (Nature) of Roots.—The young adventitious roots seem to vary in their stage of development. They are all fibrous adventitious roots, but in some cases these roots—which may be termed “roots of the first order”—have become branches and well furnished with more fully developed fibre. These fibrous offshoots from the roots of the first order (the original adventitious roots) may be conveniently termed “adventitious roots of the second order.”

Type of Rooting on the 4-year-old cordons. The object here is to distinguish between those types which are well furnished with fibre and those which possess mainly strong coarse lateral roots and little fibre. The word “coarse” is used in Table VI. in reference to these main lateral roots.

Spread and Depth of coarse (or lateral) Roots on 4-year-old cordons. The object here is to describe, as far as possible, the rooting habit—whether deep or surface rooting, whether of small or wide circumference.

Anchorage.—This term refers to the hold which the coarse roots possess on the soil as experienced in “lifting” the cordons.

One and Two Year Bedded Stocks.—This term has been used to describe stocks raised in the following manner. It is a common practice to select annually from the parent stool the sturdiest-looking shoots. The shoots can scarcely be termed layers, as they are often very poorly rooted, and sometimes without any roots. They are bedded in the ground like cuttings for a period of one

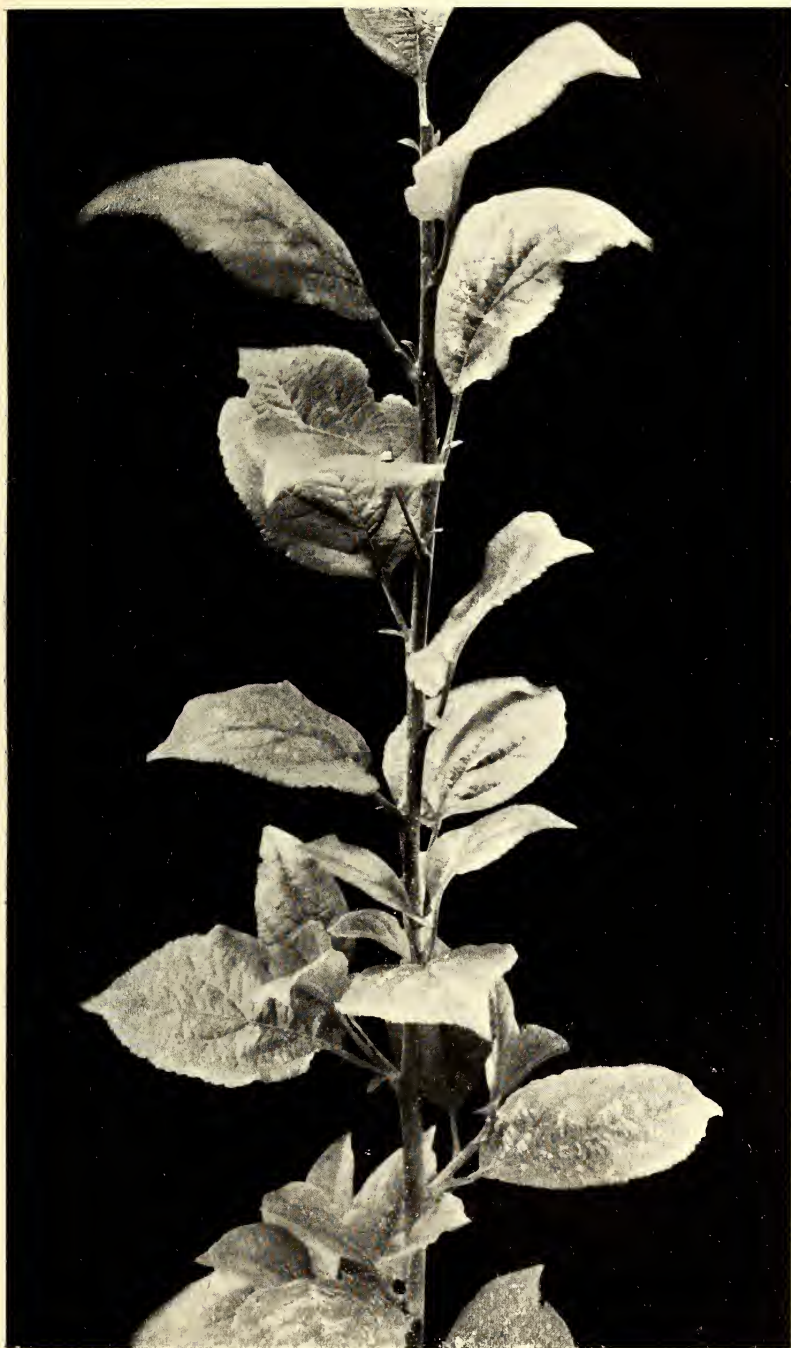


FIG. 86.—PARADISE STOCK, TYPE IX. SHOWING SUMMER CHARACTERS.
'JAUNE DE METZ PARADISE.'

[To face p. 384.]

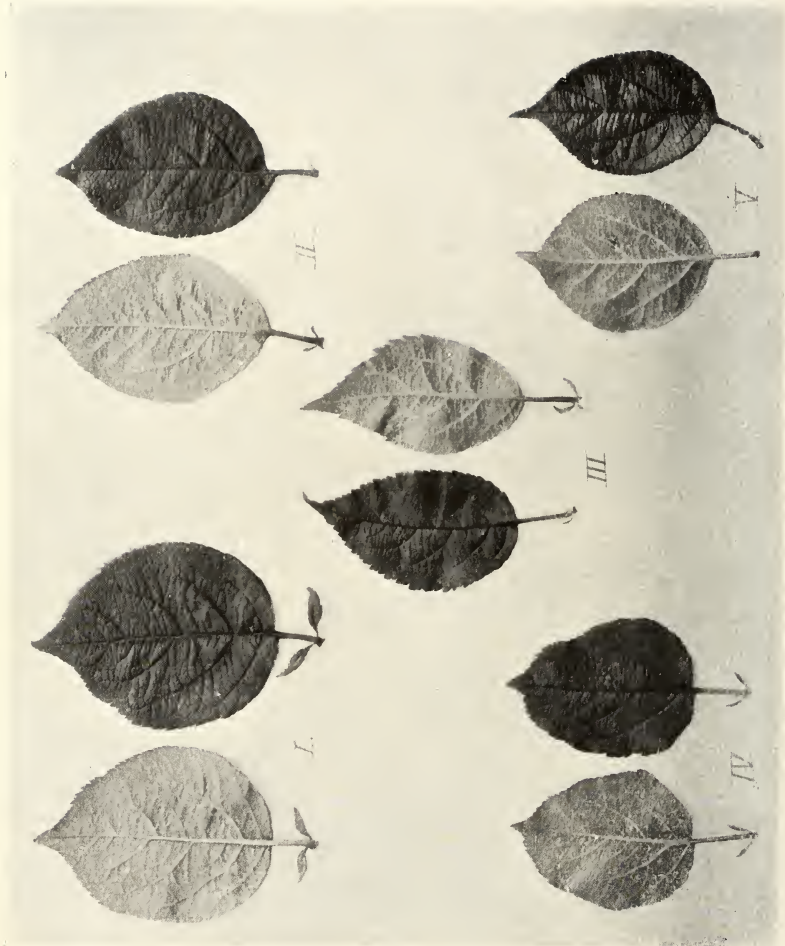


FIG. 87.—RELATIVE SIZE AND GENERAL LEAF CHARACTERS, UPPER AND UNDER SURFACE, OF TYPES I. TO V. PARADISE STOCKS.

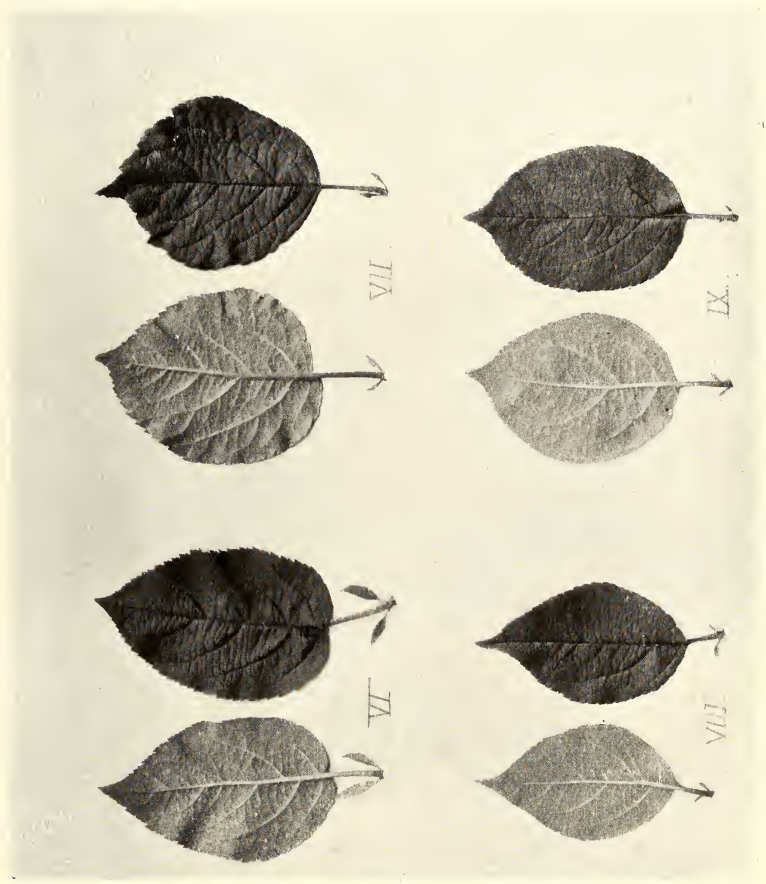


FIG. 88.—RELATIVE SIZE AND GENERAL LEAF CHARACTERS, UPPER AND UNDER SURFACE, OF TYPES VI. TO IX. PARADISE STOCKS.



FIG. 89.—PARADISE STOCK, TYPE IX.
'JAUNE DE METZ PARADISE.'



FIG. 90.—TYPE IX, ONE YEAR ROOTED LAYERS.
'JAUNE DE METZ PARADISE.'

[To face p. 385.]

or two years. Sometimes they undergo the process of transplanting. These stocks are variously described in the trade as "one or two year bedded," "once transplanted," &c. They approach the cutting rather than the layer.

The "Stool" and its formation have been described in the cultural section of this Report (p. 368). The stool is simply the parent stock or plant from which cuttings or layers are taken.

XIV. *Relative Vigour.*—Table VI.

There has proceeded, side by side with the identification work, a comparative study of the vigour of the types as demonstrated by the growth and habit of the stools and of the stocks grown as cordons for fruiting purposes. Whilst it is of course impossible to claim that the vigour thus shown is certain to reappear in the scions worked on the particular type, it is the only measure of comparative utility which it has been possible to make at present. Moreover, the actual vigour as revealed in the suitability of each type for stool-making must be of considerable practical importance to the nurseryman. Certain types, for instance, annually afford very numerous stocks, whilst others afford fewer but much more sturdy ones. These points are brought out in the comparative descriptions of the height, stoutness, and annual number of shoots or layers of the stool growths. Another point of interest to the nurseryman will be the tendency towards cleanness or feathering and spininess, a characteristic which makes certain types considerably more valuable for the purposes of budding or grafting. That this characteristic may vary somewhat on different soils is true. It is illustrated by a comparison between our own description of the Doucin and French Paradise in this respect with the French description already quoted (p. 380). At the same time this characteristic spininess has remained very fairly constant at East Malling throughout the four years of examination. It is also certain that the strongest shoots tend to be much more spiny, where spines are at all characteristic, than the medium and weaker shoots. The relative liability to mildew (*Podosphaera leucotricha*) and scab (*Fusicladium dendriticum*) should also be of use in dealing with the nursery-bed.

The fact, too, that the various Paradise types, as regards their vegetative season, afford some sort of succession may prove useful where large stock beds have to be worked. The French nurserymen appear to prolong the period of "working" by using the Jaune de Metz in succession to the French—which is notably early in bud-breaking. What measure of forecast for future promise the other points in the "Vigour" Table afford the grower it is impossible to say. The tendency to "sucker" from the roots at any rate is immediately useful as a guide, for this has been a constant source of annoyance to growers. This habit appears exceptionally marked in Types II. (Doucin), III., and VIII. (French). The early appearance of "fruit buds" and blossom on certain types may afford some measure by which to judge the age at which the fruit-bearing period is likely to begin and the

TABLE VI.—VIGOUR TABLE.

Type:—	I. Broad-leaved.	II. Doucin.	III.	IV.	V. Doucin Améloré.	VI. Nonsuch.	VII.	VIII. French.	IX. Jaune de Metz.
HEIGHT (Annual growth 4-year cordons)	very tall tall	very tall very tall	very tall medium tall	short very short	medium tall tall	medium tall medium tall	very tall medium tall	medium tall short	medium tall to short medium tall
STOUTNESS (Annual growth 4-year cordons)	stout, few slender stout	stout, numerous slender very stout	stout, numerous slender medium stout	medium stout numerous slender medium stout	medium to slender very even medium stout	very stout few slender very stout	stout few slender medium stout	medium to slender, numerous, slender medium stout to slender	medium, stout, even medium stout
TOUGHNESS of wood	tough	very tough	tough	looks "unkindly," somewhat brittle	tough	tough, looks "unripe"	tough	somewhat brittle	somewhat brittle
FEATHERING	some branching, few spines	very spined on stout shoots	numerous long drooping branches few spines	some branching, spines rare	some branching, few spines	stout shoots, often very spined, variable	stout shoots branching few spines	some branching, few spines	some short branches, often spined
Annual number of LAYERS per stool	medium	medium more than Type I.	numerous	few to medium	numerous	medium to numerous	medium to numerous	numerous	medium to few
SEASON of growth	medium	early leaf-fall	medium	early bud- breaking	medium	very late leaf-fall	medium	very early bud-breaking	medium
FRUIT BUDS on annual growth	infrequent	some at base	infrequent	infrequent	infrequent	some	infrequent	some	frequent
BLOSSOM on cordons	none	none	none	none	none	some in 1916 failed to set fruit	none	some in 1916 failed to set fruit	none
SUCKERS from Roots on cordons	no suckers	badly suckered from spreading roots	some suckers, mainly from base of root	no suckers	some suckers	no suckers	no suckers	some suckers	no suckers
Liability to DISEASE	no suckers	frequently suckered	all suckered	few suckers	some suckers	no suckers	few suckers	some badly suckered	all suckered
	very healthy, little mildew	very healthy	moderately healthy, mildew and scab present	liable to leaf damage, several dead stools	healthy little mildew	very healthy some mildew	healthy some mildew	badly scabbed on leaves	healthy

ROOTING VIGOUR.

	1-YEAR LAYERS. <i>Readiness to root</i>	very free	v. shy (stoutest often not rooted)	most free	freely, roots mostly at base	free	most free	shy, roots mostly at base	shy (stoutest sometimes unrooted)	shy
NUMBER AND POSITION of roots	very numerous as far as earthed up	very numerous as far as earthed up	very numerous as far as earthed up	very numerous as far as earthed up	not very numerous, mainly at base on 2-year heel	numerous as far as earthed up	most numerous as far as earthed up	scanty, nearly all at base on 2-year heel	scanty tendency to root as far as earthed up	scanty, as far as earthed up
QUALITY of roots	very well developed, often 12" long, many roots of 2nd order	v. well developed, of 18" long, very many roots of 2nd order	v. well developed, of 18" long, very many roots of 2nd order	v. well developed, of 18" long, very many roots of 2nd order	not v. well developed, short, few roots of 2nd order	well developed, often 12" long, many roots of 2nd order	very coarse and succulent, often 12" long, few roots of 2nd order	well developed, some roots of 2nd order	not very well developed, brittle, some roots of 2nd order	brittle and succulent, few roots of 2nd order
ROOT KNOTS on stem of cordons	small knots and few	v. small and inconspicuous	v. large and clustered, burr-like, numerous	v. large and clustered, burr-like, numerous	many bulbous swellings	very large and clustered, burr-like, numerous	small bulbous swellings	small bulbous swellings	small clustered "burr-like"	small swellings
4-YEAR ROOTS. Type of rooting	mixed, coarse and fibrous	mainly coarse	mixed, coarse and fibrous	mixed, coarse and fibrous	mixed, coarse and fibrous	mixed, coarse and fibrous	mixed, coarse and fibrous	mainly coarse	mixed, coarse and fibrous	
COARSE ROOTS, spread and depth	not so coarse or deep rooting as Type II., wide-spread	very coarse, deeper than Type I., wide-spread	not so coarse as Type I., roots tending to grow downward at once, medium spread	not so coarse as Type I., roots tending to grow downward at once, medium spread	not so coarse as Type I., very surface rooting, medium spread	not so coarse as Type I., roots tending to grow downwards small spread	coarser than Type I., medium depth, wide-spread	similar to, not so coarse as Type I., medium depth, wide-spread	not so coarse as Type I., roots tending to grow downward, small spread	No 4-year old roots were available for description
ANCHORAGE	good	v. good	medium	medium	poor	medium	good	medium	poor	
ROOT FIBRE	very much from stem and coarse roots	very little, conspicuously absent	very much from stem and coarse roots	very much from stem and coarse roots	much from stem and coarse roots	mainly confined to stem	very much from stem and coarse roots	very little, conspicuously absent	much from stem and coarse roots	
New Adventitious Roots	some on stem and coarse roots	not present	some on stem	some on stem	some on stem	few	some on stem	not present	few	

ON CORDONS.

TABLE VI.—VIGOUR TABLE.

Type:—	I. Broad-leaved.	II. Doucin.	III.	IV.	V. Doucin Améloré.	VI. Nonouch.	VII.	VIII. French.	IX. Jaune de Metz.
HEIGHT { Annual growth 4-year cordons	very tall tall	very tall very tall	very tall medium tall	short very short	medium tall tall	medium tall medium tall	very tall medium tall	medium tall short	medium tall to short medium tall
STOUTNESS { Annual growth 4-year cordons	stout, few slender stout	stout, numerous slender very stout	stout, numerous slender medium stout	medium stout numerous slender medium stout	medium to slender very even medium stout	very stout few slender very stout	stout few slender medium stout	medium to slender, numerous, slender medium stout to slender	medium, stout, even medium stout
TOUGHNESS OF WOOD	tough	very tough	tough	looks "unkindly" somewhat brittle	tough	tough, looks "unripe"	tough	somewhat brittle	somewhat brittle
FEATHERING	some branching, few spines	very spined on stout shoots	numerous long drooping branches few spines	some branching, spines rare	some branching, few spines	stout shoots, often very spined, variable	stout shoots branching few spines	some branching, few spines	some short branches, often spined
Annual number of LAYERS per stool	medium	medium more than Type I.	numerous	few to medium	numerous	medium to numerous	medium to numerous	numerous	medium to few
SEASON of growth	medium	early leaf-fall	medium	early bud- breaking	medium	very late leaf-fall	medium	very early bud-breaking	medium
FRUIT BUDS on annual growth	infrequent	some at base	infrequent	infrequent	infrequent	some	infrequent	some	frequent
BLOSSOM on cordons	none	none	none	none	none	some in 1916 failed to set fruit	none	some in 1916 failed to set fruit	none
SUCKERS from stools Roots on cordons	no suckers no suckers	badly suckered from spreading roots frequently suckered	some suckers, mainly from base of root all suckered	no suckers few suckers	some suckers some suckers	no suckers no suckers	no suckers few suckers	some suckers some badly suckered	no suckers all suckered
LIABILITY to DISEASE	very healthy, little mildew	very healthy	moderately healthy, mildew and seab present	liable to leaf damage, several dead stools	healthy little mildew	very healthy some mildew	healthy some mildew	badly scabbed on leaves	healthy

ROOTING VIGOUR.

	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.
1-YEAR LAYERS. Readiness to root	very free	v. shy (stoutest often not rooted)	most free	moderately free, roots mostly at base	free	most free	shy, roots mostly at base	shy (stoutest sometimes unrooted)	shy
NUMBER AND POSITION of roots	very numerous as far as earthed up	scanty tendency as far as earthed up	very numerous as far as earthed up	not very numerous, mainly at base on 2-year heel	numerous as far as earthed up	most numerous as far as earthed up	scanty, nearly all at base on 2-year heel	scanty, tendency to root as far as earthed up	scanty, as far as earthed up
QUALITY of roots	very well developed, often 12" long, many roots of 2nd order	not v. well developed, some roots of 2nd order	v. well developed, of 18" long, very many roots of 2nd order	not v. well developed, short, few roots of 2nd order	well developed, often 12" long, many roots of 2nd order	very coarse and succulent, often 12" long, few roots of 2nd order	well developed, some roots of 2nd order	not very well developed, brittle, some roots of 2nd order	brittle and succulent, few roots of 2nd order
ON CORDONS.									
ROOT KNOTS on stem of cordons	small knots and few	v. small and inappreciable	v. large and clustered, burr-like, numerous	many bulbous swellings	very large and clustered, burr-like, numerous	small bulbous swellings	small bulbous swellings	small clustered "burr-like"	small swellings
4-YEAR ROOTS. Type of rooting	mixed, coarse and fibrous	mainly coarse	mixed, coarse and fibrous	mixed, coarse and fibrous	mixed, coarse and fibrous	mixed, coarse and fibrous	mainly coarse	mixed, coarse and fibrous	
COARSE ROOTS, spread and depth	not so coarse or deep rooting as Type II., wide-spread	very coarse, deeper than Type I., wide-spread	not so coarse as Type I., roots tending to grow downward at once, medium spread	not so coarse as Type I., very surface rooting, medium spread	not so coarse as Type I., roots tending to grow downwards small spread	coarser than Type I., medium depth, wide-spread	similar to, not so coarse as Type II., medium depth, wide-spread	not so coarse as Type I., roots tending to grow downward, small spread	No 4-year old roots were available for description
ANCHORAGE	good	v. good	medium	poor	medium	good	medium	poor	
ROOT FIBRE	very much from stem and coarse roots	very little, conspicuously absent	very much from stem and coarse roots	much from stem and coarse roots	mainly confined to stem	very much from stem and coarse roots	very little, conspicuously absent	much from stem and coarse roots	
New ADVENTITIOUS ROOTS	some on stem and coarse roots	not present	some on stem	some on stem	few	some on stem	not present	few	

duration of its profitable life, though at present such conclusions must be drawn with great caution. The same applies to the facts revealed by the height and stoutness of the four-year-old cordons. It should here be mentioned that the main shoot or leader of the cordons has never been pruned back, because it would have been impossible in that case to measure accurately the relative heights. The lateral growth or "breast wood" was treated normally and "spurred" in summer and winter.

The selection of a particular type should be a matter for agreement between the grower and the nurseryman. In the first place, it must be remembered that the best stock for the nurseryman need not invariably be ultimately the best for the grower. The nurseryman rightly aims at producing a vigorous young tree in as short a time and with as little handling as possible. The commercial grower demands the strongest-looking young tree as being *ipso facto* the most profitable and the nurseryman endeavours to supply that demand. But it is a matter for consideration whether ultimate maturity and hardiness may not be governed by other things besides very early vigour of wood-growth. What the grower really wants the nurseryman will be willing to give, provided the grower recognizes the value of a standardized stock. That the private gardener's requirements of a stock will differ from those of commercial growers seems certain. That a great deal more use might be made of the varietal differences of stocks in relation to scions from parents of strong and weak constitution is probable. Soil and climatic conditions are also likely to dictate suitability to some extent.

Problems such as these are at once suggested by a comparative study of the Paradise types. They can only be solved satisfactorily by extensive trials, which will occupy most of the available ground at East Malling, and also require trial plots in districts widely divergent in soil conditions. Collections of Plum, Pear, and Cherry stocks have also been made, and a systematic trial of them on lines somewhat similar to Apple stocks is already in progress.

XV. *Comparative Rooting Vigour.*—Table VI.

A. *The One-Year Layers.*—The comparison of rooting vigour judged from the readiness with which one-year layers of the various types root adventitiously suggests that very important differences are likely to exist in the ultimate utility of the Paradise types.

Over a period of three years the main features in the rooting capacity of one-year layers have remained remarkably constant. It may be argued that nurserymen are not generally in the habit of using one-year layers or of severing them from the parent stool at that age, and that therefore the present descriptions do not show the stock as it is really "worked." This is quite true, and it was not the intention to describe in the first place the one or two year bedded stock. The object is simply to afford a common ground for comparison as to readiness to



FIG. 91.—One-year-rooted layers.

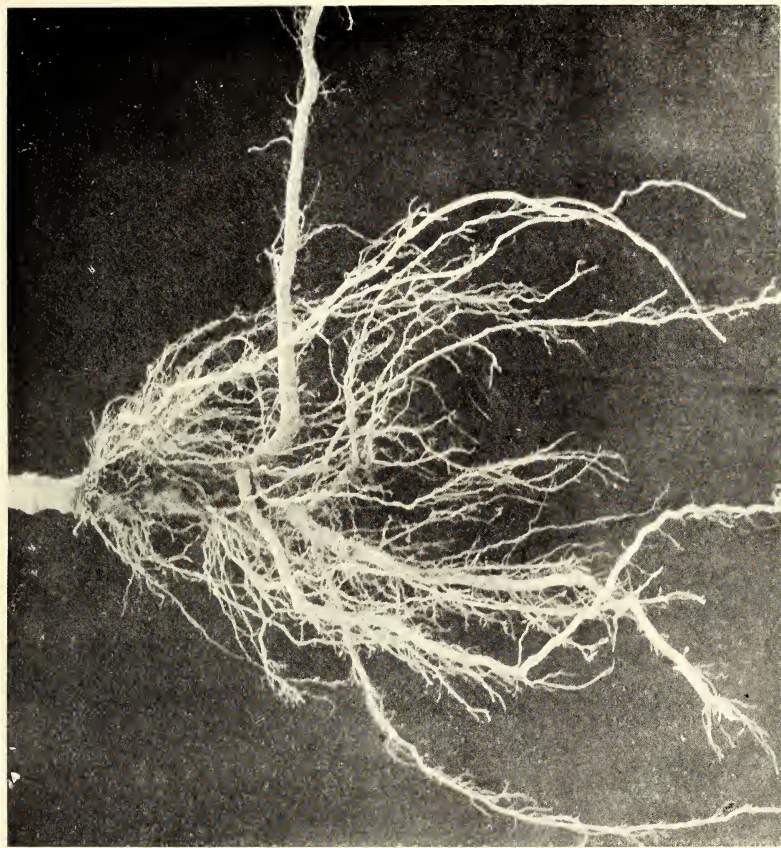


FIG. 92.—Four-year-old root system.

TYPE I. BROAD-LEAVED ENGLISH PARADISE.
Note the quality of the root-fibres on the older roots.

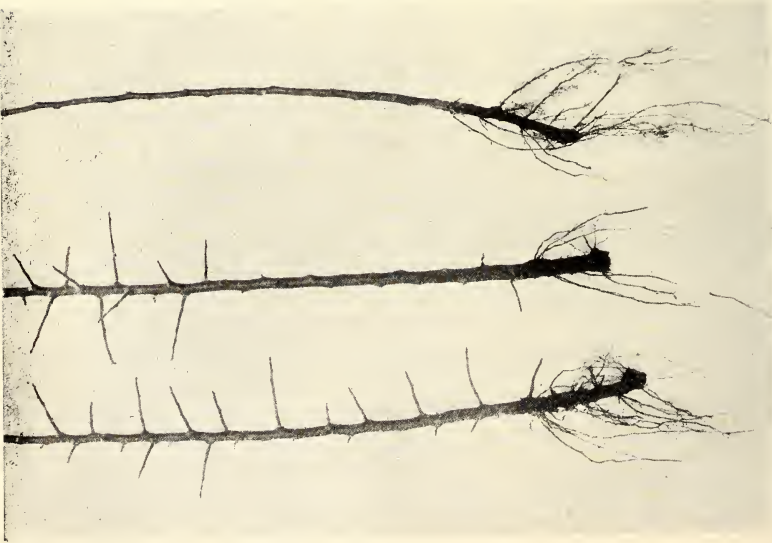


FIG. 93.—One-year-rooted layers.

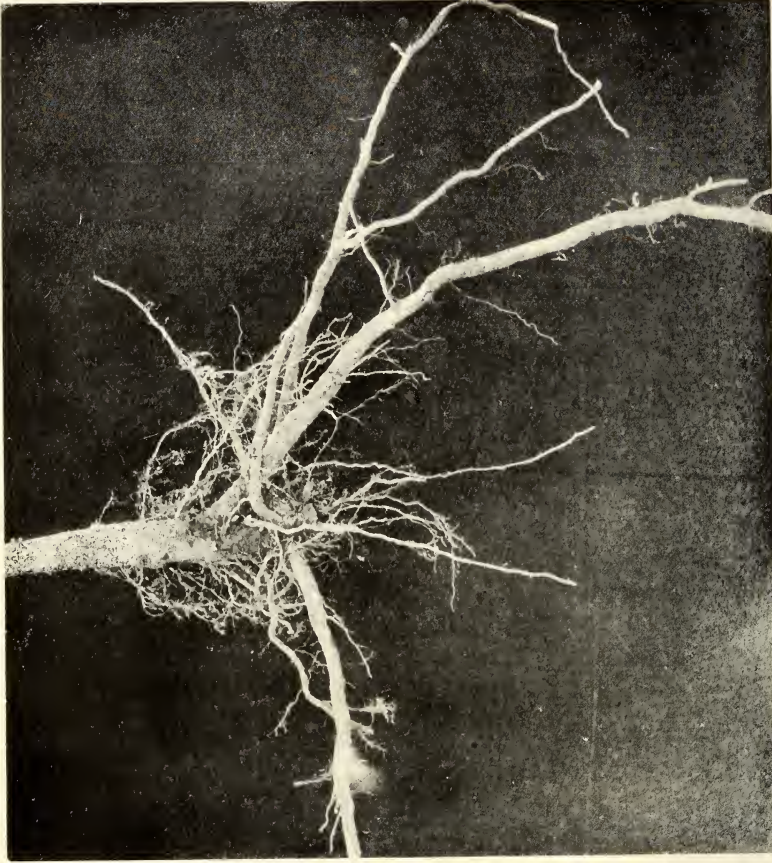


FIG. 94.—Four-year-old root system.

TYPE II. DOUCIN.

Note coarseness of main roots and comparative lack of fibre.

root in the initial stages. Moreover, it must be remembered that nurserymen do not always practise the annual method of frequent moulding up which has been employed in these experiments, so that many of the one-year growths or layers thus produced are as good or better than much of the one or two year bedded stuff in commercial use, which has often remained on the parent stool for several years before being taken off and bedded, without having made nearly as much adventitious rooting. The encouragement of natural rooting is of course aided by the early and repeated process of drawing earth over the bent-out annual layers.*

Hence our one-year rooted growths taken from the stools will appear, perhaps, abnormal to the nurseryman, as they are generally better furnished with roots than most of the shoots, taken from stools, that are annually bedded for making stocks. Our stools have annually been completely stripped of all growths. Nevertheless our one-year layers, which have all been treated exactly alike, afford an admirable ground for comparison as to the tendency of each variety in our soil towards adventitious rooting.

One-year bedded stocks of all the types, raised according to the most common method, have also been examined and they appear to exhibit relatively much the same rooting characteristics, though the rooting is not generally so vigorous as on the one-year layers. On the other hand their development is perhaps more mature.

However, it seems likely that one year of careful layering might produce a sturdier stock and also save a good deal of subsequent handling and labour.

As regards the degree of constancy exhibited throughout in these results, the figures speak. The general tendency is for shoots of medium stoutness to root best, probably because they possess both the requisite amount of suppleness for layering and sufficient vigour for "striking." The stoutest shoots are often very stiff and erect,† and in shy rooting types such as II. (Doucin) and VIII. (French) they often fail to send out any adventitious roots the first year. The weak shoots are almost invariably rooted, but the rooting is naturally not so vigorous as on the medium growths.

Varying seasonal conditions have afforded several indications that they influence in some degree certain of the types of root system. Types I., II., III., IV., VI., and VII., have given no results in this direction, but the cases of Types V. and VIII. are worth recording. The first summer of the layering trials was 1914, and at East Malling considerable dry periods were experienced during the growing season. In that

* Experiments both with regard to the need for bending out the annual growths and for commencing the process of earthing early have been carried out. Generally, the results point to the expediency of starting the moulding up early (June) in order to obtain the best results. The weight of the mould itself upon the young supple growths is sufficient to ensure all the layering necessary.

† This erectness, being characteristic of the Doucin (Type II.) throughout, may in part account for its shy rooting tendency in the early stages. It is the most difficult type to "lay."

season Type V. stood out as possessing a very promising root system in its first year. It rooted very readily and the individual roots were of considerable length and well developed. The two following summers (1915 and 1916) were considerably more rainy, and Type V. showed a marked falling off in its rooting quality, both in freedom and development. Exactly the reverse appeared to be the case of Type VIII. (French), the rooting habit of which undoubtedly showed a slight improvement during 1915 and 1916. The latter case may, of course, partly be accounted for by the fact that the stools had become more established. We also learned with certain types that it was easy to break the layers away from the parent stool, a method which gave more root system to all those types which tended to root more freely at the base and on a heel of two-year wood. Previously we had cut each layer from the parent as close to the stool as was conveniently possible. In view of the future condition of the stool and the obtaining of fresh annual shoots, the latter method seems most to recommend itself generally. Type IX. has so far only been tested during the two moister seasons, so that it is impossible to speak very definitely of its rooting characteristics, but it appeared to root more freely during last summer (1916) when we experienced the heaviest rainfall.

The question as to whether differing soil conditions affect this early adventitious rooting is now being tested, but in view of the fact that the French choose the Doucin, the French Paradise, and the Jaune de Metz as free rooting types, this assumption appears true, since these types root least well at East Malling.* On the other hand, complaints have been received from a nursery in another part of England that the bedded Doucin stocks root so poorly that the raising of them was likely to be discontinued. I have also tried to root Doucin layers on my own soil—which is considerably heavier than that at East Malling—but the results were almost identical. The fact that so many of the Doucin stocks in common use all over the country are bought in from France is sufficient to account for its predominance in our nurseries, despite its shy rooting habit here.

B. *The Four-Year Old Roots.*—How far early-rooting powers indicate future promise has to be considered. Sufficient data have not yet been collected to enable us to follow closely the life-history of the roots at this early stage and so differentiate their future functions and character. However, the examination of numerous roots of each type at later stages of development seems to show that in the main it is possible to draw safely certain inferences from the early habit.

Types I. (Broad-leaf) and VI. (Nonsuch), for instance, which in their earliest stages exhibit sturdiness together with an ample root system, continue to develop along these lines. The early rooting of the Nonsuch is distinctly coarser than that of the Broad-leaf, and this characteristic is maintained. Type II. (Doucin), as would be expected,

* I have also heard it asserted that the True Broad-leaved English—one of our most freely rooting types (Type I.)—will not root successfully in the French nurseries, but I cannot state this authoritatively.

develops along totally different lines, and, except for some similarity to Type VII., it stands out quite by itself in its subsequent development. It is scantily furnished with adventitious roots from the start, it is noticeably lacking in young fibre later. Type III. retains its very fibrous habit and somewhat less coarse development than Types I. and VI. Type IV. again maintains its characteristic weak roots which spread horizontally from the heel. Type V. (the Doucin Amélioré), which in the first dry season seemed to show considerable promise of vigour, was perhaps more noticeable for the length of some of its adventitious roots than for the abundance of them. They were never so numerous or well developed as on Types I., III., and VI. This characteristic seems to persist in the somewhat long bare lateral roots of downward tendency whilst the type retains its habit of adventitious rooting particularly around the stem. Type VII., which did not show an early tendency to throw a large amount of vigorous fibre, though scarcely as shy rooting as Type II., has developed along somewhat similar lines to the Doucin. As might be expected, its lateral roots are not quite so coarse. The lack of early vigour in Types VIII. and IX. seems reflected in the subsequent root systems which have developed with a general lack of sturdiness. The maturing root systems of the types are shown in figs. 90 to 106.

The most outstanding feature of all is undoubtedly the development of Type II. (Doucin) in comparison with the other types. The strength and coarseness of the lateral roots, together with the very apparent lack of root fibre, place it quite apart from the fibrous types. A large number of Doucin stocks at East Malling three and four years of age have been raised for root examination, and there is an extraordinarily close similarity in root development throughout. I have also lifted three-year-old Doucin stocks on my own heavier soil, and these have entirely confirmed data obtained at East Malling. The Doucin appears to be even less fibrous than many of the so-called "Free" stocks that were growing in the same ground, and thus they are indeed far removed from the general idea of 'Paradise.' In this connexion it is well to remember that the older writers generally wrote of 'Paradise' and 'Doucin' as distinct things; LINDLEY says that the 'Doucin' "is most generally, in our nurseries, called the Paradise stock, although widely different from the Pomme Paradis of the French." It is also interesting to recall what DU MONCEAU said of the Doucin:—"Lorsque le terrain plaît au Doucin, ils deviennent presque aussi forts que sur le franc." In the measurements of the height and girth of the four-year-old cordons at East Malling the average height of the Doucin exceeded that of any other type, as is indicated in Table VI. It was also second only in girth to Rivers' Nonsuch (Type VI.). On my own soil, Doucin stocks that have been allowed to grow at will have in two years made over six feet of strong growth.

The series of photographs illustrating what appears to be a really typical development of the 'Paradise' varieties on a light soil, conveys more than is possible through any description. They

demonstrate the very wide choice of a root system which is open to the fruit-grower even amongst Paradise types. There are the very vigorous types amply furnished with fibre, such as Types I. and VI.; there are Types III. and V., of more moderate vigour but with a deep-rooting tendency; and there is Type IV., the main lateral roots of which were found generally not more than four or five inches below ground. Types IV., VIII., and IX. probably represent the most dwarfing systems, whilst Types II. and VII. would seem to afford quite a different choice.

At the present moment the lack of any commonly recognized nomenclature, together with the knowledge of probable mixtures amongst Paradise stocks, makes it very difficult to generalize from existing bush plantations as to what the actual effects of these various types have been in the past. This information could, of course, be obtained through a very extensive investigation by means of taking root cuttings from existing trees. Certain facts are indeed patent from established plantations. There is ample evidence of inequalities of growth and maturity due to a mixture of stocks, a fact too not infrequently betrayed through an examination of root suckers. The suckers of Types II. and III. are often seen, though it is not always an easy matter to recognize types in immature suckers. There may be some slight evidence for surmises, such as that on a strong soil the Doucin seems to make a very large bush ill-furnished with fruit spurs, and that many of the bushes that "never do" are on French Paradise stocks which are to be found unsuspectedly mixed with other types. But for the confirmation of such surmises and the impressions of growers there are at present few scientific data. Now that the chief Paradise types are easily identifiable, all reliable evidence along these lines will be of value. It is in the same light that one can re-read with profit the impressions of the old "lovers of planting."

The aim should be, if possible, to regulate our varied requirements through the very diverse root systems at our disposal. If trees are worked on Paradise for purposes of garden dwarfs, to act as temporary "fillers" in the commercial plantation or to be the permanent trees, it would seem worth while making a study of the root system, even apart from possible refinements in improvement of colour, flavour, and the like.

XVI. *Summary of the Nine Types.*

Considerable space has already been given to the minute details of each Paradise type, details which it is hoped may serve as an ultimate guide as to type. At the same time it has been thought advisable to collect the most salient features distinguishing each type so as to present some sort of general impression. These summaries should afford a preliminary means to identification, to be supplemented, when a doubt exists, by the more minute details given in the comparative tables. Undoubtedly summer is the most favourable time for beginning identification work. In July or August the leaf characters have assumed their most typical aspect. For this

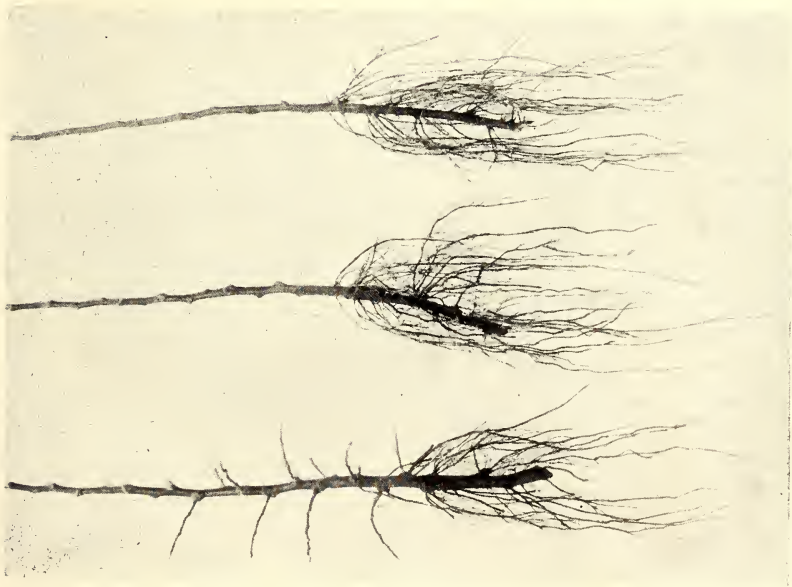


FIG. 95.—One-year-rooted layers.

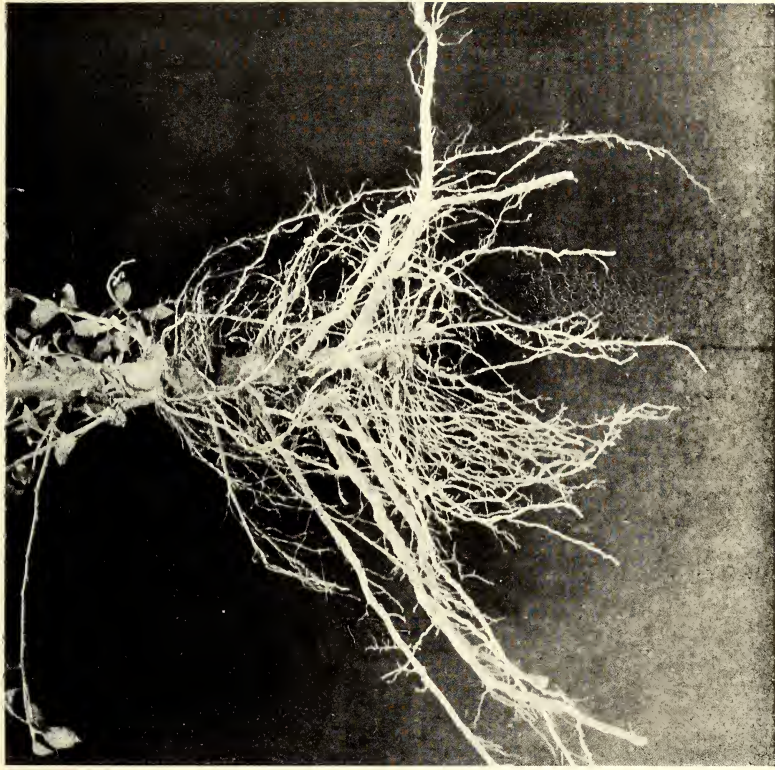


FIG. 96.—Four-year-old root system.

TYPE III.

Note the downward tendency of main roots.



FIG. 97.—One-year-rooted layers.

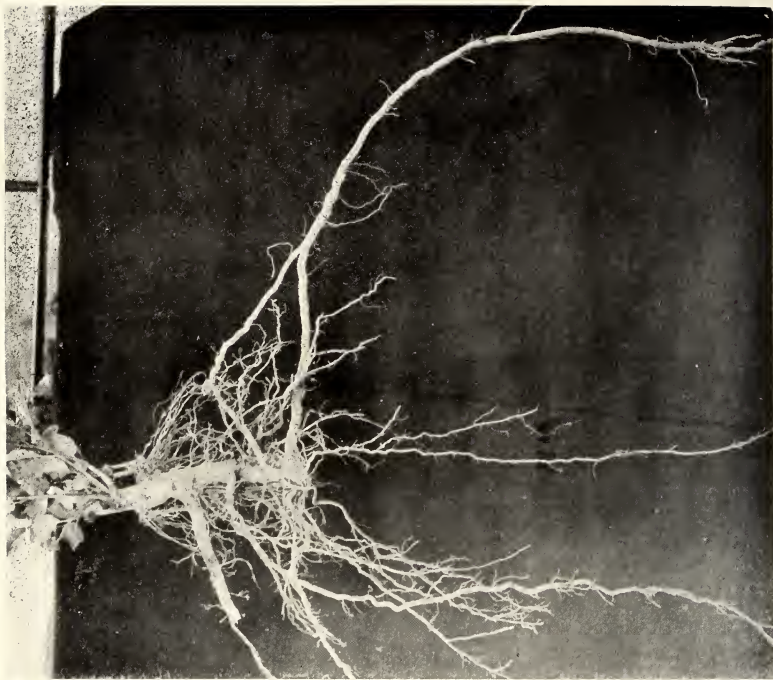


FIG. 98.—Four-year-old root system.

TYPE IV.

Note the horizontal tendency of the main roots.



FIG. 99.—One-year-rooted layers

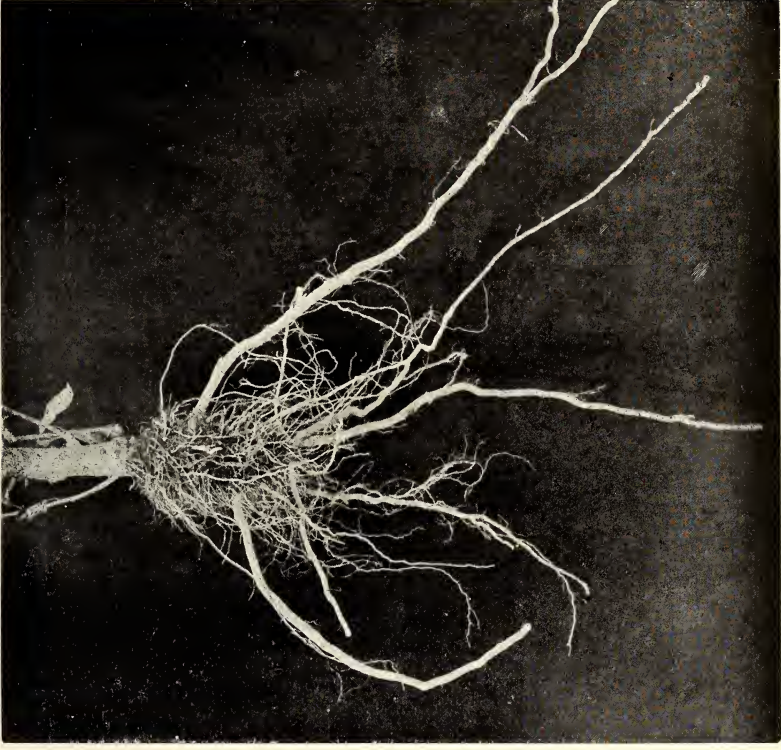


FIG. 100.—Four-year-old root system.

TYPE V. DOUCIN AMÉLIORÉ.
Note the fibrous rooting around 'collar'.

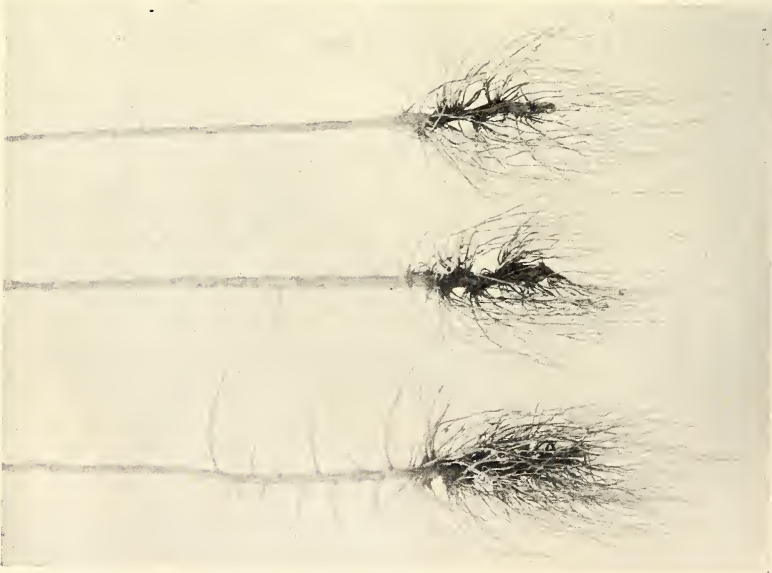


FIG. 101.— One-year-rooted layers.



FIG. 102.— Four-year-old root system.

TYPE VI. RIVERS' NONSUCH PARADISE.
Note quantity of root-fibre.

reason, these characters are principally emphasized in the summary. An early spring examination should also be made of the stock-bed, for this may reveal the presence of one or more of the types which are precocious in coming into leaf. The rooting characters of each type are also referred to in the summary, as they afford the only clue that can be given at present as to the ultimate value of each type.

Type I.—True Broad-leaved English Paradise.

This type is well known to have been a chance seedling selected as a stock for its vigorous appearance, exhibited by healthy growth and readiness to root adventitiously. Although it is the stock in greatest demand to-day, it is important to remember that we actually received it true from surprisingly few sources, though numerous other types are masquerading under the name.

The "Broad-leaf" stools appear remarkably strong and vigorous in growth, and though individual stools do not send up very many growths annually, these growths are mostly of uniform sturdiness and "clean" in character, though the strongest shoots show a slight tendency to branching. The leaves are a dark healthy green and are in general larger than those of other types, with the exception of Types VI. and VII., from which they are easily distinguishable by shape and pose. The leaf, which has a crinkled surface, is curved so that the apex points downwards; it stands well away, almost horizontally, from the stem. The very large stipules and deeply furrowed leaf-stalk are also noticeable. Though the purple-brown wood is covered with numerous lenticels, these are not conspicuous as in Type II., a fact which is very well illustrated by a comparison of figs. 78 and 79. In winter, these characters of the wood are extremely useful for identification.

The True Broad-leaf is very ready to root adventitiously, and at a more mature stage its roots seem to show a very well-balanced system of fibre and coarse lateral roots at medium depth in the soil. There are many signs that the early vigour is maintained.

Type II.—The Doucin.

Type II. is certainly the modern Doucin of the best French nurseries, but the fact that it has very generally acquired the name 'English Paradise,' to which are often attached the words "old" or "broad-leaf," has greatly obscured its identity. It may be said with certainty that it is by far the most commonly used stock in England to-day, and also that it stands almost alone amongst Paradise types in its peculiar root system.

It is strong and vigorous in growth with a medium number of annual shoots, but the exceptional stiffness or rigidity of these shoots is almost sufficient to establish its identity. The strongest shoots are very spined, and this often gives the shoot a somewhat pyramidal appearance of growth. The leaves are of medium size and dark green, but have a much flatter appearance of surface than the True Broad-leaf, though these leaves are somewhat inclined to droop, especially in the latter part of the season, when the stalk is nearly at right angles to the stem. This gives the leaves the appearance of being closer together than on Type I. The stipules here are very small and the leaf-stalk almost flat. The wood generally has a browner tint than Type I., and it is most easily distinguished by the conspicuous lenticels. Protruding buds are not infrequently towards the base of the shoot.

This type has been noticeably early in commencing to drop its leaves. In 1914 all leaves had fallen by November 22, and generally it is bare at least a fortnight earlier than any of the other types. Its early rooting habit is very shy, whilst its mature roots are characterized—in comparison with other types—by an absence of fibre. The coarse lateral roots are very strong. The Doucin shows signs of "suckering" badly.

The observations made upon the Doucin at East Malling force us at least to question the very wide and indiscriminate use to which the stock has attained in this country as a Paradise type. It remains to be proved whether its popularity is due to its real pre-eminence, or to the fact that it is easily obtained from France, or to the name 'English Paradise,' under which it is most frequently sold. There seems no doubt that on more than one type of soil, the Doucin exhibits the peculiar characteristics which we have noted at East Malling, but

until we have ascertained the relative value, upon varied soils, of the predominance of coarse root or the abundance of fibre, it is impossible to pass judgment.

It has already been noted that the Doucin is frequently mixed with other types.

Type III.—(Name at present unknown.)

Type III. presents a most striking instance of the need for investigation. Though this type has been very frequently found at East Malling, it has never reached us as a named type but always mixed with other types. It is perhaps the most easy to identify, except in respect of its name and origin.

The growth, though strong and vigorous, is of a very whippy nature, whilst long drooping lateral branches are very characteristic on the stronger shoots. The leaves are usually on the small side, compared with Types I. and II., and their whole character is unmistakable. They are long and very gradually pointed, whilst their margin is somewhat ragged and more deeply serrated. The leaf is held rather erect with a curved tip. It is thin and harsh to the touch, and, viewed as a whole, gives the impression of a holly leaf.

The wood is of a very dark purple-brown with few lenticles which are not conspicuous. There is a quantity of short grey hair on the wood in winter. This type is very free-rooting. Adventitious roots are frequently seen even on the surface of the ground and the young stocks soon become "knotted" on their stem. Fig. 69 shows this very well. The type unfortunately seems to possess the habit of "suckering" badly. The four-year-old root system shows much vigorous fibre, but the lateral roots are not as coarse as on Types I. or II., and they have a very decided downward tendency in growth. It is curious that this type should be so generally in circulation amongst other types from which it is remarkably distinct.

In the nursery rows it seems liable to both Black Spot and Apple Mildew.

Type IV.—(Name at present unknown.)

Though we did not receive this type from many English sources, yet we received it from Dutch and German ones also, and there is some evidence to show that it was once more widely distributed.* Both its dwarf habit of growth and its rooting vigour would lead one to suppose that its influence on the scion would be far more dwarfing than any of the other Paradise of to-day, except possibly Types VIII. or IX.

Its strongest annual shoots barely reach $1\frac{1}{2}$ foot, though they are stiff and fairly sturdy. It is most readily recognized by the light yellow-brown wood. The leaves, too, are distinctive. They are a lighter green than Types I., II., or III., and they approach the circular form. They are very crinkled and often slightly upturned. They are soft and fleshy to the touch, and each year we have had to note considerable insect damage to the leaves. A long leaf-stalk gives a characteristic pose to the leaves.

In winter the yellow wood colour is almost sufficient clue to identification. In some of his earliest descriptions Mr. WELLINGTON described the wood as "unkindly-looking"; in this connexion it may be interesting to quote from the letter of a nurseryman which I have only recently received: "There was one which had a yellow skin, an excellent stock, but it had to be grafted, as buds never lived." We have not yet been able to test our "yellow-skinned" stock in this direction.

This type is about three weeks earlier in commencing growth than the other types—Type VIII. being excepted. The one-year layers nearly all root, though not very freely. The adventitious roots are mainly at the base of the shoot and on the two-year wood. The four-year-old roots showed plenty of fibre, but the coarse lateral roots were noticeably shallow in the soil, usually being not more than four or five inches deep. One would imagine that for certain purposes this stock might prove an effective dwarf.

Type V.—Doucin Amélioré.

With the exception of the true Doucin, this type appears to be in most general circulation, in this country and abroad, and it occurs very commonly mixed with other types.

* One English source from which it was received unmixed furnished information to the effect that they "selected it between fifty and sixty years ago." Is it possible that this may be the Dutch Paradise? It formed the bulk of the Dutch collection. It is also interesting to recall that the article in the *Gardeners' Chronicle*, 1874, already quoted, described the Dutch Paradise as having "olive-coloured" wood and being in full leaf much earlier than other types.

Though its name implies that it is a selected strain of Doucin, it bears little resemblance to Type II. except in its somewhat erect growth and in the pose of the leaf.

In general habit the Doucin Amélioré shows moderate strength in height and sturdiness. The annual shoots do not grow so tall as Types I., II., or III., but they are taller than Type IV. They are very even in growth and somewhat erect; the annual number of shoots is numerous, and they are not very much spined or feathered. The leaves are usually much smaller than those of the true Doucin, from which they are very easily recognizable by their peculiarly pointed apex. The leaf-stalk tends to be short, and the stipules are very insignificant.

The wood is of a reddish purple with a bright appearance, and is noticeable also for the very few conspicuous lenticels. In winter the very reddish, almost hairless, buds afford a good means to identification.

The Doucin Amélioré roots much more easily from layers than does the true Doucin, though it is perhaps not so vigorous in this respect as either Type I. or III. The four-year-old roots seem to show a somewhat curious mixture of rather bare deep-rooting laterals, together with much fibre immediately around the stem of the stock.

One would suppose this might be a stock with intermediate dwarfing habit.

Type VI.—Nonsuch,†

This is another type of the selected seedling, which, like the True Broad-leaf, was introduced by the late Mr. RIVERS. Though these two types are frequently found mixed to-day, they are easily distinguishable.

The Nonsuch is exceptionally stout of growth, though the annual shoots, which are fairly numerous, do not attain to the height of Broad-leaf. Sometimes it is very much spined, sometimes rather branched. The leaves are usually large,* but of a much lighter green than Type I.; they are longer in relation to their breadth, and they are not so abruptly pointed. The very drooping pose is most characteristic. The furrow is well marked on the leaf-stalk and the stipules are very large. Nonsuch is very late in shedding its leaves, and, especially towards the tip of the shoot, they remain long after the other types are bare. The yellow green wood colour, which gives a somewhat "unripe" look, is a very distinct feature. There are numerous inconspicuous lenticels. The pubescence on the wood gives a distinctive "mealy" appearance on the shoot. The young wood shows more "fruit-buds" than Type I.

Type VI. is perhaps the most ready to root adventitiously. Its mature root-system is somewhat similar to that of Type I., showing plenty of root-fibre side by side with the coarse lateral roots. As a stock it is reputed to be more precocious than the Broad-leaf, a fact which needs verifying. It seems questionable whether it is quite so hardy, for during the early winter of this year (1916) frequent large cracks were noticeable on the young shoots owing to a splitting of the bark. This may be due to the fact that since it is late in leaf fall, the early sharp frosts caused this damage, which was also very noticeable upon some free stocks that retained their leaves a long while. In any case the splitting quite spoilt many of the layers for working purposes. This phenomenon has not been noticeable in other seasons, nor was it generally seen this season on any of the other Paradise types.

Type VII.—(Name at present unknown.)

Type VII., rather like Type IV., has evidently long been known in our English nurseries, though it appears to be little used to-day. From one source I learn that it was obtained from France some twenty-seven years ago, and from another that it has long been in the nurseries, where it was always known as the 'English Paradise.' At the moment there are not sufficient data to warrant a revival of this old discussion, though it may be worth noting that there is a very superficial resemblance in the wood character of this type and the Doucin (now called 'English Paradise') caused by the conspicuous and numerous lenticels.

The resemblance goes no further. Type VII. is very tall in growth, but the shoots are whippy or flexible. The annual shoots are numerous and fairly even in growth. The leaves are medium to large in size, and though slightly variable in shape they tend to be circular. Sometimes the leaf is almost trilobed.† The leaf-stalk is long and very erect, giving a characteristic pose to the

* There is more variation shown in this type as to leaf-size than in other types.

† This characteristic is well illustrated in Figure 88 Type VII., showing the upper surface of leaf.

leaves which are only very slightly convex. The wood is of a reddish purple with conspicuous lenticels. The small blackish-brown bud is a great aid to identification in winter.

Type VII. shows no remarkable freedom in rooting on one-year layers, which are best rooted towards the base and on a heel of two-year wood. In its later development it shows numerous medium coarse lateral roots without any large quantity of root-fibre. In this respect it somewhat approaches the Doucin, except that the roots are not so coarse.

Type VIII.—French Paradise.

This is undoubtedly the French Paradise of to-day. It is very largely used on the Continent, but does not seem to find much favour amongst our nurserymen, yet it is not infrequently mixed with imported stocks. It has an established reputation for its dwarfing habit, but the one-year layers are not strikingly stunted, although the more mature cordons are certainly relatively small.

The annual shoots are of a medium strength and somewhat whippy. It is quite the earliest Paradise type to start into growth, and during the early part of the season it is most conspicuous with its bright reddish wood and light-green foliage. Later in the season the wood becomes a dark purple, but, except for the young tips, it appears almost hairless and shiny. The lenticels on the wood are numerous. The leaves tend to be small and narrow, and they are gradually pointed with a fine regular serration. The upper surface of the leaves appears almost hairless. The leaf-stalk is very short and slightly furrowed and the stipules are small. The younger leaves are almost vertical but slightly recurved at the tip; they often tend to be concave; the older leaves towards the base become crinkled and drooping.

In winter the rather narrow reddish buds, which are almost hairless and rather large for the stoutness of wood, afford a useful aid to identification together with the wood characters. There are some "fruit-buds" towards the base of the one-year layers.

At East Malling the French Paradise has been shy in its early-rooting habit, whilst the more mature roots, though they show a mixture of fibre and coarse lateral root, appear much less vigorous than Broad-leaf or Nonsuch.

The suitability of the French Paradise for our soil has long been a disputed fact. Trials on different soils with different varieties of apple can alone ultimately decide this. That it is subject to both Apple Mildew and Black Spot in the nursery row is certain.

Type IX.—Jaune de Metz.

The Jaune de Metz Paradise does not seem to be in common use in our English nurseries, but since it is frequently used both in France and Germany it seemed advisable to include it in these descriptions.

The annual shoots are of medium growth. At this stage it appears more dwarfing than the French Paradise. The leaves are large for the size of the growths and of a dark healthy green; they are generally ovate in shape and somewhat abruptly pointed. The leaves are almost vertical, but are bent over at the apex. It is most characteristically found with short spines and sometimes spurs and "fruit-buds" towards the base of the annual shoot, where the leaves appear crowded. The wood is noticeably patchy in colour, varying from red-brown to green-brown. The lenticels are few. The annual layers would give one the impression of pronounced precocity, though an examination of three-year-old cordons seemed to suggest that it is more vigorous than the true French. The rooting of the one-year layers, however, is not markedly superior.

This type appears much healthier than the French, and it seems quite possible that it might afford a useful dwarfing type, if suitable to this country. Further observation is required to establish this point. As its period of growth differs somewhat from that of the French Paradise, it is popular in French nurseries for succession purposes.

XVII. *Further Types from Germany.*

In addition to the nine types already summarized six other types have appeared in the collections received from Germany in 1914. Since we have not yet found these types occurring in this country

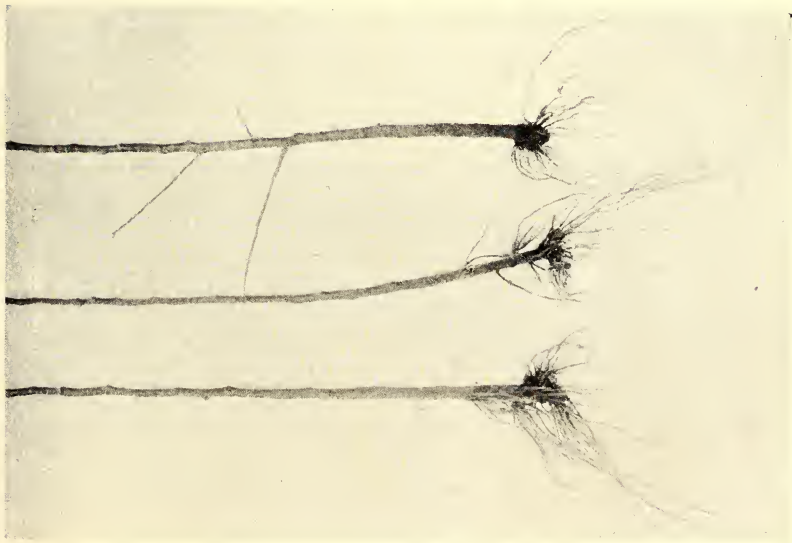


FIG. 103.—One-year-rooted layers.

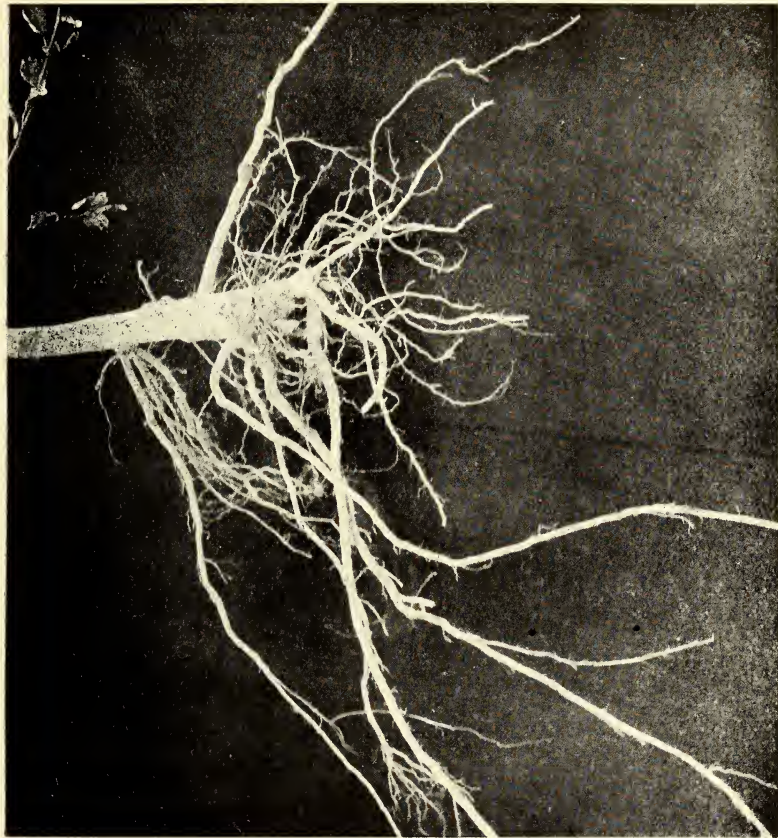


FIG. 104.—Four-year-old-root system.

TYPE VII.

Note the comparative lack of fibrous roots.

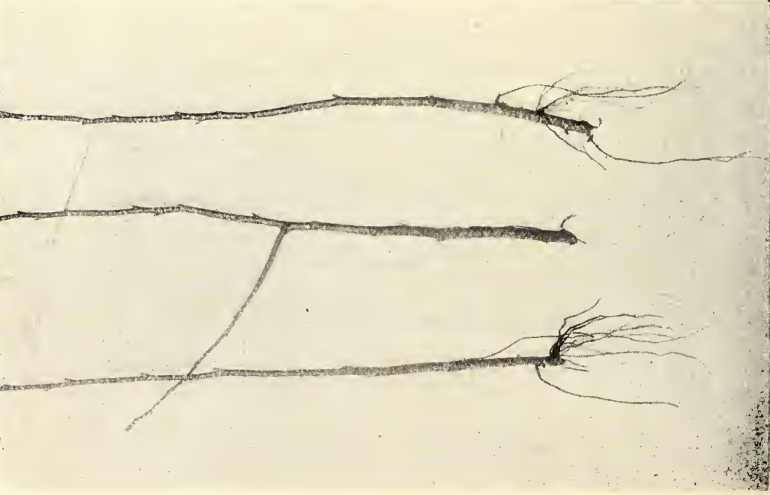


FIG. 105.—One-year-rooted layers.

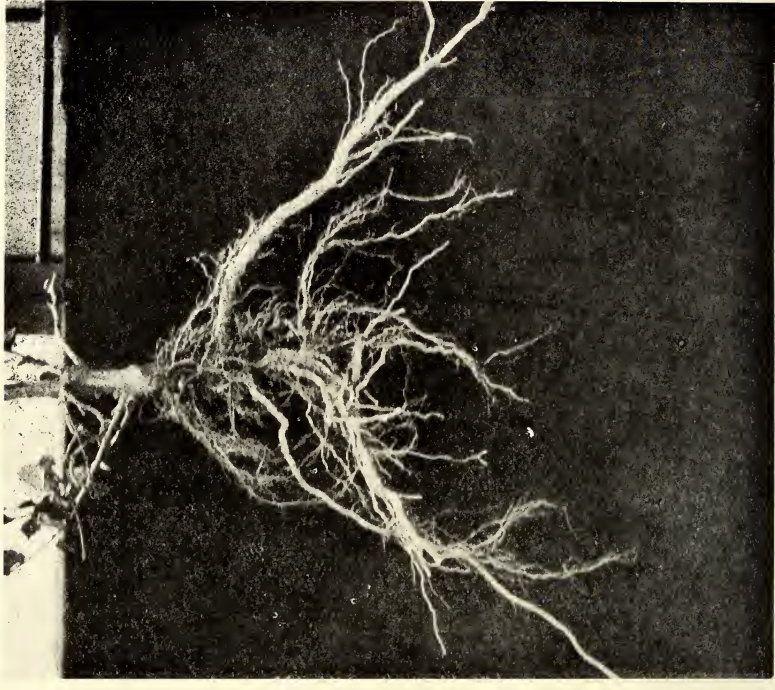


FIG. 106.—Four-year-old root system.
TYPE VIII. FRENCH PARADISE.

detailed descriptions of them are not given here. Some of them are interesting as approaching the true Doucin very closely, another is notable for the health and vigour which it displays, whilst yet another appears to be very weak and dwarfing. They vary too in rooting vigour. These types will also be tested on a small scale, in case any of them should prove of exceptional value.

XVIII. *Possible Origin and Identification of Types.*

It is not the intention in this report to deal at length with the origin of the various types and with their identification with historic types of Paradise. But in order to avoid misunderstanding it seems advisable to state that undoubtedly there has been a very considerable change of significance in the word 'Paradise.' Paradise can, in our trade sense, be no longer held to mean "*Pyrus acerba* D.C. (*Malus acerba* Mérat), known to horticulturists under the name of Paradise,"* which was supposed to be commonly found in a wild state in the woods. Though the *Malus acerba* may still have its representatives amongst the Paradise types of to-day—especially in Type VIII. does this seem likely—we know quite definitely that at least three of our common types, the Broad-leaved English, the Nonsuch, and the Jaune de Metz Paradise were merely chance seedlings selected as stocks because of certain tendencies they exhibited.†

Chief among these tendencies was that of readiness to root when layered. This tendency is most frequently exhibited in apples by the appearance of small root-knots or excrescences on the stem and by the growth of adventitious roots near and on the surface of the ground. The characteristic is frequently described in the older writers, who described these root-knots very aptly as "burr-knots," and it is still commonly to be seen on some of the older Codlin apples. A close examination of any bed of stocks will soon reveal this habit amongst certain members.

Figure 68 shows a "knotted" stock picked with several others from a bed of "Free" stocks, raised from seed.

In the past any Apple showing this tendency was recommended as a stock, because the burr-knots indicated its readiness to root from layers or cuttings, and it was supposed to indicate root vigour. These facts are mentioned in order to show that the word 'Paradise' possesses a much wider meaning than is sometimes supposed, and that Paradise stocks have arisen through various channels.

Again, it should be pointed out that although we include the 'Doucin' to-day amongst Paradise stocks, and it is generally sold under the name of 'English Paradise,' it is very questionable whether

* GRENIER et GODRON, *Flores de France*.

† For the origin of Broad-leaf and Nonsuch, see the statements of their raiser and introducer, the late Mr. T. Rivers.

The origin of the Jaune de Metz, which has a somewhat similar French history, is given in the *Revue Horticole*, 1879, p. 437.

it bears a near relationship at all to most of the other types.* A careful comparison of the root systems alone is enough to suggest this, whilst in literature the Doucin is repeatedly mentioned as differing very considerably from the Paradise.

It remains to be proved whether the Doucin (Type II.) and Paradise (French, Type VIII.) of to-day are the same as those of the seventeenth century. DU MONCEAU'S description, especially of the latter's very dwarfing tendencies, makes one incline to doubt it. There is little doubt that the very dwarfing type of Paradise frequently referred to is at least temporarily lost to us to-day.

This Report, then, deals with the various forms of so-called 'Paradise' in common use, and lays no claim to make a systematic botanical classification.

The names attached to various types of Paradise in the Report are those which the consensus of opinion amongst leading English and French nurserymen has given to the types in question. In some cases it has been possible to verify these names from the sources of origin; in others, the various fragmentary descriptions and references in literature have gone to strengthen the evidence.

XIX. *Probable Sources of Confusion.*

After having demonstrated that there is considerable confusion with regard to the various Paradise types, it seems only fair to say that frequent opportunities occur in the ordinary routine of work likely to cause unintentional mixing together of types. The most prolific source of confusion is probably the root-cutting. The Paradise types seem easily propagated from root-cuttings. When trees are lifted, portions of the root frequently remain in the ground, and I have seen shoots from these appearing and forming a fresh stock. It will be realized how easily this may cause mistakes. Moreover, unless very great care is taken, any form of cutting—and especially the root-cutting—may be dropped unnoticed and subsequently find its place amongst another variety. Until due emphasis was laid upon the importance of the differences amongst Paradise types it was hardly to be expected that this matter would receive special attention.

The recent paper of Professor BATESON on "Root-cuttings, Chimæras, and Sports," † has proved too that we must be on our guard in this matter of root-cuttings. It is possible that some of our Paradise types to-day arose as "sports" from the root. The importation of stocks from abroad may, too, lead to the appearance of new varieties of Paradise, and to inadvertent mixing. Until we can be clear as to our nomenclature these mistakes are unavoidable.

* Some authorities definitely classify it as a different species.

Pyrus malus L. "To this species are related the numerous varieties of Apple which have been produced by husbandry; it is known to horticulturists under the name of Doucin."—GRENIER et GODRON, *Flore de France*,

† *Journal of Genetics*, VI. pp. 75-80 (Dec. 1916).

It will, of course, be realized that there are two points of view with regard to the "stock question." One side has been sufficiently emphasized in this Report in order that the matter may receive the attention it deserves. Certainly the initial observations seem to justify this emphasis. On the other hand, it is perhaps well to quote what KNIGHT once wrote of the stock: "The office of the stock is, in every sense of the word, subservient; and it acts only in obedience to the impulse it receives from the branches; the only qualities therefore, which are wanting to form a perfect stock are vigour and hardiness." Even so, our investigations have their work to perform. Selection is obviously necessary from the numerous types of different vigour. It is greatly to be hoped that the work will receive the co-operation of both nurserymen and growers. Some of the former at present emphasize the importance of a true stock bed and a good stock. The grower should see that it is of advantage to the nurseryman to put a "good brand" upon the market. There should be more inquisitiveness about "Apples on Paradise." A great aid to progress would be a definite standardization and revision of names by the trade. Doubtless, certain types of Paradise at present unnamed have, to the nurseryman's knowledge, proved suitable to certain districts and uses. If we can proceed along these lines, valuable information and reliable results should be forthcoming, such as would be of benefit both to the raisers and growers of fruit-trees. Our knowledge of the Paradise stock has advanced considerably since the seventeenth century, but the subtleties of choosing a stock seem to have been more fully explored even by the writer who described the Paradise Apple as "a curious fruit produced by grafting a Pearmain on a Quince."

[The photographs illustrating habit and root systems in this report are the work of Mr. J. Ames and those representing foliage characters of Mr. Reginald Malby.]

SPRING CABBAGES AT WISLEY, 1915-16.

ONE hundred and three stocks of Spring Cabbages were received at Wisley for trial, representing sixty-three varieties, one of which was red. The seed was sown on August 7, and the germination was fairly good. The seedlings were planted out on September 27, on moderately-manured and deeply-dug ground. The season was rather a trying one, especially in the early months of 1916, owing to the exceptionally late and heavy snow and frosts, followed by cold rains and then drought, but, on the whole, the bed of cabbages was a very good one. The cultivation was under the charge of Mr. J. Wilson, foreman in the Vegetable Department.

A sub-committee of the Fruit and Vegetable Committee inspected the trial on two occasions, viz. May 8 and June 2, and selected the following as the best in the trial:—

First-class Certificate.

No. 85, 'Ellam's Early Dwarf.'

Award of Merit.

No. 29, 'Eclipse Summer Cutting' (Barr); 33, 'First and Best' (Barr); 73, 'Harbinger' (Sutton).

Highly Commended (XXX).

No. 22, 'Flower of Spring' (Veitch); 34, 'First and Best' (Barr); 71, 'April' (Sutton); 102, 'Spring Beauty' (Bath).

Commended (XX).

No. 30, 'Early Favourite' (Farr); 31, 'Favourite' (Sutton).

VARIETIES.

*1. Red Dutch Pickling.	20.	} Flower of Spring.
2. } Defiance.	21.	
3. } Enfield Market.	22.	
4. } Enfield Market.	23.	} Nonpareil.
5. } Seedling.	24.	
6. } Enfield Market.	25.	
7. } Mein's No. 1.	26.	} Favourite.
8. } Mein's No. 1.	27.	
9. } Mein's No. 1.	28.	
10. } Mein's No. 1.	29. Eclipse Summer Cutting.	} First and Best.
11. } Mein's No. 1.	30. Early Favourite.	
12. } Mein's No. 1.	31. Favourite.	
13. } Mein's No. 1.	32. } Mein's No. 1.	} First and Best.
14. } Mein's No. 1.	33. } Mein's No. 1.	
15. } Mein's No. 1.	34. } Mein's No. 1.	
16. } Mein's No. 1.	35. } Mein's No. 1.	} First and Best.
17. } Mein's No. 1.	36. } Mein's No. 1.	
18. Early Rainham.	37.	
19. Mammoth Beefheart.		

* All plants sent for trial in the Wisley Gardens are grown under number and by this alone are they known until judgment is completed.

38.)		71. April.
39.)		72. April Queen.
40.)	Imperial.	73. Harbinger.
41.)		74. Talisman.
42.)		75.) Nonsuch.
43.)	All the Year Round.	76.)
44.)		77. Springtide.
45.)		78. Criterion.
46.)	Emperor.	79. Dwarf Spring Cutting.
47.)		80. Early Bunching.
48.)		81. Colewort Green Rosette.
49. Seedling.		82.)
50. Étampes.		83.)
51. Little Pixie.		84.) Ellam's Early.
52. Johnson's Market Garden.		85.)
53.)	Early Evesham.	86.)
54.)		87.)
55.)	Early Market.	88. Seedling.
56.)		89. Early Feltham.
57. Methven's Edinburgh Market.		90. Early Gem.
58. East Ham.		91. Midlothian Early.
59. Early Rainham.		92. Early Dwarf Nonpareil.
60. Early Jersey Wakefield.		93. King of Earlies.
61. Heartwell.		94. Earliest of All.
62. Heartwell Marrow.		95. Excelsior.
63. Pioneer.		96. Seedling.
64. Jubilee.		97. Seedling.
65. Advancer.		98. Seedling.
66. Pomeranian.		99. Mighty Atom Early.
67. Conqueror.		100. Unnamed.
68.)	Incomparable.	101. Matchless.
69.)		102. Spring Beauty.
70. Seedling.		103. Matchless.

I. GREEN VARIETIES.

65. Advancer (Simpson).—Plant large; growth spreading; foliage large; head medium, conical, pointed, loose; stock fair. Ready May 16.

43, 44. All the Year Round (Barr, Hurst).—Plant of small to medium size; growth rather spreading, foliage medium; head small, conical, pointed, solid; stocks not even. Ready May 8.

71. April (Sutton), XXX May 16, 1916.—Plant small to medium; growth fairly compact; foliage medium; head medium, conical, pointed, solid; stock good. Ready May 3.

72. April Queen (Barr).—Plant of medium to large size; growth rather spreading; foliage of medium size; head medium, pointed, conical, solid. Stock uneven. Ready May 3.

81. Colewort Green Rosette (Barr).—A stock of Colewort containing a very large percentage of bolters.

67. Conqueror (Pearson).—Plant small; growth spreading; foliage medium; head small, conical, obtusely pointed, solid; stock true, stood badly. Ready May 6.

78. Criterion (Barr).—Plant of medium to large size; growth rather spreading; foliage medium to large, rather coarse; head medium, conical, obtusely pointed, solid; stood well. Ready May 6.

2, 3. Defiance (Simpson, Daniels).—Plant large; foliage abundant,

spreading, and of large size; head large, conical, obtusely pointed, loose; stocks not true. Ready May 30.

79. Dwarf Spring Cutting (Barr).—Plant small to medium size; growth spreading; foliage medium; head small, pointed, conical, solid; stock uneven. Ready May 6.

94. Earliest of All (R. Veitch).—Plant of large size; growth rather spreading; foliage large, somewhat coarse; head small, conical, obtusely pointed, solid; stock uneven, stood fairly well. A good number of bolters. Ready May 5.

80. Early Bunching (Nutting).—Plant of medium size; growth spreading; foliage large; head medium, conical, pointed, loose; stock uneven. Ready May 16.

92. Early Dwarf Nonpareil (Pearson).—An unsuitable variety for autumn sowing. Contained a good number of bolters.

53. Early Evesham (Nutting), **A.M.** Aug. 25, 1908.—Plant of medium size; foliage medium, spreading; head small, conical, pointed, loose; stock fair, stood well. Ready May 11.

54. Early Evesham Selected (Barr).—Like No. 53 but heads rather more solid. Ready May 11.

30. Early Favourite (*Farr*), **XX** May 16, 1916.—Plant of medium size; growth compact; foliage medium, deep green veined white; head medium, conical, pointed, solid; stock good. Ready May 3.

89. Early Feltham (Barr).—Plant of fairly large size; growth rather spreading; foliage large, rather coarse; head medium, pointed, conical, solid; stock good, stood badly. Ready May 3.

90. Early Gem (Barr).—Plant of medium to large size; growth spreading; foliage large; head medium, conical, pointed, solid; stock fair, stood moderately well; some bolters. Ready May 16.

60. Early Jersey Wakefield (Veitch).—See vol. xli. p. 475. Not ready by beginning of June.

55. Early Market (Barr).—Plant of small to medium size; growth rather spreading; foliage medium; head small, pointed, conical, solid; stock uneven. Ready May 3.

12, 13, 14, 15, 16, 17, Early Offenham (Barr, Dawkins, Sydenham, Hurst, Simpson, Veitch).—See vol. xli. p. 477; stocks 12 and 13 had rather more spreading foliage than the others. Ready May 3.

18, 59. Early Rainham (Veitch, Barr).—Plant of medium size; growth rather spreading; foliage medium, rather coarse; head medium, conical, pointed, solid; stocks mixed. Stock No. 59 had rather larger foliage and smaller heads. Ready May 3.

58. East Ham (Barr).—Plant of medium to large size; growth spreading; foliage large; head medium, pointed, conical, solid; stock fair. Ready May 6.

29. Eclipse Summer Cutting (Barr), **A.M.** May 16, 1916.—Plant fairly large; growth fairly compact; foliage large, rather coarse; head medium, conical, pointed, solid; stock good, stood well. Ready May 3.

*82. Ellam's Early, Sutton's Strain (Sutton).—Plant medium to large size ; growth fairly compact ; foliage medium size, green, veined white ; head medium, conical, pointed, solid ; stock good. Ready May 1.

*83. Ellam's Early Dwarf (Sydenham).—Plant of medium to large size ; growth rather spreading ; foliage medium to large, green, veined white ; head medium, conical, pointed, solid ; stock fair. Ready May 6.

*84. Ellam's Early Dwarf (Simpson).—Plant of medium to large size ; growth fairly compact ; foliage medium to large, green, veined white ; head medium, conical, pointed, solid ; stock fair. Ready May 3. See vol. xli. p. 477.

*85. Ellam's Early Dwarf (Barr), **F.C.C.** April 8, 1884.—Plant medium to large ; growth fairly compact ; foliage medium to large, green, veined white ; head medium, pointed, conical, solid ; stock good. Ready May 3.

*86. Ellam's Early Dwarf (Pearson).—Plant medium to large ; growth fairly compact ; foliage medium to large, green, veined white ; head medium, conical, pointed, solid ; stock fair. Ready May 3.

*87. Ellam's Early Dwarf (Veitch).—Plant medium to large ; growth fairly compact ; foliage medium to large, green, veined white ; head medium, conical, pointed, solid ; stock good. Ready May 3.

45. Emperor (*Charlton*).—Plant small to medium size ; growth spreading ; head medium, conical, pointed, solid ; stock fair, stood well. Ready May 8.

47. Emperor (Toogood).—Plant small to medium ; growth spreading ; head small, conical, pointed, solid ; stock fair, stood well. Ready May 6.

48. Emperor (Webb).—Similar to No. 47, but heads looser. Ready May 11. See vol. xli. p. 475.

46. Emperor, Early (Barr).—Not ready by June.

4. Enfield Market, special stock (Barr).—See vol. xli. p. 477. Ready May 11. Fairly even stock.

7. Enfield Market (Pearson).—Similar to No. 4, but later.

8. Enfield Market (Veitch).—Similar to No. 4. Stock not true. Ready May 30.

5. Enfield Market Selected (Barr).—Plant large ; foliage abundant, large, spreading ; head medium, conical, pointed, solid ; stood well. Ready May 30.

50. Étampes (Barr), **A.M.** August 25, 1908.—See vol. xli. p. 475. Stock poor ; large percentage of bolters.

95. Excelsior (Dawkins).—Plant of medium size ; growth fairly compact ; foliage of medium size, green, veined white ; head medium, conical, obtusely pointed, solid ; stock good, stood fairly well. Ready May 6.

31. Favourite (Sutton), **XX** May 16, 1916.—Plant of medium size ; growth fairly compact ; foliage medium, deep green, veined white ;

* The Committee placed these stocks of Ellam's Early in the following order ; 85, 82, 87, 86, 84, 83.

head medium, conical, pointed, solid. A good stock. Ready May 3.

32. Favourite (Webb).—Plant of medium size ; growth rather spreading ; foliage medium ; head medium, conical, pointed, solid ; stock good, stood moderately well. Ready May 3.

33. First and Best (Barr), **A.M.** May 16, 1916.—Plant fairly large ; growth rather spreading ; foliage large, deep green, veins white ; head medium, conical, obtusely pointed, solid ; stock good. Ready May 3.

34. First and Best (Barr), **XXX** June 6, 1916.—Similar to No. 33. Stock even. Ready May 3.

35, 36. First and Best (Dawkins, Sydenham).—Similar to No. 33, but rather less spreading growth. Ready May 5. See vol. xli. p. 475.

37. First and Best (Hurst).—Similar to No. 33. Stock fair. Ready May 5.

20. Flower of Spring (Barr).—Plant of medium size ; growth rather spreading ; foliage medium size, rather coarse ; head medium, conical, pointed, loose ; fair stock, stood well. Ready May 3.

21. Flower of Spring (Pearson).—Similar to 20, but growth fairly compact, and head small ; stood badly. Ready May 3.

22. Flower of Spring (Veitch), **XXX** May 16, 1916.—Similar to No. 20, but growth fairly compact ; head obtusely pointed, solid ; stock fair, stood well. Ready May 3.

23. Flower of Spring (Simpson).—Stock not quite true ; stood well. Ready May 3.

24. Flower of Spring (Sutton), **XXX** June 6, 1916.—Larger than foregoing stocks. Ready May 3.

73. Harbinger (Sutton), **A.M.** May 9, 1911.—Plant of medium size ; growth fairly compact ; foliage of medium size, deep green, veins white ; head small, conical, pointed, solid ; stock fair. Ready May 17.

61. Heartwell (Carter).—Plant of medium size ; growth fairly compact ; foliage medium, rather coarse ; head medium, conical, pointed, solid ; stock fair, stood moderately well. Ready May 3.

62. Heartwell Marrow (Barr).—Many bolted.

38, 39, 40. Imperial Selected (Barr, Hurst, Dawkins).—Plant medium to large ; growth rather spreading ; foliage medium ; head medium, pointed, conical, solid ; stock good, stood well. Ready May 3.

41. Imperial (Webb).—Similar to No. 38. Stock good. Ready May 3.

42. Imperial (Sutton).—Plant of medium size ; growth rather spreading ; foliage medium to large ; rather coarse, head medium, pointed, conical, loose ; stock good. Ready May 6.

69. Incomparable (Dawkins).—Plant small to medium ; growth spreading ; foliage medium ; head small, conical, obtusely pointed, loose ; stock uneven, stood well. Ready May 8.

68. Incomparable (Veitch), **A.M.** August 25, 1908.—Stock not true ; failed to form a head.

52. Johnson's Market Garden (Barr).—Plant small to medium in size ; growth compact ; head small, conical, pointed, loose ; stock fair, stood badly. Ready May 11.

64. Jubilee (*Shaw*).—Plant medium to large ; growth rather spreading ; foliage large, deep green, veins white ; head medium, conical, obtusely pointed, solid ; stock good, stood badly. Ready May 3.

93. King of Earlies (Barr).—Plant medium to large in size ; growth spreading ; foliage medium ; head medium, pointed, conical, solid ; stock uneven, stood badly. Ready May 6.

56. Large Early Market (Nutting).—See vol. xli. p. 475. Ready May 11.

51. Little Pixie (Barr).—Nearly all bolted.

19. Mammoth Beefheart (Carter).—Plant of medium size ; growth rather spreading ; foliage medium to large, rather coarse ; head medium, pointed, conical, solid ; stood badly. Ready May 3.

101. Matchless (Bath).—Plant of fairly large size ; growth rather spreading ; foliage large, rather coarse ; head medium, conical, pointed, solid ; stock good, stood moderately well. Ready May 3.

103. Matchless (*Staward*).—Plant of large to medium size ; growth spreading ; foliage large ; head medium, conical, pointed, solid ; stood well. Ready May 30.

9. Mein's No. 1 (Barr).—Plant large ; growth rather spreading, foliage large, rather coarse, glaucous ; head medium, conical, pointed, solid ; stood well ; fairly even stock. Ready May 3.

10. Mein's No. 1 (Pearson).—Similar to No. 9. Stock good, stood well. Ready May 3.

11. Mein's No. 1 (Veitch).—Similar to No. 9. Stock not quite true ; stood well. Ready May 6.

57. Methven's Edinburgh Market (Barr).—Plant of medium size ; growth rather spreading ; foliage medium, rather coarse ; head medium, conical, pointed, loose ; stock fair, stood moderately well. Ready May 8.

91. Midlothian Early (Dobbie).—Plant of medium to large size ; growth rather spreading ; foliage large, deep green, white veined ; head medium, conical, obtusely pointed, solid ; stock fair, stood fairly well. Ready May 3. Selected from MacEwan's Early.

99. Mighty Atom Early (*Weightman*).—Not in by June.

25. Nonpareil (Shaw's) Selected (Barr).—Plant of medium size ; outer foliage abundant, spreading, medium ; head medium, conical, pointed, solid ; stock mixed, many bolted ; stood well. Ready May 11.

26. Nonpareil, Tovey's Extra Early (Barr).—Plant fairly large ; growth rather spreading ; foliage of medium size, rather coarse ; head small, pointed, conical, solid ; stock mixed, stood moderately well. Ready May 8.

27. Nonpareil Improved (Barr).—Plant fairly large; growth rather spreading; foliage medium to large, deep green, with white veins; head medium, pointed, conical, solid; stood fairly well; stock mixed, a good many bolted. Ready May 8.

28. Nonpareil (Simpson).—Plant fairly large; growth rather spreading; foliage medium to large, deep green, with white veins; head medium, pointed, conical, loose; stock mixed, stood well. Ready May 6.

75. Nonsuch (Barr).—Plant medium to large; growth rather spreading; foliage medium to large, some rather coarse; head medium, conical, pointed, solid; stock fair, cracks badly. Ready May 5.

76. Nonsuch (Toogood).—Plant of medium size; growth spreading; foliage medium; head small, conical, pointed, solid; stock fair, stood well. Ready May 6.

63. Pioneer (Carter).—Many bolted.

66. Pointed-headed Pomeranian (Toogood).—Did not form a head like a Kale.

102. Spring Beauty (*Bath*), XXX May 16, 1916.—Plant of fairly large size; growth fairly compact; foliage large, deep green, veins white; head conical, medium, obtusely pointed, solid; stock fair, stood well. Ready May 3.

77. Springtide (Carter).—Plant medium; growth spreading; foliage medium; head small, conical, pointed, solid; stock fair, stood well. Ready May 16.

74. Talisman (Toogood).—Plant of medium size; growth rather spreading; foliage medium; head medium, conical, obtusely pointed, solid; stock fair, stood moderately well. Ready May 6.

Nos. 6, 49, 70, 88, 96, and 98 were unnamed seedlings from Messrs. J. K. King; and No. 100 from Messrs. W. Fell.

II.—RED VARIETY.

1. Red Dutch Pickling (Veitch).—A good stock of red pickling Cabbage.

SAVOYS AT WISLEY, 1916.

FORTY-SEVEN stocks of Savoys were sent for trial in 1916. Two sowings of each were made, the first on April 26, the second on May 26. They were transplanted on land which had grown peas the previous year, followed by mustard which was dug in. The first sowings were transplanted on June 14, the second on June 30. The smaller types, Nos. 1 to 15, were planted 2 feet apart each way, the larger 2 feet apart in rows 2 feet 6 inches apart. They were inspected on November 9 and the following varieties were selected as the best in the trial.

Award of Merit.

No. 31, 'Perfection' (Sutton); 47, 'Norwegian' (Barr).

Highly Commended.

No. 9, 'Sugarloaf' (Sutton).

Commended.

No. 7, 'Tom Thumb,' re-selected (Carter); 29, 'Perfection' (Hurst); 37, 'Selected Drumhead' (Sutton); 45, 'Covent Garden Late Drumhead' (Watkins & Simpson).

After the very severe weather of January and February 1917 the following varieties were found to have stood best, and to be still fit for use, and Awards of Merit were recommended to them.

No. 18, 'Selected Green Curled' (Dobbie); 25, 'New Year' (Sutton); 41, 'Ormskirk Late Green' (Sydenham); 42, 'Ormskirk' (Nutting); 43, 'Ormskirk Selected' (A. Dickson); 44, 'Late Drum head' (Nutting).

VARIETIES.*

1. Kinver Globe.	18. Selected Green Curled.
2. Little Wonder.	19. } Dwarf Green Curled.
3. Advancer.	20. }
4. } Tom Thumb.	21. }
5. }	22. }
6. }	23. Golden Globe.
7. Tom Thumb re-selected.	24. Reliance.
8. Very Dwarf.	25. New Year.
9. Sugarloaf.	26. Giant Green Curled.
10. Kitzing.	27. Gilbert's Universal.
11. New Cone-headed.	28. American Drumhead.
12. Cartercone.	29. }
13. } Dwarf Green Curled.	30. }
14. }	31. }
15. } Earliest of All.	32. Early Drumhead.
16. }	33. }
17. Dwarf Close Curled.	34. } Best of All.

* See footnote p. 400.

35. } Drumhead.	41. Ormskirk Late Green.
36. } Selected Drumhead.	42. Ormskirk.
37. Latest of All.	43. Ormskirk (Hawlmare Selection).
38. Drumhead.	44. Late Drumhead.
39. Late Drumhead.	45. Covent Garden Late.
	46. Drumhead.
	47. Norwegian.

Oxheart Type.

3. Advancer (Webb).—Plant of large size, dwarf; outer foliage medium, spreading, large, slightly crinkled, green; head of medium to large size, obtuse, solid, becoming yellow. Very much mixed. Stands badly. Ready August 25.

12. Cartercone (Carter).—Plant of medium size, much outer foliage, large, spreading, finely crinkled, green, glaucous; head of medium size, obtuse, fairly solid. Stands well. Ready October 21.

17. Dwarf Close Curled (Cooper-Taber).—Plant of large size; much outer foliage, large, spreading, finely crinkled, dark green; head of medium size, obtuse, solid, becoming yellow. Some tall, some dwarf. Stands fairly well. Ready September 15.

13. Dwarf Green Curled (Nutting).—Plant of medium size; much outer foliage, medium, spreading, finely crinkled, dark green, glaucous; head of medium size, obtuse, rather loose. Some tall, some dwarf. Stands fairly well. Ready October 11.

14. Dwarf Green Curled (R. Veitch).—Plant of large size; much outer foliage, large, very spreading, finely crinkled, dark green, glaucous; head of medium size, obtuse, solid. Some dwarf, some tall, and sugar-loaf. Stands fairly well. Ready October 11.

19. Dwarf Green Curled (Sutton).—Plant of medium size, fairly compact, dwarf; much outer foliage, spreading, medium, very finely crinkled, dark green; head of medium size, obtuse, solid. A little lighter colour, distinct. Stands fairly well. Ready September 20.

20. Dwarf Green Curled (Simpson).—Plant of large size, fairly compact, dwarf; much outer foliage, medium, spreading, finely crinkled, dark green; head of medium size, obtuse, solid. Stands fairly well. Ready September 20.

21. Dwarf Green Curled (Barr).—Plant of large size, dwarf; much outer foliage, medium, spreading, finely crinkled, dark green, glaucous; head of medium size, obtuse, solid. Stands fairly well. Ready September 20.

22. Dwarf Green Curled (Sydenham).—Plant of large size; much outer foliage, large, spreading, finely crinkled, dark green, glaucous; head of medium size, obtuse, solid. Stands well. Ready September 20.

15, 16. Earliest of All (Sutton, Barr).—Plant of medium to large size; outer foliage large, spreading, coarsely crinkled, dark green; head of medium size, obtuse, not very solid. Several types, oxheart and drumhead. Stood badly. Ready August 25.

23. Golden Globe (Barr).—Plant of large size; much outer foliage, large, spreading, coarsely crinkled, yellowish green, glaucous; head

of medium size, obtuse, loose. Like a cattle cabbage. Stood fairly well. Ready October 30.

1. Kinver Globe (Webb).—Plant of medium size; outer foliage medium, spreading, coarsely crinkled, dark green, glaucous; head of small size, obtuse, solid, becoming yellowish. Stands well. Ready September 20.

10. Kitzing (Hurst).—Plant of medium size; outer foliage medium, spreading, coarsely crinkled, light green; head of medium size, flat and obtusely pointed, solid, soon yellowing. Mixed, of various types. Stands badly. Ready August 25.

2. Little Wonder (Webb).—Plant of large size, dwarf; much outer foliage, medium, spreading, coarsely crinkled, dark green, glaucous; head of medium size, obtuse, solid, becoming yellowish. Mixed, several shapes of head. Stands well. Ready September 20.

25. New Year (Sutton), **A.M.** February 27, 1917.—Plant of medium to large size; much outer foliage, large, spreading, finely crinkled, dark green, glaucous; head of medium size, obtuse, solid. Stood well. Ready October 5.

24. Reliance (Sutton).—Plant of small to medium size; outer foliage medium, spreading, finely crinkled, dark green; head of medium size, obtuse, solid. Stands well. Ready September 20.

18. Selected Green Curled (Dobbie), **A.M.** February 27, 1917.—Plant of large size; much outer foliage, large, spreading, finely crinkled, dark green, glaucous; head of medium size, obtuse, solid. Stood well. Ready September 15.

4, 5, 6. Tom Thumb (Simpson, Hurst, Sutton).—Plant of small to medium size, dwarf, compact; medium outer foliage, medium, spreading, rather coarsely crinkled, dark green; heads of small to medium size, obtuse, solid. Stood fairly well. Ready from September 13 to 15.

7. Tom Thumb, re-selected (Carter), **XX** November 9, 1916.—Plant of large size; much outer foliage, large, spreading, finely crinkled, lightish green, glaucous; head of large size, obtuse, solid. Stands fairly well. Ready September 20.

27. Universal (Barr), **F.C.C.** March 25, 1884.—Plant of large size; much outer foliage, large, spreading, green, some crinkled; heads of medium size, obtuse, solid. Mixed. Stands badly. Ready September 20.

Drumhead Type.

28. American Drumhead (Cooper-Taber).—Plant of large size; much outer foliage, large, spreading, finely crinkled, dark green, glaucous; head of medium size, flat, solid, becoming yellowish. Several types. Stands badly. Ready September 15.

33, 34. Best of All (Sutton, Sydenham).—Plant of large size, dwarf; medium to much outer foliage, large, spreading, crinkled, dark green; head of large size, flat, solid. Stands fairly well. Ready

September 10. No. 34 was larger, lighter green, and of several types. Ready September 25.

35, 36. Drumhead (Webb, Simpson).—Plant of large size ; much outer foliage, large, spreading, finely crinkled, med. green, glaucous ; head of large size, flat, solid. Stands fairly well. Ready September 20. No. 36 was smaller in size and had some leaves with reddish veins, and both comprised several types of heads.

39. Drumhead (Veitch).—Plant of large size ; much outer foliage, large, spreading, finely crinkled, dark green, glaucous ; head of medium size, flat, solid. Stands well. Ready September 29.

46. Drumhead (Barr).—Plant of large size ; much outer foliage, large, spreading, coarsely crinkled, green, glaucous ; heads of large size, flat, solid. Soon maturing. Ready September 30.

45. Drumhead, Covent Garden Late (Watkins & Simpson), **XX** November 9, 1916.—Plant of large size ; much outer foliage, large, spreading, coarsely crinkled, med. green, glaucous ; head of large size, flat, solid. Soon maturing. Ready September 30.

32. Early Drumhead (Nutting).—Plant of large size ; much outer foliage, large, spreading, finely crinkled, dark green, glaucous ; head of large size, flat, solid, becoming yellowish. Stands well. Ready September 27.

26. Giant Green Curled (Carter).—Plant of large size, dwarf ; much outer foliage, large, crinkled, green ; heads of large size, flat, solid, becoming yellowish. A bit mixed. Stands badly. Ready September 15.

40. Late Drumhead (Sutton).—Plant of large size ; much outer foliage, large, spreading, finely crinkled, dark green, glaucous ; head of medium to large size, flat, solid. Some good, type varies. Stands fairly well. Ready October 5.

44. Late Drumhead (Nutting), **A.M.** February 27, 1917.—Plant of large size ; much outer foliage, large, spreading, coarsely crinkled, med. green, glaucous ; head of large size, flat, solid. Stands well. Ready October 21.

38. Latest of All (Watkins & Simpson).—Plant of large size ; much outer foliage, large, spreading, finely crinkled, dark green, glaucous, veins reddish ; head of medium to large size, flat, solid. Stands well. Ready October 26.

47. Norwegian (Barr), **A.M.** November 21, 1916.—Plant of large size ; much outer foliage, large, spreading, dark reddish, glaucous green, coarsely crinkled ; head of large size, flat, solid. Hardy, late, fine type. Stands well. Ready October 11.

41, 42, 43. Ormskirk (Sydenham, Nutting, A. Dickson), **A.M.** February 27, 1917.—Plant of large size ; much outer foliage, large, spreading, coarsely crinkled, green, glaucous ; head large, flat, solid. Stands well. Ready October 13. No. 41 was later, being ready October 26.

29. Perfection (Hurst), **XX** November 9, 1916.—Plant of medium size, dwarf ; much outer foliage, large, finely crinkled, dark green,

glaucous; head of medium size, flat, solid, becoming yellowish. Stands well. Ready September 20.

30. Perfection (A. Dickson).—Plant of large size; much outer foliage, large, spreading, finely crinkled; heads of medium to large size, obtuse, loose, becoming yellowish. Several types, some dwarf, some tall. Stands badly. Ready September 27.

31. Perfection (Sutton), **A.M.** November 9, 1916.—Plant of medium size, dwarf, compact; medium outer foliage, medium, finely crinkled, dark green, glaucous; head medium to small, flat, solid. The best; a nice dwarf little Savoy with no waste, can be planted 18 inches apart. Stands fairly well. Ready September 27.

37. Selected Drumhead (Sutton), **XX** November 9, 1916.—Plant of large size, dwarf, compact; much outer foliage, large, spreading, finely crinkled, dark green, glaucous; head of large size, flat, solid. Soon maturing. Ready September 15. Award to the variety as an early one. Good for market.

8. Very Dwarf (Barr).—Plant of medium size, dwarf; much outer foliage, medium, spreading, crinkled, green, glaucous; head of medium size, flat, solid, becoming yellowish: not true. Stands badly. Ready September 13.

Sugar-loaf Type.

11. New Cone-headed (Barr).—Plant of medium size; medium outer foliage, medium, rather spreading, finely crinkled, glaucous; heads oval, fairly solid. Some large and spreading. Soon maturing. Ready October 21.

9. Sugar-loaf (Sutton), **XXX** November 9, 1916.—Plant of medium size, tall, fairly compact; medium outer leaves, rather erect, medium, much crinkled, dark green; head of medium size, oval, fairly solid, becoming yellow. Good type for small gardens. Soon maturing. Ready September 20.

CLARKIAS AT WISLEY, 1916.

FORTY-FIVE stocks were sent in for trial. The seed was sown on May 15 and the seedlings thinned out when large enough to fifteen inches apart. The dwarf forms (belonging to the *C. pulchella* section) began to flower on August 2, about five or six days before the taller forms of the *elegans* section.

No trial of Clarkias has been made in the Society's gardens since 1877, and no award has been granted since 1875. At and previous to the latter date the following awards were made:—

- C. pulchella* fl. pl. (Carter), **F.C.C.** 1861.
- „ *integrifolia* (Carter), **F.C.C.** 1864.
- „ *limbata* (Carter), **F.C.C.** 1873.
- C. elegans* 'Purple King' (Hardy), **F.C.C.** 1875.
- „ 'Salmon Queen' (Hardy), **F.C.C.** 1875.

Of the above 'Purple Queen' and 'Salmon Queen' received awards in the present trial and were noted in the trial held in 1877 as being "very fine and distinct."

Clarkia pulchella fl. pl. occurred in the previous trial under two colour forms, white and crimson (rose-purple), of which the former was again received. Of *integrifolia* one variety was sent, viz. 'Mrs. Langtry.'

Of the forty-five stocks, thirty-five were true, the mixed stocks being Nos. 5, 6, 7, 16, 22, 30, 31, 34, 35, 40.

The garden varieties of *Clarkia* may be classified under two sections:—

Pulchella section, derived from *C. pulchella*, a species native in the region of the Kooskoosky and Clarke rivers in North America, and characterized by dwarf habit (1 foot), narrow leaves and trilobed petals.

In this section are included the *integripetala* forms characterized by unlobed petals.

Elegans section, derived from *C. elegans*, a species from the Pacific side of North America, characterized by tall habit (2-4 feet), pyramidal habit, broad leaves, and entire petals.

DWARF (10 to 15 inches).—*C. pulchella* section.

Rose Purple.

*8. Double Crimson (Sydenham).—Single and semi-double.

Rose Purple, White Margins.

40, 41. *integripetala* 'Mrs. Langtry' (Nutting, Sydenham)—Single.

* See footnote, p. 400.

White.

43. Double White (Sydenham), **XX** September 1, 1916.—Single and semi-double.

TALL (2 feet and over).—*C. elegans* section.

Rose Purple.

1, 2, 3, 4, 5. Purple Prince (Hurst, Watkins & Simpson, Barr, Simpson, Dobbie).—Semi-double and double. No. 1 is called by the old name 'Purple King' and contained single and semi-double. No. 3 received award of **XX** September 1, 1916.

Shades of Deep Salmon Pink.

6, 7. Firefly (Sutton, Hurst).—Semi-double and double.

9, 10, 11, 12. Queen Mary (Barr, Nutting, Sydenham, Watkins & Simpson).—Semi-double and double. No. 12 received award of **XX** September 1, 1916. In No. 10 the shade varies.

13, 14, 15, 16, 17. Brilliant (Sydenham, Watkins & Simpson, R. Veitch, Barr, Simpson).—Double. Nos. 13, 14, and 17 received award **XXX** September 1, 1916. No. 17 contained semi-double and double.

18, 19, 20. Vesuvius (Watkins & Simpson, Dobbie, Sydenham).—Double. Nos. 18 and 19 received award **XXX** September 1, 1916.

21. Salmon Scarlet (Sutton), **XXX** September 1, 1916.—Double.

22, 23, 24, 25, 26. Scarlet Queen (Barr, Nutting, Carter, Hurst, R. Veitch).—Semi-double and double. No. 23 received award **XXX** September 1, 1916.

27, 28, 29. Orange King (Watkins & Simpson, R. Veitch, Barr), **XXX** September 1, 1916.—Semi-double and double. No. 27 is deeper in colour and an advance.

30. Orange Prince (Simpson).—Similar to 28, 29.

Salmon Pink.

31, 32, 33. Salmon Queen (Sydenham, Barr, Hurst).—Single and semi-double.

White with Pink Flush.

34. Pink Pearl (Barr).—Double.

42. Double Delicate Pink (Sutton).—Double.

35, 36, 37, 38. Chamois Queen (Watkins & Simpson, R. Veitch, Simpson, Dobbie).—Double. No. 38 contained semi-double and double.

39. Rose Beauty (Barr), **XXX** September 1, 1916.—Semi-double and double.

White.

44. White Queen (Barr).—Single and semi-double.

45. Snowball (Sutton).—Single and semi-double.

GODETIAS AT WISLEY, 1916.

FORTY-TWO stocks of Godetias were sent for trial at Wisley. They were sown in the open on May 15, thinned out when large enough and with the exception of No. 12, 'Sunset' (R. Veitch), which failed to germinate, they all flowered in August.

No systematic trial of Godetias had been held since 1877. In that year a trial of Godetias was made at Chiswick and among the forms grown was *G. Schaminii*, a variety which is probably a form of *G. rubicunda* (*Bot. Reg.* t. 1856), and one which has entered largely into the composition of the garden Godetias of the present day. *G. Whitneyi* was also included in the Chiswick trial.

The following awards (given in chronological order) have been made to Godetias:—

1870. *Oenothera* (*Godetia*) *Whitneyi*, first collected by Dr. Bolander in Shelter Cove, Humboldt County, California, 1867 (Thompson); **F.C.C.**

1890. *Godetia* 'Duke of Fife' (Daniels), **A.M.** (also sent in 1916).

1891. *Godetia* 'White Pearl' (Carter), **A.M.**

1895. *Godetia* 'Marchioness of Salisbury' (Daniels), **A.M.** (also sent in 1916).

1897. *Godetia gloriosa* (Dobbie), **A.M.**, a very free-flowering variety of dwarf, compact habit; flowers large, cup-shaped, deep rich crimson.

1900. *Godetia speciosa rosea* (Perry), **A.M.**

1905. *Godetia Schaminii* fl. pl. (Lawrence), **A.M.**

1915. *Godetia* 'Lavender' (Carter), **A.M.**

The following stocks were not true, the rogues differing from the type in some cases in colour of flower, in others in height, and in others in both these characters: 3, 5, 6, 7, 11, 13, 14, 17, 18, 19, 20, 21, 25, 29, 31, 32, 33, 37, 38, 41, 42.

The true stocks were:—

	Sender.	Award.
1. Mandarin	Barr	—
2. White Gem	Barr	XX
4. Bridesmaid	Barr	—
8. Nana compacta Rosy Gem	R. Veitch	—
9. Nana compacta Rosy Gem	Watkins & Simpson	—
10. Compacta Sunset	R. Sydenham	XX
15. Duke of York	Barr	—
16. Crimson Gem	Barr	XXX
20. Sparkler	Barr	—
22. Marchioness of Salisbury	Barr	XXX
23. Lavender	Carter	A.M. confd.
24. Malmaison	Barr	—

	Sender.	Award.
26. Schaminii Double Rose	R. Sydenham	—
27. Schaminii fl. pl.	Dobbie	—
28. Schaminii fl. pl.	R. Veitch	—
30. Schaminii fl. pl.	Watkins & Simpson	XXX
34. Schaminii Double Carmine	A. Dickson	XX
35. Tall Double Carmine	W. H. Simpson	—
36. Tall Double Mauve	W. H. Simpson	XX
39. Grandiflora lilacina fl. pl.	Barr	—
40. Duke of Fife	Daniels	XXX

The most striking Godetia in the Trial was No. 23, 'Lavender.' This variety differs from all the others in the colour of the flower, lavender with dark purple at the base, and its more slender habit. Its general resemblance to *Oenothera viminea* (see *Bot. Mag.* 2873), one of the N. American plants introduced by Douglas, suggests that this Godetia is a cultivated form of that species.

It is noteworthy that all the dwarfs—see later, A a (1) and (2)—are without exception singles, and so are the plants of middle height (18 to 24 inches).

The characters of the garden races suggest that the Godetias of cultivation—or at least those grown in the Trial—(with the exception of 'Lavender,' see above) are derived from one or other or both of two species: the dwarfer races from *G. Whitneyi*, and the taller from *rubicunda*. The former grows 1 foot and the latter 2 feet.

The two sections are distinguished, moreover, by the following characters:—

Whitneyi Section.—Dwarf, compact; flowers single, self-coloured or white, white base, 8 stamens.

Schaminii Section.—Taller, semi-double: flowers self-coloured or white, crimson base, stamens 8–12. The excessive number of stamens is correlated with the semi-doubleness of the petals.

Godetia Whitneyi, which is figured in *Bot. Mag.*, tab. 5867, under the name of *Oenothera Whitneyi*, has the following characters:—Height 1 foot, habit bushy; petals wine-red, with large diffused crimson-purple blotch above the claw (base white); and, as shown in the plate, the stamens are crimson, 8 in number, and the flowers single.

Godetia rubicunda, as figured in *Bot. Reg.*, tab. 1856, was introduced by Douglas from California and is characterized as follows: Height 2 feet, branching first spreading then erect; petals pale red with rose base, stamens red (crimson in the closely allied *G. vinosa*). Inasmuch as the name *Schaminii* is in general use in gardens, the taller forms sent in for trial are classed as belonging to the section *Schaminii*.

It is interesting that no dwarf white was included in the plants sent in for trial. It is also noteworthy that several varieties, e.g. 'Crimson Glow' and 'Rosamund,' have given rise each to two distinct races differing consistently in height, and as this character is of importance in gardens and is used in the classification below, the names of these varieties occur more than once in the classified list.

I. Flowers lavender ; stamens deep purple.

*23. Lavender.—Lavender, dark purple at base ; 18 to 24 inches in height.

II. Flowers crimson, pink, or white ; stamens crimson or pink.

WHITNEYI SECTION.

A. Flowers single (8 stamens only).

(a) *Dwarf compact habit.*

(1) Very dwarf, between 12 and 16 inches.

20. Sparkler.—Rich crimson, lighter margin, white base ; 12 to 14 inches.

17, 18, 19. Crimson Glow.—Similar to 20 ; 12 to 15 inches. Cf. 41 below.

16. Crimson Gem.—Similar to 20 ; 14 to 18 inches.

8, 9. *nana compacta* Rosy Gem.—Pinkish white, suffused light crimson (rose-pink, magenta) ; 14 to 16 inches.

12. Failed.

(2) Dwarf, between 16 and 20 inches.

6. Rosamund.—Light crimson, white base and margins ; 16 to 18 inches. Cf. 5 below.

13. *compacta* Sunset.—Rich crimson, white base and margins ; 16 to 18 inches.

10. *compacta* Sunset.—Bright crimson, white base and margins ; 16 to 20 inches.

11. Sunset.—Similar to 10 ; 16 to 20 inches.

14. *compacta* Sunset.—Similar to 10 ; 18 to 20 inches.

7. Lady Satin Rose.—Deep crimson, white base and margins ; 16 to 20 inches.

21. *compacta gloriosa*.—Ruby crimson, light lavender base ; 16 to 20 inches.

41. Crimson Glow.—Rich crimson, pinkish-white centre and lower margins ; 16 to 20 inches. Cf. 16–20 above.

(b) *Mid or Tall, rather spreading habit.*

(1) Mid-height, between 18 and 24 inches.

1. Mandarin.—White ; 18 to 24 inches.

42. White.—20 to 24 inches.

15. Duke of York.—Rich crimson, white base ; 18 to 24 inches.

40. Duke of Fife.—Rich crimson, pinkish-white base ; 18 to 24 inches.

(2) Intermediate Tall, between 24 and 30 inches.

2. White Gem.—White, fading to pink ; 24 to 30 inches.

3. Duchess of Albany.—White ; 24 to 30 inches.

* See footnote, p. 400.

4. Bridesmaid.—White, suffused with crimson over upper half ;
24 to 30 inches.
5. Rosamund.—White, suffused in centre with light crimson ;
18 to 28 inches. Cf. 6 above.
22. Marchioness of Salisbury.—White with crimson blotch ;
24 to 30 inches.

SCHAMINII SECTION.

B. Flowers semi-double or single and semi-double.

Intermediate Tall or Tall (stamens 8 or 9-10 or 12), rather spreading habit.

(1) Intermediate Tall, between 24 and 30 inches.

35. } Tall Double Carmine.—Crimson, pinkish-white margins ; single
and semi-double ; stamens 8, crimson.
37. } *carminea grandiflora* fl. pl.—Similar to 35.
38. } *grandiflora carminea* fl. pl.—Similar to 35.
36. } Tall Double Mauve.—Light rose-purple ; semi-double ; stamens
8-10, crimson.
39. } *grandiflora lilacina*; fl. pl.—Similar to 36 ; single and semi-
double ; stamens 8, crimson.
25. } Double Rose.—Delicate pink, crimson base ; single and semi-
double ; stamens 9-10, crimson.
26. } Schaminii Double Rose.—Similar to 25, but all semi-double.
27. } Schaminii fl. pl.—Similar to 26.
28. } Schaminii fl. pl.—Similar to 26.
29. } Tall Double Pink.—Similar to 26.

(2) Tall, between 30 and 36 inches.

24. Malmaison.—Delicate pinkish white, dull crimson base ; mostly
semi-double ; stamens 9-10, crimson.
31. } Schaminii Crimson.—Rich crimson, pinkish-white margins ; semi-
double ; stamens 8, crimson.
32. } Double Beauty.—Similar to 31, but single and semi-double.
33. } Tall Double Crimson.—Similar to 32.

(3) Very Tall, over 36 inches.

34. Schaminii Double Carmine.—Rich crimson, pinkish-white
margins ; 30 to 40 inches ; single and semi-double ; stamens
8-10, crimson. Of straggling habit.
30. Schaminii fl. pl.—Rose-pink, crimson base ; 38 to 42 inches ;
semi-double ; stamens 9-12, crimson. Of good habit.

INDIAN PINKS AT WISLEY, 1916.

THIRTY-SIX stocks of Indian Pinks (varieties of *Dianthus chinensis*) were sent in for trial in 1916. They were sown in pots on April 4, pricked off on April 24 into boxes and planted out on May 22 in double-dug soil.

The most striking feature of the Indian pinks, as grown in the trial, was the brilliancy of the display of flowers late in the season (mid-October) when comparatively few garden subjects are in blossom.

The following named forms contained no "rogues": Nos. 10, 18, 22, 23, 26, 27, 28, 29, 30, 33, 34, 35, 36.

Flowers White.

*29, 30. Snowdrift (Barr, Nutting).—Single and double, much fringed.

32. Purity fl. pl. (Watkins and Simpson).—Semi-double and double, much fringed; stock not true, some flushed crimson.

33. Purity (R. Veitch).—Double, much fringed.

34, 35, 36. Queen Alexandra (Watkins and Simpson, Dobbie, R. Veitch).—Single and semi-double, fringed. No. 36 awarded **XX** September 1, 1916.

Flowers Pinkish White.

23. Salmon Queen (Nutting).—Mostly single, much fringed.

24. Salmon Queen (Dobbie).—Single, much fringed.

27. Pink Beauty (R. Veitch).—Semi-double and double, much fringed.

28. Pink Beauty (Watkins and Simpson).—Single and double, much fringed.

Flowers Pink to Crimson.

15. Count Kerchove (Barr).—Semi-double and double, fringed. Some of good colour, requires further fixing.

Flowers Scarlet Lake.

8, 9, 10. Vesuvius (R. Veitch, Barr; Watkins and Simpson), **XX** September 1, 1916.—Single, fringed; No. 9 slightly mixed.

19, 20, 21, 22. Lucifer (Nutting, Dobbie, R. Veitch, Barr).—Single and semi-double, fringed; the last the only stock quite true to colour.

* See footnote p. 400.

Flowers Brick Red to Scarlet Lake.

25. Salmon Queen (R. Veitch).—Single and semi-double, fringed.

Flowers Dark Rich Crimson.

7. Crimson Belle (Barr), **XXX** September 1, 1916.—Single, fringed ; needs selection.
 17. Brilliant Red (Dobbie).—Mostly single, much fringed ; some good colour, needs selection.
 18. Fireball (Dobbie), **XX** September 1, 1916.—Semi-double and double, much fringed.
 26. Salmon Queen (Barr), **XX** September 1, 1916.—Single, fringed and much fringed.

Flowers of Mixed Colours.*White to Crimson.*

2. superbissimus mixed (Sydenham), **XXX** September 1, 1916.—Single and semi-double, much fringed.
 3. Heddewigii mixed (Sydenham), **XX** September 1, 1916.—Single and double, fringed.
 4. Heddewigii new deeply fringed (Barr), **XXX** September 1, 1916.—Mostly single, very deeply fringed.

White with various dark centres, from Scarlet to dark Purple.

5. Heddewigii extra choice mixed (Barr).—Single, fringed.
 11. Heddewigii, double mixed (Sydenham).—Semi-double, much fringed.
 12. Heddewigii, double extra choice mixed (Barr).—Semi-double, much fringed.
 13. Chinensis double mixed (Sydenham).—Single and semi-double, fringed.
 16. Rose Queen (Barr).—Single and semi-double, much fringed.
 31. Star of Devon Strain (R. Veitch), **XXX** September 1, 1916.—Single and semi-double, some fringed.

Pink to Crimson.

1. Heddewigii superbissimus mixed (Watkins and Simpson).—Single and semi-double, much fringed.
 6. Heddewigii new Giant Strain (Barr).—Single, fringed.
 14. laciniatus Malmaison (Dobbie).—Single and double, much fringed.

LARKSPURS (ANNUAL DELPHINIUMS) AT WISLEY,
1916.

FIFTEEN stocks of Annual Delphiniums were received at Wisley for trial in 1916. They were sown on May 15, and thinned out as soon as large enough. The Floral Committee inspected them in September and made the awards to the following stocks:

Award of Merit.

No. 13. Blue Butterfly (Hurst).

Highly Commended.

No. 3. Rosy Scarlet (Sydenham).

Nos. 5 and 7. Azure Fairy (Dobbie, Watkins and Simpson).

Awards had previously been given to 'Empress Carmine' (Veitch), A.M. Sept. 6, 1907, and 'Blue Butterfly' (Carter), A.M. July 17, 1900.

TALL SECTION (4 feet 6 inches).

Pink, streaked and suffused with Crimson.

1, 2, 3, 4. Rosy Scarlet (Simpson, Watkins and Simpson, Sydenham, Sutton).—Semi-double. No. 1 contained both single and semi-double.

MED. SECTION (3 feet).—Leaves with broader segments.

Purplish-Blue; Yellowish-white centre.

15. New Annual Type (Dickson and Robinson).—Single (some lighter in colour).

DWARF SECTION (18 to 24 inches).

Sky-Blue, streaked Purple.

5, 6, 7. Azure Fairy (Dobbie, R. Veitch, Watkins and Simpson).—Single.

Royal-Blue with Purple blotch at apex.

8, 9, 10, 11, 12, 13, 14. Blue Butterfly (R. Veitch, Simpson, A. Dickson, Dobbie, Sydenham, Hurst, Watkins and Simpson).—Single. No. 13 is of fine colour.

MIGNONETTE AT WISLEY, 1916.

FORTY-SIX stocks of Mignonette were received at Wisley for trial in 1916. The seed was sown on May 15 in drills and thinned to 15 inches apart when large enough. With one exception the seed germinated well, and the plants filled the space allotted to them, so that the beds were well covered. The Floral Committee inspected the trial in August and made the following recommendations:—

Highly Commended (XXX).

- 18. Hercules.
- 21. Machet grandiflora, Giant.
- 22. Machet Giant Crimson.
- 27. Machet.
- 32. Giant.
- 36, 39. Golden Queen.

Commended (XX).

- 25. Machet Improved.
- 31. Gabriele.

The only Mignonette which had received an award previously was 'Bush Hill White,' **A.M.** March 26, 1895).

VARIETIES.

*1. Red Monster (Dickson).—Of somewhat spreading habit, 10 to 12 inches high; spikes large, flowers whitish with orange stamens.

2, 3, 4. Goliath (Nutting, Barr, Hurst).—Compact, 12 to 14 inches (No. 4 rather taller); spikes large, flowers in No. 2 whitish, Nos. 3 and 4 mainly greenish, stamens orange.

5. Victoria Crimson (Barr).—Tall, 18 to 24 inches; spikes large, flowers whitish with orange stamens. Not quite true.

6. Little Gem (Barr).—14 to 18 inches; spike of medium size, rather lax; flowers as in 5.

7. Prizetaker Red (Barr).—18 to 24 inches; spikes of medium size, flowers whitish with orange stamens.

8. Red King (Carter).—Compact; 14 to 18 inches; spikes large, flowers whitish with orange stamens of very pleasing shade.

9. Perfection (Carter).—A mixed stock containing green, yellow, and white forms.

10. New Red (Barr).—14 to 16 inches; spikes of medium size; flowers greenish with orange stamens. Germinated badly.

11. Bismarck (Hurst).—14 to 16 inches; spikes of medium size, flowers whitish with orange stamens. Not quite true.

* See footnote p. 400.

12, 13. *Crimson Queen* (Hurst, Barr).—14 to 18 inches; spikes of medium size; flowers whitish with orange stamens.

14. *Crimson Queen* (Dobbie).—Compact; 12 to 14 inches; spikes large, flowers greenish with orange stamens.

15. *Orange Queen* (Barr).—Compact, similar to 14; scent strong.

16. *Machet Orange Queen* (Watkins and Simpson).—Similar to 15, but rather dwarfer. Germinated badly.

17. *Covent Garden Favourite* (Barr).—16 to 20 inches; spikes large; flowers whitish with orange stamens. Stock not true.

18. *Hercules* (Barr), **XXX** August 1916.—14 to 18 inches; spikes large, flowers whitish with orange stamens; very sweet and long-lasting.

19. *Common Improved* (Barr).—Rather lax; 18 to 20 inches; spike long slender; flowers whitish with orange stamens.

20. *Paris Market* (Barr).—14 to 20 inches; spike of medium size; flowers whitish with orange stamens.

21. *Grandiflora Giant* (Watkins and Simpson), **XXX** August 1916.—12 to 14 inches; spikes large; flowers whitish with orange stamens.

22, 23, 24. *Giant Crimson* (Barr, Watkins and Simpson, Simpson).—A variety with many lateral spikes, 15 to 18 inches high; spikes large, flowers whitish, stamens orange; deeper in colour than 21. No. 23 was highly commended, August 1916. No. 24 not quite true.

25. *Machet Improved* (Barr), **XX** August 1916.—A variety with numerous side spikes, 14 to 18 inches; spikes larger; flowers whitish, with orange stamens; a fine variety but less sweetly scented than 22–24.

26, 27, 28. *Machet* (Simpson, Veitch, Sydenham).—Lateral spikes numerous, 16 to 20 inches high; spikes medium to large, flowers whitish, stamens orange. No. 27, the best stock, highly commended, August 1916.

29, 30, 31. *Gabriele* (Nutting, Barr, Hurst).—16 to 18 inches; spikes of medium size; flowers whitish, stamens orange. Stocks 29 and 30 not quite true. 31 commended (**XX**), August 1916.

32. *Giant* (Dobbie), **XXX** August 1916.—16 to 18 inches; rather procumbent; spikes long, large, good for cutting; flowers whitish with orange stamens.

33, 34. *Yellow Prince* (Watkins and Simpson, Barr).—15 to 18 inches; spikes large, flowers whitish, stamens yellow. Stock 33 contained some orange-anthered plants.

35. *Golden Machet* (Barr).—14 to 18 inches; flowers whitish with yellow-orange stamens.

36, 37, 38, 39. *Golden Queen* (Sydenham, Carter, Nutting, Barr).—16 to 20 inches; with many lateral branches; spikes of medium size; flowers whitish with golden orange stamens. Stocks 36 and 39 had rather smaller spikes than 37 and 38 and were both highly commended August 1916.

40. *Miles' Hybrid Spiral* (Barr).—A small rather straggling variety,

18 to 24 inches, with small, thin but sweetly scented spikes of whitish flowers with orange stamens.

41. Allen's Defiance (Nutting).—16 to 18 inches; rather procumbent; spikes large; flowers whitish with orange stamens.

42. Parsons' White (Barr).—16 to 18 inches; spikes of medium size, white with pale stamens. Stock not true.

43, 44. White Pearl (Barr, Simpson).—14 to 18 inches; spikes of medium size, flowers white with pale stamens. Stocks not true.

45, 46. White Queen (Barr, Carter).—14 to 16 inches; spikes large, flowers white. Stocks not true.

ANNUAL SUNFLOWERS AT WISLEY, 1916.

THE trial of Sunflowers, begun in the previous year, was concluded in 1916.

In the first year of the trial the plants were grown on fairly rich soil and made vigorous growth; this year, on the poorer soil by the new cottages, the growth was less rampant.

Eighty-four stocks were received for trial in 1916.

The Committee inspected the trial on September 1.

Having regard to the facts that most of the stocks of red Sunflower failed to come true from seed, and that none was of conspicuous merit, the Committee decided unanimously to make no awards.

Yellow Sunflowers.

LARGE-FLOWERED FORMS (derived from *Helianthus annuus*).

Single.

Tall races (6 to 10 feet).

*1. Giant Russian (Barr).—Flowers rich yellow, $6\frac{3}{4}$ inches diameter; disc yellow and black, $2\frac{1}{2}$ inches; rays twisted.

2. Giant Single (Barr).—Flowers rich yellow, $7\frac{1}{2}$ inches diameter; disc yellow and black, $2\frac{3}{4}$ inches; rays twisted.

4. *uniflorus* (Barr).—Flowers rich yellow, 8 inches diameter; disc yellowish black, $2\frac{1}{4}$ inches; rays large, lax, twisted.

18. *Æsthetic Gem* (Barr).—Flower rich yellow, $6\frac{1}{2}$ inches diameter; disc brown, $2\frac{3}{4}$ inches; rays furrowed.

16. Henry Wilde (Barr).—Flowers deep yellow, 6 inches diameter; disc dark, $1\frac{3}{4}$ inch; rays furrowed.

17. Tall Single (Dickson and Robinson).—Flowers golden yellow, streaked reddish brown, 6 inches diameter; disc dark, $1\frac{3}{4}$ inch; rays furrowed.

21. Tall Single (Barr).—Flowers deep yellow, 9 to 12 inches diameter; disc yellow and black, 3 inches; rays furrowed and twisted.

Mid races (4 to 6 feet).

19. *argophyllus* (Barr).—Flowers rich yellow, $3\frac{3}{4}$ inches diameter; disc dark, 1 inch; rays furrowed.

20. *californicus* (Barr).—Flowers deep yellow, 5 inches diameter; disc dark, $1\frac{1}{2}$ inch; rays furrowed.

38, 39, 40. Golden Nigger (Sydenham, Simpson, Barr).—Flowers golden yellow, $6\frac{1}{2}$ inches diameter; disc dark, $2\frac{1}{2}$ inches; rays furrowed.

* See footnote, p. 400.

41. Primrose (Simpson).—Flowers primrose, $8\frac{1}{2}$ inches diameter; disc greenish yellow, $3\frac{1}{4}$ inches; rays pointed, twisted, and furrowed; some plants dwarfer, with smaller flowers.

22. Primrose Perfection (Sydenham).—Flowers lemon-yellow, $6\frac{1}{2}$ to 7 inches diameter; disc dark, $2\frac{1}{4}$ inches; rays pointed, ribbed, and twisted. Not quite true, thin in petals.

42. Munstead Primrose (Barr).—Flowers lemon-yellow, $8\frac{1}{2}$ inches diameter; disc dark, $3\frac{1}{4}$ inches; rays furrowed and twisted. Very like No. 43.

43. Primrose (Carter).—Flowers lemon-yellow, $6\frac{1}{2}$ inches diameter; disc dark, $2\frac{1}{4}$ inches; rays pointed and furrowed (variable in height and disc).

Double.

Tall races (6 to 10 feet).

25. Double Cactus-flowered Earliest of All (Barr).—Flower semi-double, deep yellow, 8 inches diameter; disc black, $2\frac{1}{2}$ inches; rays furrowed.

31. New Double Lemon Queen (Barr).—Flowers double, lemon-yellow, 6 inches diameter; centre a little darker; rays narrow and pointed.

Mid races (4 to 6 feet).

27. Chysanthemum-flowered Double (Barr).—Flowers double, golden yellow, $6\frac{1}{2}$ inches diameter; rays narrow, fimbriated.

28. *californicus* fl. pl. (Barr).—Flowers double, golden yellow, 8 inches diameter; centre greenish; rays furrowed and quilled.

29, 30. *globosus fistulosus* (Barr, Sydenham).—Flowers double, rich yellow, 8 to 12 inches diameter; centre greenish, quilled; rays furrowed. No. 29 had 1 plant single, and No. 30 was mixed, with smaller flowers.

45. *pallidus plenissimus* (Watkins and Simpson).—Flowers double, straw-yellow, $6\frac{1}{4}$ inches diameter; centre slightly deeper; inner florets narrow, fimbriated.

Dwarf race.

77. *nanus* fl. pl. (Barr).—Height, $3\frac{1}{2}$ feet; flowers double, golden yellow, $5\frac{1}{2}$ inches diameter; centre greenish; rays reflexed, crumpled and furrowed.

SMALL-FLOWERED FORMS (mainly derived from *H. cucumerifolius*).

Single.

Tall races (4 to 6 feet).

71. *cucumerifolius* fol. var. (Laxton).—Flowers deep yellow, $3\frac{1}{2}$ inches diameter; disc dark, $\frac{3}{4}$ inch; rays furrowed and pointed. Mixed stock; some straw-yellow.

37. Miniature (Sydenham).—Flowers golden yellow, 4 inches diameter; disc dark, $1\frac{1}{4}$ inch; rays furrowed, notched. One good plant, with regular flower and double row of rays.

44. *grandiflorus* (Barr).—Flowers golden yellow, 3 inches diameter; disc dark, $1\frac{1}{4}$ inch; rays pointed and furrowed; a poor flower.

23. Primrose Dame (R. Veitch).—Flowers yellow, deeper base and tip, $3\frac{1}{2}$ inches diameter; disc dark, $\frac{3}{4}$ inch; rays twisted to points.

Mid races (3 to 4 feet).

54. Mars (Barr).—Flowers rich yellow, $4\frac{1}{2}$ inches diameter; disc dark, $1\frac{1}{4}$ inch; rays furrowed and twisted. One plant lemon.

55. Circe (Barr).—Flowers deep yellow, $3\frac{3}{4}$ inches diameter; disc dark, $\frac{3}{4}$ inch; rays furrowed and twisted. One plant lighter yellow, nicely twisted rays.

56. *cucumerifolius* type (Barr).—Flowers deep yellow, $3\frac{1}{2}$ inches diameter; disc dark, $\frac{3}{4}$ inch; rays furrowed.

57. *stellatus* (Barr).—Flowers deep yellow, 2 inches diameter; disc dark, $\frac{3}{4}$ inch; rays furrowed; a poor flower.

58. Stella (Barr).—Flowers yellow, deeper towards disc, 3 inches diameter; disc dark, $\frac{3}{4}$ inch; rays furrowed and twisted.

59. Golden Fleece (R. Veitch).—Flowers deep yellow, $3\frac{1}{2}$ inches diameter; disc dark, 1 inch; rays furrowed and twisted.

60. Golden Fleece (Barr).—Flowers rich yellow, $3\frac{3}{4}$ inches diameter; disc dark, $\frac{3}{4}$ inch; rays furrowed and twisted, lax.

61. Golden Fleece (Watkins and Simpson).—Flowers light yellow, suffused darker, $3\frac{1}{2}$ to 4 inches diameter; disc greenish, $\frac{3}{4}$ inch; rays distant, twisted. Mixed stock; some deep yellow with ragged flowers.

66. Primrose Gem (Barr).—Flowers pale yellow, $\frac{3}{4}$ inch diameter; disc dark, $\frac{3}{4}$ inch; rays furrowed.

69. Orion (Barr).—Flowers light yellow, $4\frac{1}{2}$ inches diameter; disc dark, $1\frac{1}{4}$ inch; rays furrowed and twisted, almost tubular. Stock mixed; some small and deep yellow.

62. Sirius (Barr).—Flowers lemon yellow, darker at centre, 4 inches diameter; disc dark, $1\frac{1}{4}$ inch; rays pointed and furrowed. Stock mixed. Known also as 'Diadem.'

63. Leda (Barr).—Flowers yellow, lemon towards disc, 5 inches diameter; disc brown, $1\frac{3}{4}$ inch; rays pointed, furrowed, and twisted.

64. Venus (Barr).—Flowers lemon-yellow, deeper towards disc; disc dark, $3\frac{1}{2}$ inches; rays furrowed, pointed, and twisted.

67. Sunlight (Barr).—Flowers straw-yellow, deeper towards disc, $3\frac{3}{4}$ inches diameter; disc dark, $1\frac{1}{4}$ inch; rays furrowed and twisted.

79. *nanus albus* (Barr).—Flowers straw-yellow, deeper towards disc, $2\frac{1}{2}$ inches diameter; disc brown, $\frac{3}{4}$ inch; rays with slightly incurved margins. Sent as white.

65. Erato (Barr).—Flowers, some pale, some deep yellow, 4 inches diameter; disc dark, 1 inch; rays, some furrowed and twisted, some furrowed only. Mixed.

Dwarf races (1 to 3 feet).

82. *Miniature*²₁ *Sunlight* (Watkins and Simpson).—Flowers, some light, some dark yellow, $2\frac{1}{2}$ inches diameter; disc dark, $\frac{3}{4}$ inch; rays narrow, twisted, lax.

83. *Lilliput* (Barr).—Flowers golden yellow, 3 inches diameter; disc dark, $\frac{3}{4}$ inch; rays, some twisted, some furrowed.

84. *Perkeo* (Barr).—Flowers golden yellow, 3 inches diameter; disc dark, 1 inch; rays furrowed.

78. *Princess Ida* (Barr).—Flowers lemon-yellow, $2\frac{1}{2}$ inches diameter; disc green, $\frac{3}{4}$ inch; rays pointed and furrowed. Sent as white.

Double.

Mid races (3 to 4 feet).

70. *plumosus* (Barr).—Flowers, some straw, some deep yellow, 4 inches diameter; disc dark, $1\frac{1}{4}$ inch; rays pointed, furrowed, and twisted. Stock not true; flowers single.

74. *cucumerifolius* fl. pl. (Barr).—Flowers, some deep yellow, some streaked purple-brown, $3\frac{1}{2}$ inches diameter; disc dark, 1 inch; rays pointed and furrowed. Stock not true; one double lemon-yellow, others single.

75. *stellatus* fl. pl. (Barr).—Flowers, some pale, some deep yellow, 4 inches diameter; disc dark, $1\frac{1}{4}$ inch; rays pointed and furrowed. Stock not true; one double, canary-yellow, greenish centre, others single.

76. *albus* fl. pl. (Barr).—Flowers pale yellow, darker towards disc, $2\frac{1}{2}$ inches diameter; disc brownish, 1 inch; rays pointed and furrowed. Stock not true; one double. Sent as white.

"Red" Sunflowers.

HYBRIDS OF ANNUUS HABIT.

Single.

Tall races (6 to 10 feet).

5. *Ruby Gem* (Sutton).—Flowers lemon-yellow, streaked dull purple-brown, $5\frac{1}{2}$ inches diameter; disc dark, $1\frac{1}{2}$ inch; rays twisted.

6. *Bronze King* (Sutton).—Flowers deep yellow, suffused rich velvety brown, 6 inches diameter; disc dark, $2\frac{1}{2}$ inches; rays twisted.

9. *New Gaillardia-flowered* (Barr).—Flowers deep yellow, streaked brown, $6\frac{1}{4}$ inches diameter; disc dark, 2 inches; rays furrowed.

13. *Langley Gem* (Sutton).—Flowers yellow, suffused purple-brown, $5\frac{1}{2}$ inches diameter; disc dark, $1\frac{1}{2}$ inch; rays furrowed; one almost lacking brown.

10. *Red* (Dickson and Robinson).—Flowers deep yellow, streaked with brown, $5\frac{1}{2}$ inches diameter; disc dark, $1\frac{3}{4}$ inch; rays furrowed.

11. Mexican Red (Dobbie).—Flowers rich yellow, streaked red-brown, 5 inches diameter; disc dark, $1\frac{3}{4}$ inch; rays furrowed.

7. Red (Sutton).—Flowers golden yellow, 6 inches diameter; disc dark, $1\frac{3}{4}$ inch; rays furrowed. One plant streaked golden brown. Sent as a red variety, but proved to be an excellent golden yellow.

24. Gipsy Queen (R. Veitch).—Flowers straw-yellow, streaked purple-brown, 5 inches diameter; disc dark, $1\frac{1}{4}$ inch; rays twisted. Mixed, some with deeper flowers and narrow, pointed rays.

15. Rose Queen (Barr).—Flowers yellow, streaked purple-brown, $4\frac{1}{4}$ inches diameter; disc dark, $1\frac{1}{4}$ inch; rays furrowed.

Mid races (4 to 6 feet).

14. *annuus roseus* (Laxton).—Flowers deep yellow, streaked brown, some lighter, $2\frac{1}{2}$ to 3 inches diameter; disc dark, 1 inch; rays furrowed. Mixed.

32. New Red (Sydenham).—Flowers deep yellow, streaked red-brown, 6 inches diameter; disc dark, $1\frac{3}{4}$ inch; rays distant, furrowed, and slightly twisted.

12. Single Red (Simpson).—Flowers rich yellow, streaked umber-brown, 7 inches diameter; disc dark, $2\frac{1}{2}$ inches; rays twisted. Mixed in colour and height.

36. Wine and Primrose (Carter).—Flowers lemon-yellow, streaked purple-brown, 6 inches diameter; disc dark, 2 inches; rays slightly twisted.

Double.

Tall races (6 to 10 feet).

26. Double Red (Sutton).—Flowers semi-double, golden yellow, $9\frac{1}{2}$ inches diameter; disc deep yellow, greenish centre, 4 inches; rays furrowed and twisted. Stock not true; all flowers yellow.

HYBRIDS OF CUCUMERIFOLIUS HABIT.

Single.

Tall races (6 to 10 feet).

8. *intermedius sanguineus* (Laxton).—Flowers dull purple-brown, streaked yellow, margins lighter, 4 inches diameter; disc dark, 1 inch; rays furrowed. Of good habit and distinct colour.

34. Stella Red Hybrid (Sutton).—Flowers deep yellow, suffused purple-brown, $3\frac{1}{2}$ inches diameter; disc dark, $\frac{3}{4}$ inch; rays furrowed. Stock mixed: 3 plants with dark stems, 1 intermediate, 1 with light stem and smaller yellow flowers.

35. Stella Hybrid "B" (Sutton).—Flowers straw-yellow, slightly streaked purple-brown, 3 inches diameter; disc dark, $\frac{3}{4}$ inch; rays furrowed. Mixed; 2 darker, with ragged flowers.

48. *cupreatus* (Barr).—Flowers deep yellow, $2\frac{1}{2}$ to 3 inches diameter; disc dark, $\frac{3}{4}$ inch; rays furrowed. Stock not true; flowers yellow.

49. *cupreatus* (Laxton).—Flowers deep yellow, $3\frac{1}{2}$ to 4 inches diameter; disc dark, 1 inch; rays furrowed. Stock not true; flowers yellow.

Mid races (3 to 4 feet).

46. Hybrid (Sutton).—Flowers orange, streaked brown, $2\frac{1}{2}$ inches diameter; disc dark, $\frac{3}{4}$ inch; rays furrowed.

47. Red Hybrids (Barr).—Flowers pale yellow, slightly streaked purple-brown, $2\frac{1}{4}$ inches diameter; disc dark, $\frac{3}{4}$ inch; rays furrowed, notched. Many flowers without rays, others greenish yellow.

52. Hybrid bicolor (Cayeux).—Flowers rich yellow, suffused red-brown, 4 inches diameter; disc dark, $\frac{3}{4}$ inch; rays furrowed.

50. Fairy Queen (Barr).—Flowers golden yellow, streaked purple-brown, $3\frac{1}{4}$ inches diameter; disc dark, $1\frac{1}{4}$ inch; rays furrowed.

51. *carneus* (Laxton).—Flowers deep yellow, 4 inches diameter; disc dark, $\frac{3}{4}$ inch; rays furrowed; poor flower. Stock not true; flowers yellow.

Double Red.

Tall races (4 to 6 feet).

73. *purpureus* fl. pl. (Laxton).—Flowers, some deep yellow, some streaked purple-brown, $3\frac{1}{2}$ inches diameter; disc dark, $\frac{3}{4}$ inch; rays furrowed, pointed, lax. Stock not true; 1 double, 1 semi-double, others single.

Mid race (3 to 4 feet).

72. The Moor (Barr).—Flowers deep yellow, streaked purple-brown, $3\frac{1}{4}$ inches diameter; disc dark, 1 inch; rays pointed, furrowed, and twisted. Stock not true; single and some straw-yellow.

COMMONPLACE NOTES.

NICOTINE FOR HORTICULTURAL PURPOSES.

LIEUT. G. PARRY-DAVIS, of Borneo, gives us the following valuable account of a method of extracting nicotine, which may be of considerable use:—

“ In these days, when shortage of labour hampers all branches of industry, it may prove of interest to Fellows of the R.H.S. and others to know the results of an interesting experiment I made with tobacco (*Nicotiana Tabacum* and *N. angustifolia*) on my plantation in Sarawak, in the early months of 1914.

“ The labour difficulty—in this case the expense of catching caterpillars by hand—caused me to seek for some method of destroying them inexpensively through natural means. The rainfall, which in 1913 was 222 inches, is distributed, with the exception of some seventeen days, generally in November, throughout the entire year. This heavy rainfall causes ‘spraying,’ if done with any of the usual insecticides and for the usual ends, to be an incomplete and recurring process.

“ I therefore sprayed the area in question with the definite view of attracting ants (Sanba Ant, Fire Ant, or Semūt Api), one of the caterpillars’ greatest enemies.

“ With this end in view I made use of a solution of sugar-refuse, boiled down with a little borax and lime. This, when sprayed, formed a thin film on the plant when dry, and was impervious to rain.

“ It had an extraordinarily quick and beneficial effect. Swarms of large ants (Semūt Api), attracted by the sweetness of the solution, preyed upon the caterpillars, killing them in thousands.

“ Whether from reaction and relief from puncturing of the leaves, with attendant additional respiration and transpiration, or from absorption of the lime and sugar to build up growth, the plants revived magically.

“ The purpose of my raising tobacco at that period was to obtain tobacco with a large nicotine percentage, for use as an insecticide on the other crops that I was growing.

“ Realizing that the process followed by growers of tobacco intended for smoking (the refuse of which is sold as ‘scrap’ or ‘insecticide tobacco’) was too slow and expensive for the nicotine percentage contained, I determined, if possible, to produce a tobacco more quickly, more cheaply, and with a higher nicotine percentage.

“ I therefore tried the experiment of bursting or rupturing the

cells in the leaves, instead of allowing them to collapse, as in the usual method.

“ This I did by passing the green leaves through a chaff-cutter, and then fermenting in mass: thus ensuring the nicotine being evenly distributed over the whole mass. Green leaves are infinitely easier to cut up than dry ones. When the leaves were sufficiently fermented, I sun-dried the mass by thinning the bulk to a depth of about two inches and then exposing it to the sun on a drying-shed of my own construction.

“ This is the principle upon which my drying-shed was constructed :

“ Instead of taking the mass of tobacco (which weighs heavily) in and out of the shed at the approach of rain, I made a sliding roof which was drawn over the mass when needed. The roof in question was a light structure composed of a light bamboo skeleton framework, covered with a light palm-leaf thatch (*Neepa Attaps*).

“ The mass was spread upon five tiers of trays, which worked upon a central pivot, and which allowed the tiers to slope on either side as required, in order to face the sun.

“ The tobacco turned out in this manner I found to be far stronger in nicotine than the ordinary (which was due to my having fermented it more than I should have done for smoking-tobacco), and the process proved to be from start to finish at least seventy per cent. cheaper.

“ An adaptation or modification of this idea might, it seems to me, in these days of scarcity of labour, be used to advantage by growers of medicinal plants and others.”

APPLE ‘ RIBSTON PIPPIN.’

MR. R. V. SHERRING, F.L.S., has recently presented to the Society, through Mr. H. BACKHOUSE, F.R.H.S., a contemporary pencil sketch showing the condition of the original tree of the well-known apple ‘ Ribston Pippin ’ at Ribston Hall, Wetherby, in 1836. It depicts a storm-rent trunk of considerable girth and two still living but languishing lateral branches supported horizontally by stakes forked at their tops.

The story of the tree is told by Dr. HOGG in ‘ British Pomology ’ (1851), p. 171. “ The original tree was first discovered growing in the garden at Ribston Hall, near Knaresborough, but how, when, or by what means it came there has not been satisfactorily ascertained. One account states that about the year 1688 some apple pips were brought from Rouen and sown at Ribston Hall, near Knaresborough ; the trees then produced from them were planted in the park, and one turned out to be the variety in question. The original tree stood till 1810, when it was blown down by a violent gale of wind. It was afterwards supported by stakes in a horizontal position, and continued to produce fruit till it lingered and died in 1835. Since then a young shoot has

been produced about four inches below the surface of the ground, which, with proper care, may become a tree, and thereby preserve the original of this favourite old dessert apple. The gardener at Ribston Hall, by whom this apple was raised, was the father of Lowe, who during the last [*i.e.* the eighteenth] century was the fruit-tree nurseryman at Hampton Wick."

There is a slight discrepancy between the date given by Dr. HOGG as that at which the tree died and the date on the drawing, and the definite statement as to the raiser in the last sentence of the quotation hardly agrees with the indefinite character of the earlier part.

Dr. HOGG's information as to the date was probably derived, directly or indirectly, from an old labourer on the estate, as appears from a note in "The Florist" for July 1857 (p. 202). In that note the gardener, Mr. T. W. ABBOTT, quotes from an old letter written by a grandson of the introducer, as follows: "My grandfather, Sir Henry Goodrick, being at Rouen, in Normandy, in y^e year 1707, he eat an Apple of very superior flavour, and saved y^e seeds, which he sent to Ribston, where they were sown, and y^e produce planted in y^e park. Out of y^e trees planted five proved bad and two proved good. They are growing yet and never were grafted, and one of these trees is y^e celebrated Ribston Pippin": showing that the origin of the apple as described in Dr. HOGG's note was at any rate a tradition among the owners of the estate, though the date does not coincide. The other tree said to be good is unknown.

In the fifth edition of his "Fruit Manual," which appeared in 1884, Dr. HOGG repeats this statement without modification or addition, but the note just referred to tells us that the shoot mentioned in Dr. HOGG's account had, in 1857, reached fruiting size, and, in spite of its bad position, frequently bore good crops. It is still standing, but, as Major J. W. DENT, of Ribston Hall, writes: "It is in a cankered and unhealthy condition, but bears fruits, and, in some favourable years, quite good crops. It stands a good deal exposed in the park here, and suffers from cold winds in spring."

From various sources, and especially from the planting-books of the famous nursery of Brompton Park, with which he was at one time connected, Dr. HOGG concluded that the 'Ribston Pippin' did not become well known for perhaps a hundred years after its raising, but after that its rise in popular esteem was rapid. Our boyhood's recollection of it is that 'Ribston Pippin' was a household word and connoted the quintessence of excellence in a dessert apple, but "Alas," said almost everyone, "the apple is worn out. It has lost its vigour and is bound to succumb to the attacks of canker. Soon its fruits will be but a rare and pleasant memory."

The prophets were at fault, for 'Ribston Pippin' is still more than a memory, and in this poor apple season (1916), of all the varieties grown at Wisley, 'Ribston' was among the best for crop; there the trees are perfectly healthy, and as yet no sign of canker foretells their doom, either in those on Paradise or those on Crab



FIG. 107.—*VIBURNUM PLICATUM TOMENTOSUM* AT WISLEY,

[To face p. 433.]

stock, nor are they any less vigorous than other varieties of similar habit. In company with 'Cox's Orange,' 'D'Arcy Spice,' 'Allen's Everlasting,' 'Duke of Devonshire,' and a few others, it still merits a place among the most highly flavoured of dessert apples where the soil is properly drained and attention is given to cultivation, and proper, not excessive, pruning.

The tree itself may fail to supply the needs of its numerous buds ; the roots may exhaust the soil or find the water supply deficient, or the stem may cease to give free passage to the constant streams of food and water for which it is the channel, and so the tree grows old and dies ; but less and less will that tempting theory, that a *variety* loses vigour and grows old and dies in the same way, find support as the causes of death and low-vitality are studied. Grafted on a fresh stock or propagated in some other suitable way, the variety renews its youth and flourishes, to the confusion of the pundits who have prophesied its death.

A REMARKABLE CATTLEYA.

The figure on page 352 represents a remarkable plant of *Cattleya Skinneri alba* growing in Berkeley, California, where it has been tended with loving care since it was a small plant. When the photograph, which was kindly sent to us by Mr. J. N. Cox of H.M. Consulate, Costa Rica, was made, the plant measured almost a yard across, and had forty spikes of flowers, some with 10 to 12 flowers apiece.

VIBURNUM PLICATUM TOMENTOSUM.

Among the six best flowering shrubs for English gardens *Viburnum plicatum tomentosum* must always be included. It has been illustrated before in our JOURNAL, but we are glad to be able to figure the fine plant near the top of the hill in the wild garden at Wisley, through the kindness of Mr. Frederick J. Hanbury, F.L.S., who took the photograph from which Fig. 107 is made.

DUTCH BROWN BEANS.

These beans are grown in Holland in enormous quantities by all classes of the people who use the *seeds* for winter food. Mrs. Labouchere most kindly sent the Society samples in 1915, and they were grown in private gardens, and a large number also at Wisley in 1916.

They were sown at the end of April exactly as if they were ordinary French Beans. As soon as they turned brown, about the end of September, they were pulled up and tied together in small bundles by their roots and hung up in a dry open shed. When quite dry they were shelled and yielded a very large crop of seed, which, on being soaked twelve hours and boiled one and a half hours, were found to be a decided advance on the ordinary white Haricots.

The Council has now been able to secure from Holland and to distribute a ton of these beans, but it does not seem at all generally known that haricots for winter use may be grown in this country with every hope of a good crop.

They should be sown in fairly rich soil about the first or second week in May, unless in a district not subject to late frosts, when the end of April would ordinarily not be too soon. Draw a shallow drill about two inches deep with the corner of the hoe and place the seeds down flat in the trench at a foot distance one from the next, and the rows eighteen inches apart, or make a double row nine inches apart, alternating the beans, and leaving two feet before the next double row is planted. The only other point to observe is to keep the hoe going frequently between the rows.

Remember that it is waste to use them as green pods.

AMERICAN GOOSEBERRY MILDEW.

Experiments which have been conducted by Dr. Horne during the last three years at Wisley on the American Gooseberry Mildew have been productive of striking results. By the use of a modified form of Burgundy mixture, an outbreak on the foliage and berries of over a hundred bushes, comprising several varieties of Gooseberry, exposed to infection, has been completely prevented. One or other of the following mixtures was used:—

(1) Copper sulphate, 81½ oz. ; washing soda, 91½ oz. ; soap, 100 oz. ; water, 100 gallons. (2) Copper sulphate, 40½ oz. ; washing soda, 45½ oz. ; soap, 100 oz. ; water, 100 gallons.

The chemicals were dissolved separately, the solutions mixed when quite cold, and the soap added last. Both strengths proved effective. Spraying took place on May 30 at 6 P.M., when the bushes were just dry after gentle rain in the afternoon. The sprayed bushes, even when completely surrounded by infected ones, remained for long quite free from mildew, although they became infected later. Whereas all the berries on the sprayed bushes were absolutely free from mildew, many on the unsprayed bushes are heavily infected.

In a further experiment all the bushes in a small plot adjacent were sprayed and remained for long free from mildew.

Burgundy sprays leave a fine deposit on the berries, consisting of a mixture of the precipitates of copper carbonate and sodium sulphate, but nearly the whole of this deposit can be removed by a sharp rinsing in tap water.

Spraying in July was also found to damage the fungus so severely that no living winter spores were found surviving in the following spring.

LONDON CHILDREN'S GARDENS.

THE Council of the Royal Horticultural Society, having been invited to inspect the Gardens for Children carried on by the "London Children's Gardens" appointed Mr. James Hudson, V.M.H., and Mr. Arthur W. Sutton, V.M.H., F.L.S., who kindly consented to act on behalf of the Society.

The inspection of the gardens took place on Saturday, September 2, 1916, when the following Report was drawn up and presented to the Council:—

"On this, the first occasion of a round of inspection, we visited four sets of the Children's Garden plots.

"The first garden visited was in Sutherland Avenue, situated in the main thoroughfare, and all the work done by the children could be seen by passers-by. This set of plots was at one time a vacant piece of building land between other houses. Every advantage had been taken to render it both useful and attractive. The object in this and in every other instance was to cultivate vegetables rather than flowers, in our opinion a most commendable feature of the work. The ground had been divided into long strips with narrow footways between the lines of plots and a broader walk down the middle. These strips were again marked off so that every child had a small plot to cultivate for himself. Mrs. Lyons, who accompanied us, told us that there is each spring a keen competition for the plots, and lots have to be drawn for them. The teachers from each school first show them how to proceed with the cultivation, and then each child has to do all the work upon his or her own plot—digging, hoeing, weeding, planting, the sowing of seeds, &c.

"The plots were in most commendable order, free from weeds, the crops healthy and flourishing. The chief kinds of vegetables were beets, carrots, onions, lettuces, and cabbages of varied types—all in good order. Quite a good supply of these vegetables is thus grown. Each child takes home the produce of his allotment. The chief fault to be noted in each of the various gardens was the reluctance of the children to thin out the plants sufficiently and in good time, so as to obtain the best results.

"The next plot visited was of considerable size and of a crescent shape, with houses on every side. This piece of land was at one time quite overrun by the children of the locality—an undesirable spot in fact. Now it is a joy to the tenants around, everything being kept so clean. Mrs. Lyons said that since the cultivation of this plot was begun, some four years ago, the tenants of the houses around have taken to growing plants in their windows, in boxes

and in pots, as a result of the adjacent cultivation carried on by the children.

“The soil here was not in such good condition as in the former plot, but time will remedy this. Commendable progress had, however, been made, with promise of better results in the near future. Here, too, all the work done by the children was in full view of the surrounding houses. The vegetables noticed were similar to those of the first plot.

“The third garden visited was in what may be termed ‘slumland,’ poverty and small one-storey dwellings being all round. Yet a general tidiness and cleanliness pervaded the place, a result beyond question partly due to the work of the children in their gardens. At one time this land, not an available site for building, and in a certain sense without owner, was a general dumping-ground for all the undesirable refuse of the locality—in fact, a veritable ‘no man’s land.’ This, again, had not long been under cultivation. It was evident too that there had been great difficulties to be overcome. Potsherds, brickbats, and similar undesirable refuse had to be removed to some two feet in depth before any soil whatever worthy of the name could be found. This meant a great deal of labour, for all had to be removed by a flight of some half-a-dozen steps. The same steps had again to be negotiated in order to bring in some amount of loam in order to get it into better condition. Although the surroundings in a great measure excluded the free circulation of air, the crops in many plots were giving encouraging results, but in a few cases the soil appeared to be poisoned. It should be noted in this instance that the inhabitants around were at first much opposed to the innovation of any kind of gardening, but had now quite altered their opinion and were most favourable to it.

“We next inspected a prospective site for more gardens. Nothing had yet been attempted here, simply for want of funds. It has everything in its favour, if and when progress can be made. The surroundings are open, light, and airy, with a good aspect towards the south and west. At present there are tons of bricks and brickbats, with other refuse, from houses that had been condemned and pulled down. This, Mrs. Lyons said, had all to be removed at the expense of the Children’s Gardens Fund before any attempt at cultivation could be made. At present there are no funds available for this work. The bricks, however, would prove serviceable for foundations &c., but no building is at present being done in this locality.

“The fourth garden visited was in the Vauxhall Bridge Road—a corner site and a most suitable one too. This had been shut off from the roadway by hoardings, but not in such a way as to exclude light and air. Here the soil was congenial and in a workable condition; the crops at a glance indicated this. The best crops were the onions and carrots, both of excellent quality; French beans and radishes coming next in order of merit. Here we were introduced to the children themselves, those who actually cultivate the plots. They

were a bright, cheerful, respectful, and intelligent lot of boys and girls who were very keen in the work of their plots.

“After having inspected the four separate garden plots we came to the conclusion that it would be beneficial to apply a good dressing of lime early in the winter season. This should be forked in soon after its application. A more liberal dressing of well-rotted manure early in the spring would be a decided assistance to the future crops. This has reference more particularly to the second and third gardens visited. In these two gardens the soil was most unmistakably poor in quality. From the results of the crops, where such things as scarlet runners had been trained up to the walls, it was not considered expedient to continue this practice.

“The children should have it very carefully and frequently impressed upon them that *thinning of the crops* is most essential, especially in such crops as onions, beets, and carrots. If an object lesson upon one plot could be given of the result of such thinning we think the children would be convinced of its utility and necessity if a good crop is to be secured.

“The inspection satisfied us that a vast amount of good is being done in these localities. Healthy exercise is afforded to the children, and a knowledge of vegetables and of their cultivation impressed upon their minds, which must surely produce good results in later life. Mrs. Lyons and those working with her are working on the right lines for the future welfare of the children in crowded localities; and they deserve every encouragement in their praiseworthy endeavours to ameliorate the conditions of child-life of these congested districts.

“A word should be said on behalf of the teachers of the several schools, upon whom devolves the duty of supervision and instruction. They are most enthusiastic in their work, and devoted to the welfare of the children under their charge.

“What is most wanted is funds for further development. The plots have to be rented; and high rents, even for such plots, are demanded and obtained. The economy in the working, however, is most commendable. We feel sure that every confidence may be placed in those who are associated with Mrs. Lyons in their benevolent endeavours.

“Signed, ARTHUR W. SUTTON.
JAMES HUDSON.”

DONORS OF SEEDS, PLANTS, BOOKS, &c., TO THE SOCIETY'S LABORATORY AND GARDEN AT WISLEY DURING THE YEAR 1916.

- ALLARD, A. J., Merton. *Cupressus glabra*. Germinated.
- ALLEGROVE, J. C., Langley. *Primula pycnoloba* (planted in garden). Raspberries. Included in trial.
- BAKER, Messrs., Codsall. Collection of Mossy Saxifrages. Included in nomenclature trial. Delphiniums. Included in trial.
- BALCH, A., Girvan. Tomatos for trial.
- BALFOUR, Prof. I. B., Edinburgh. Seeds of *Clethra Delavayi* (sown); *Primula Winterei* (growing on); seed of *Androsace saxifragaeifolia* (sown but not yet germinated); *Primula luteola* (planted in garden).
- BALLARD, E., Colwall. Hybrid Polemonium. Planted in garden. Raspberry 'Allen's Champion.' Included in trial.
- BARR, Messrs., London. Pæonies. Included in trial. Sunflowers; Dianthus; Mignonette (see p. 421); Godetias (see p. 414); Clarkias (see p. 412); Peas; Celery and Celeriac; Savoys (see p. 407); Tomatos; Stocks (included in trial); Hollyhocks (included in trial); Delphiniums (included in trial); Saxifrages and Sedums (included in nomenclature trials); seeds of Zonal Pelargoniums; Lupines (planted in garden); Onions (included in trial); Myosotis (included in trial); Narcissus bulbs (for experimental purposes); seeds of *Melampyrum nemorosum*.
- BARTHOLOMEW, A. C., Reading. Seeds from Petrograd. Sown. *Anemone palmata*. Growing on.
- BARTLEET, H. S., Shooters Hill. Myosotis. Included in trial.
- BAYLEY, A., Slough. Grafts of Apple 'Hoary Morning.'
- BECKETT, E., V.M.H., Elstree. Pea 'Edwin Beckett'; Onion 'Autumn Triumph' (included in trial); *Berberis Sargentiana* (planted in garden); collection of shrubs (planted in garden); *Berberis concinna* (planted in garden).
- BELL, D., Leith. Peas; Myosotis 'Rymer's Royal Blue' (included in trial).
- BLACKMORE & LANGDON, Messrs., Bath. Delphiniums. Included in trial.
- BOWERS, E. H., Roscommon. Myosotis 'White Pearl.' Included in trial.
- BOWLES, E. A., M.A., F.L.S., Waltham Cross. Seed of *Echeveria setosa*. Plants for rock garden.
- BRIIGGS, Mrs., Haddington. *Primula luteola* and hardy Calceolaria. Planted in garden.
- BRODIE OF BRODIE, Major, Forres. Seeds from Suvla Bay and Island of Imbros. Sown but not yet germinated.
- BROOKLYN BOTANIC GARDEN, New York. Collection of seeds.
- BROOKS, W., Weston-super-Mare. Tomato 'Whitecross.'
- BROWN, A., High Blantyre. Collection of Mossy Saxifrages, *Sedum rupestre* and *S. oreganum*. Included in nomenclature trials.
- BROWN, G., Hull. Raspberry. Included in trial.
- BULLEY, A. K., Neston. Collection of seedlings of Chinese plants.
- BUNYARD, E. A., Maidstone. Grafts of *Malus dioica* and Apple 'Cobham.' 'Journal of Agricultural Science.' Deposited in the Wisley Library.
- BUNYARD, P. F., Croydon. Nico-Brand Fumigant. For trial.
- BUNYARD, Messrs., Maidstone. Delphiniums. Included in trial. Strawberry 'St. Fiacre.' Growing on. Raspberries. Included in trial.
- BURROUGHS, T. H., Stamford. Seeds of *Clematis alpina*. Distributed to Fellows.
- CAMBRIDGE BOTANIC GARDENS. Collection of seeds. Plants raised for distribution.
- CAMPBELL, A., Pannal. Dwarf form of *Rumex acetosa*. Planted in rock garden.
- CARTER, G., Cottenham. Potatos.
- CARTER, Messrs., Raynes Park. Peas; Tomato 'Golden Sunrise'; Celery and Celeriac; Savoys (see p. 407); *Claykia elegans* 'Scarlet Queen' (see p. 412); Godetias (see p. 414); Mignonette (see p. 421); Dianthus (see p. 418); Sunflowers; Hollyhock 'Palling Belle' (included in trial); Potatos; Onions and Myosotis (included in trial).
- CAYEUX, M. H., Havre, France. Seed of *Helianthus cucumerifolius* hybrid bicolor. Included in trial. (See p. 429.)

- CHARLTON, Messrs., Tunbridge Wells. Tomato 'Charlton's Defiance.'
- CLOSE, H., Orpington. Red Currant 'Littlecroft Beauty.' Planted in garden.
- COBLEY, R., Cheshunt. Tomatos.
- COEY, J., Larne. Calabash seeds. Plants raised.
- COOPER, J. A., Sligo. Potato 'Irish Chieftain.' Delphinium 'Arago.' Included in trial. Collections of Sedums and Saxifrages. Included in nomenclature trials.
- COOPER, TABER, Messrs., London. Tomato 'Napoleon'; Celeriac 'Improved Paris'; Celery 'Borough Market Champion White'; Savoys (see p. 407); Pea 'Duke of York.'
- COUSENS, P. H., Swanwick. Raspberries. Included in trial.
- CRAGG, HARRISON & CRAGG, Messrs., Heston. Tomatos.
- CROSELY, F., Camberley. Collection of plants and seeds. Planted in garden and plants raised.
- CROWFOOT, W. M., Beccles. Tecoma seedlings. Growing on.
- CUTHBERTSON, M., Rothesay. Tomato 'Glenburn.'
- DANIELS, Messrs., Norwich. Black Currant 'Daniels' September Black.' Planted in garden. Godetia 'Duke of Fife' (see p. 414); Stocks (included in trial); Myosotis (included in trial).
- DARLEY, C. W., Little Bookham. Seeds and plant of *Sempervivum*. Planted in garden.
- DAWKINS, A., Chelsea. Parsnip 'Intermediate.' Stocks (included in trial).
- DICKSON, Messrs. ALEX., Belfast. Peas; Tomatos; Potatos; Celery; Savoys (see p. 407); *Godetia Schaminii* Double Carmine (see p. 414); Mignonette 'Red Monster' (see p. 421); Delphinium 'Blue Butterfly' (see p. 420); Stocks (included in trial).
- DICKSON, Messrs., Chester. Sedums and Saxifrages. Included in nomenclature trials.
- DICKSON & ROBINSON, Messrs., Manchester. Celery; Peas; Tomatos; Delphinium 'New Annual Type'; Sunflowers; Stocks (included in trial); Tomatos (included in trial).
- DIXON, J., Oughtibridge. Fern for fernery.
- DOBBIE, Messrs., Edinburgh. Celery; Clarkias (see p. 412); Delphiniums (see p. 420); Dianthus (see p. 418); Godetias (see p. 414); Mignonette (see p. 421); Tomatos; Savoy 'Selected green curled' (see p. 407); Sunflowers (see p. 429); Potatos; Roses (planted for mildew experiments); Stocks (included in trial); Myosotis (included in trial).
- EARLE, Mrs., Cobham. Bulbs of *Fritillaria imperialis* (planted in garden). Seed of *Astroemeria chilensis* (sown). Plants of *Gazania* Bawdsey variety (planted).
- ECKFORD, H., Wem. Pea 'Prior.'
- EDWARDS, Mrs. LLOYD, Llangollen. Mossy Saxifrages. Included in nomenclature trial.
- ELLINGTON, W., Mildenhall. Potato 'Ellington's Abundance.'
- ELLIOTT, C., Stevenage. Delphinium 'Blue Rocket' (included in trial). Collection of rock plants (planted in rock garden). Seed of *Cheiranthus linifolius* (sown). Collection of Saxifrages for rock garden. *Gentiana sino-ornata*, *G. Lawrencei* (growing on).
- ELLIOTT, H., Hurstpierpoint. Tomato 'Winter Marvel.' Included in trial.
- ELWES, H. J., Cheltenham. Seeds of *Eremurus* (plants raised); collection of Sikkim seeds (plants raised); seeds of *Berberis Holstii* (sown); seeds of *Cupressus* from Darjeeling (germinated); *Acer Opalus neapolitanum* (not yet germinated); *Thunbergia Gibsonii* (germinated); *Eucalyptus coriaceous* (sown); collection of seeds from New Zealand (sown); seed of *Convolvulus*-like plant from Sikkim (sown); seed of *Eucalyptus coriacea*; tubers of *Tropaeolum Leichtlini*; bulbs of *Tulipa primulina*.
- EVANS, R. E., Stratford-on-Avon. Fungicides for trial.
- FAIRBAIRN, Messrs., Carlisle. Delphinium 'Glory of Edentown.' Included in trial.
- FARRER, R., Clapham, Yorks. Seeds from Chinese Expedition. Sown. Plants raised.
- FIDLER, Messrs., Reading. Potato 'Reading Giant.'
- FLEMYNG, Rev. W. W., Portlaw. *Cyclamen neapolitanum* (planted in garden). Miscellaneous seeds. Plants raised.
- FLETCHER, W. H. B., Bognor. Seed of *Romneya Coulteri* ♀ × *R. trichocalyx* ♂. Distributed to Fellows.
- FORBES, Messrs., Hawick. Collections of Delphiniums (included in trial); Saxifrages and Sedums (included in nomenclature trials).
- FRASER, J., F.L.S., Kew. Book for Wisley Library.

- FRY, Lady, Bristol. Seedling *Fraxinus Praxiana*. Planted in garden.
- GAVIN, L., Ellon. Potato 'Drumwhindle.'
- GERAHTY, C. E., Pyrford. Seeds of *Xanthoceras sorbifolia* and *Chimonanthus fragrans*. Sown.
- GIBSON, Messrs., Bedale. Delphinium 'Lady Isobel.' Included in trial.
- GIBSON, Mrs., Kelvedon. Seed of *Myosotis*.
- GODFREY, Messrs., Exmouth. Delphinium 'Star of Devon.' Included in trial.
- GRANT-DALTON, Miss H., Sway. *Sedum* from Switzerland. Included in nomenclature trial.
- GRIMES, J., Cardiff. Hybrid Saxifrage; variegated Ash. Planted in garden.
- GROVE, Messrs., Sutton Coldfield. *Galega Hartlandii alba* and *Helenium* 'Wyndley' for comparison with forms already in the garden. Planted in garden.
- HALL, Mrs. J. M., Tayinloan. Surplus plants for distribution.
- HALLAM, G. H., Harrow. Collection of New Zealand seeds. Sown but not yet germinated.
- HANBURY, F. J., F.L.S., East Grinstead. Collection of plants and cuttings for the garden.
- HANBURY, Lady, Ventimiglia, Italy. Collection of seeds. Plants raised for distribution.
- HANKER, Mrs., Reading. Collection of seeds from Rhodesia. Sown.
- HARRISON, Messrs., Leicester. Onions. Included in trial.
- HARVEY, J. N., Evesham. Tomatos 'Evesham Wonder' and 'Bengeworth Beauty.'
- HEADFORT, Marquis of, Kells. Collection of trees and shrubs.
- HENRY, Prof. A., Dublin. Seed of *Larix olgensis*. Sown.
- HIGH COMMISSIONER FOR NEW ZEALAND. Pea 'Moumahaki.' For trial.
- HILL, V. T., Langford. Delphinium 'Gentian Blue.' Included in trial.
- HILLIER, Messrs., Winchester. *Populus generosa*. Planted in garden.
- HIRSCH, Mrs., London. Hibiscus 'Peach Blow.' Growing on.
- HOBBS, Messrs., Dereham. Tomato 'Hobbies Pilot.' Included in trial.
- HOGHTON, C. A., Cobham. Poles for electrification experiments.
- HOLMES, E. M., F.L.S., Sevenoaks. Seeds from Pekin. Sown.
- HOLMES, R., Norwich. Tomatos. Included in trial.
- HORNIBROOK, M., Abbey Leix. *Saxifraga Aizoon* × *aretioides*. Growing on.
- HUNT, F. W., Northampton. Runner Bean 'Hunt's High Perfection.' For trial.
- HURST, Messrs., London. Clarkias (see p. 412); Delphinium 'Blue Butterfly' (see p. 420); Mignonette (see p. 421); Celeriac and Celery; Savoys (see p. 407); Tomatos; Peas; Stocks (included in trial); *Myosotis* (included in trial).
- ILLMAN, J., Lincoln. Tomato 'Illman's Selected.' Included in trial.
- JACOB, Rev. J., Whitchurch. *Myosotis* 'Indigo Queen.' Included in trial.
- JAMES, W. E., Surbiton. Orchids. Added to collection.
- JENKINS, Dr., Hindhead. Seeds and bulbs from Malta.
- JEYES, Messrs., London. Summer wash and Nicotine wash. For trial.
- JOHNSON, A. T., Talycafn. Seed of *Romneya Coulleri*. Sown.
- JOHNSON, Messrs., Boston. Pea 'The Victor.'
- KELWAY, Messrs., Langport. Tomato 'Kelway's Eldorado.' Delphiniums. Included in trial.
- KENT & BRYDON, Messrs, Darlington. Potato 'Scottish Farmer.'
- KERR, W., Dumfries. Potato 'Dargavel.'
- KERSWILL, G., Exeter. Gooseberries for mildew experiments.
- KEW, Royal Botanic Gardens. Collection of seeds. Plants raised for distribution.
- KING, Messrs. J. K., Coggeshall. Pea 'Money Maker.'
- LACAITA, C. C., Petworth. Collection of Sikkim seeds. Sown.
- LAWRENCE, Sir WILLIAM, Bt., Dorking. Asparagus Pea.
- LAXTON, Messrs., Bedford. Peas for trial. Tomatos; Sunflowers (see p. 429); Perpetual Strawberries (planted in garden); Raspberries (included in trial).
- LEAKE, R. F., London. Unnamed bulbs for identification. Growing on.
- LEDGER, W. E., Wimbledon. Cuttings of *Kitchingia uniflora*, *Ceropegia Ledgeri*. Growing on.
- LILLEY, F., Guernsey. *Amaryllis Belladonna maxima*.
- LOCKWOOD, Col. M., M.P., Romford. *Cupressus Benthamii*. Planted in garden.
- LODER, G., Ardingly. *Picea Breweriana*. Planted in garden.
- LUCKHAM, Miss K. E., Cheltenham. Seed of *Dianthus lusitanicus* (sown). Plants of white and pale pink *Ericas*. Planted in garden.
- MACK & MILN, Messrs., Darlington. Tomato 'Main Crop.' Included in trial.
- MACOUN, W. T., Ottawa. Seed of 'Early Malcolm' Corn and 'Early Otta' Corn.
- MAGOR, E. G. P., St. Tudy. Rhododendrons. Planted in wood.

- MAINWARING, Lt.-Col., Upwey. *Lonicera Griffithii*. Planted in garden.
 MARTINEAU, Mrs., Hurst. Potatos.
 MATTHEWS, C., Plymstock. Cuttings of *Cerasus ilicifolia* and *Veronica Hulkeana*.
 Growing on.
 MELLOR, Hon. Mrs. Shaw, London. Orchids. Added to collection.
 MILLER, G. W., Wisbech. White *Primula obconica* (growing on). Tomato
 'Norfolk Hero.'
 MILNER, W. A., Sheffield. *Primula Winteri*. Growing on.
 MITCHELL, Mrs., Woking. Various seeds (sown), and bulb of *Sprekelia for-*
mosissima (growing on).
 MORETON, Sir R., K.C.V.O., Fleet. Double shell-pink Sweet Briar. Planted
 in garden.
 MORRIS, Sir DANIEL, K.C.M.G., J.P., V.M.H., Boscombe. Seeds of *Eucalyptus*
coccifera, *E. obliqua*, *E. verrucosa*, *Acacia Riceana*, *Eucalyptus cosmophylla*,
E. leucoxylon var. *macrocarpa* (sown).
 MORRIS, S., Norwich. *Androsace pyrenaica*, *A. helvetica*. Planted in garden.
 MORRISON, E. M., Woking. Seed of 'Dutchman's Pipe.' Sown but not yet
 germinated.
 MOWATT, Mrs., Grayshott. Cuttings of *Lardizabala biternata* and *Stauntonia*
latifolia. Failed to strike.
 NEALE, J. J., Penarth. Collection of Droseras &c. Growing on.
 NELKE, Mrs., Virginia Water. *Shortia uniflora*, *S. grandiflorum*, *S. rosea superba*.
 Planted in garden.
 NOBLE, R., Canterbury. Strawberry 'Lord Roberts.'
 NOTCUTT, R. C., Woodbridge. *Helianthemum candidum*. Planted in rock
 garden.
 NUTTING, Messrs., London. Peas; Celery; Savoys (see p. 407); Clarkias
 (see p. 412); Godetias (see p. 414); Dianthus (see p. 418); Mignonette
 (see p. 421); Stocks (included in trial); Onions (included in trial);
 Tomatos (included in trial).
 O'CONNOR, M. B., Calcutta, India. Zephyranthus.
 OWEN, Lieut. G. M., Worcester. Seed of small Broom. Sown.
 PAGE, Messrs. Carter, London. Tomato 'Surprise.'
 PATON, O. B., Streatham. *Omphalodes cappadocica*. Planted in garden.
 PAUL, F. F., Botley. Tomatos. Included in trial.
 PAUL, Messrs. G., Cheshunt. Various plants for the garden. Planted. Rasp-
 berries. Included in trial.
 PEAKE, Mrs., Newbury. Seedling Pentstemons.
 PEARSON, Miss, Earl's Colne. Grafts of two seedling apples.
 PEREZ, Dr., Teneriffe. *Sedum lanzarotense*. Included in nomenclature trial.
 Died in winter.
 PETHERICK, Miss L. B., Croydon. Seeds of Sarsaparilla. Sown.
 PHIPPS, G. R., Barnham. Sedums. Included in nomenclature trial.
 PRAEGAR, R. L., Dublin. Seeds of Sedums from Yunnan (some germinated).
 Sedums. Included in nomenclature trial.
 PRICE'S PATENT CANDLE Co., Battersea. Solid and liquid Gishurst compound.
 For trial.
 ROBINSON, W., Garstang. Potato 'Red King.'
 RODMAN, G., Keynsham. Tomatos.
 ROSENHEIM, P., East Molesey. Alpines. Planted in rock garden.
 ROSS OF BLADENSBURG, Sir JOHN, K.C.B., Rostrevor. Collection of seeds
 Sown.
 ROTHSCHILD, LEOPOLD DE, C.V.O., Acton. Water Lilies. Planted in garden.
 RUSSELL, Dr. E. J., Harpenden. "Berichte der Deutschen Chemischen Ges.
 zu Berlin." Deposited in the Wisley Library.
 RUYB, B., Dedemsvaart, Holland. Delphiniums. Included in trial.
 SANDS, W. E., Hillsborough. Potatos.
 SARSONS, D., Wisley. Pea 'Sarson's Sensation.'
 SAVAGE, Sir G. H., London. *Trifolium stellatum*. Planted in rock garden.
 SCARLETT, T. A., Edinburgh. Potato 'Golden Wonder.'
 SCULTHORPE, Rev. H. J., Weston-super-Mare. Apple 'Beeley Pippin.' Added
 to collection.
 SHADWELL, Miss B., Oxford. "Transactions of British Mycological Society."
 Added to Wisley Library.
 SIM, W., Fyvie. Potatos; Peas.
 SIMONDS, Mrs., Basingstoke. Seeds from New Zealand. Sown.
 SIMPSON, Messrs., Birmingham. Celery; Clarkias (see p. 412); Godetias
 (see p. 414); Larkspurs (see p. 420); Mignonette (see p. 421); Peas;
 Savoys (see p. 407); Potatos; Tomatos; Sunflowers (see p. 429).
 SINCLAIR, M. H., Aberdeen. Potatos.

- SMITH, Messrs., Guernsey. *Berberis Smithiana*.
- SMITH, Messrs., Woodbridge. Delphiniums. Included in trial.
- SMITH, Mrs., Eastbourne. *Erodium corymbosum*.
- SMITH, T., Newry. Varieties of *Berberis stenophylla* and *B. Darwinii*. Planted in garden.
- STARK, Messrs., Great Ryburgh. Polyanthus (planted in garden); seed of Poppies for trial.
- STRUDWICK, H., Fakenham. Tomatos. Included in trial.
- SUTTON, Messrs., Reading. Annual Carnations; Hollyhocks (included in trial); Clarkias (see p. 412); Larkspurs (see p. 420); Godetias (see p. 414); Stock 'Sutton's All-the-Year-Round' (included in trial); Sunflowers (see p. 429); Savoys (see p. 407); Celeriac and Celery; Tomatos; Peas; Potatos; roots of 'Dasheen' *Colocasia esculenta*; Myosotis (included in trial); Onions (included in trial); Tomatos (included in trial).
- SYDENHAM, Messrs., Birmingham. Peas; Savoys (see p. 407); Celery; Potatos; Tomatos; Dianthus (see p. 418); Clarkias (see p. 412); Godetias (see p. 414); Larkspurs (see p. 420); Mignonette (see p. 422); Hollyhocks (included in trial); Sunflowers (see p. 429); Myosotis (included in trial); Onions (included in trial).
- TAYLOR, G., Ferrybridge. Onion 'The Urn.'
- TAYLOR, G. M., Portobello. Potato 'Sunbeam.'
- TENNANT, Mrs. H. J., Rolvenden. Seed of unnamed Myosotis. Included in trial.
- THE T.P. SEED BOX CO., Birmingham. Seed raisers. For trial.
- TOOGOOD, Messrs., Southampton. Potato 'Southampton Wonder.' For trial of wart-resistant varieties.
- TRINDER, G., Fleet. Raspberry 'Trinder's Golden Hornet.' Included in trial.
- TRISTRAM, Mrs., Worthing. Collection of seeds from India. To be sown.
- VEITCH, Sir HARRY, Kensington. Sweet Pea 'Arry waa.' Grown in garden.
- VEITCH, Messrs., Exeter. Potatos; Peas; Celery; Tomatos; Savoys (see p. 407); Godetias (see p. 414); Dianthus (see p. 418); Clarkias (see p. 412); Mignonette 'Machet' (see p. 421); Delphiniums (see p. 420); Sunflowers (see p. 429); Mossy Saxifrages (included in nomenclature trial); Myosotis 'Blue Eyes' (planted in garden); Stocks (included in trial); Myosotis (included in trial); Onions (included in trial).
- VOSS, Messrs., Millwall. Nicotyl Fungicide, Carlton Green Sulphur, Nicotine Soap, Nicotyl Spraying Compound, Bordorite. For trial. Sulphate of potash and kainite, 25 per cent. nicotine.
- WALLACE, Messrs., Colchester. *Primula helodoxa*. Growing on.
- WATKINS & SIMPSON, Messrs., London. Tomatos; Celery; Savoys (see p. 407); Clarkias (see p. 412); Godetias (see p. 414); Dianthus (see p. 418); Mignonette (see p. 421); Sunflowers (see p. 429); Pea 'Majestic'; Stocks (included in trial); Onions (included in trial).
- WEBB, Messrs., Stourbridge. Peas; Potatos; Savoys (see p. 407); Celery; Tomatos; Parsnip 'Student'; Onions (included in trial).
- WHEELER, Messrs., Gloucester. Onions 'Gloucester Mammoth' (included in trial).
- WHITE, J. G., Strathspey. Tomato 'Muirtown Seedling.'
- WHITTON, J., Glasgow. *Todea superba*, *T. pellucida*. Planted in garden.
- WILDING, E. H., Southampton. Seed of *Paeonia Woodwardii*. Sown.
- WILKS, Rev. W., M.A., V.M.H., Shirley. Seeds of *Azalea mollis*, *Eucalyptus coccifera* (sown); Beans from Holland (grown in garden); seed of Yellow Alpine Anemone (sown); cuttings of Veronica 'Purple Queen' (growing on).
- WILLIAMSON, F. J., Mallow. Potatos.
- WILLMOTT, Miss E., Great Warley. *Primula megaseaeifolia*. Growing on.
- WILSON, J., Hereford. Onions. Included in trial.
- WORTHINGTON, H. H., High Wycombe. Bulbs of Gloriosas. Growing on.

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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.

ABLETT, W. H. English trees and tree-planting. London, 1880. 8vo. (1)

ANDREWS, H. C. Coloured engravings of heaths. . . . London, 1802-[30]. 4 vols. col. pl. fol. (2)

ANONYMOUS. A volume of col. plates lettered " Collection choisie de plantes." fol. (1)

— The language of flowers, and alphabet of floral emblems. London, 1849. col. pl. sm. 8vo. (1)

AUSTIN, A. The garden that I love. London, 1894. il. 8vo. (2)

AVERILL, M. Japanese flower arrangement [ike-bana] applied to western needs. London, 1914. il. pl. col. frontis. 8vo. (1)

BACON, F., and COWLEY, A. On gardens, two essays. Guildford, 1903. 12mo. (1)

BAILEY, L. H. The survival of the unlike. A collection of evolution essays suggested by the study of domestic plants. 6th ed. New York, 1911. 8vo. (3)

— The nursery-book. A complete guide to the multiplication of plants. 20th ed. New York, 1915. il. 8vo. (3)

— The standard cyclopedia of horticulture. . . . New York, 1915-16. Vol. 3-4. il. pl. col. pl. port. maps. 4to. (3)

BAKER, J. G., and TATE, G. R. A new flora of Northumberland and Durham, with sketches of its climate and physical geography . . . with a sketch of the geology of the two counties. . . . by G. TATE. London and Newcastle-on-Tyne, 1868. maps. 8vo. (4)

Nat. Hist. Trans. of Northumb. and Durham, vol. ii.

BARRON, A. F. British apples. Report of the committee of the National Apple Congress, held in the Royal Horticultural Gardens, Chiswick, October 5 to 25, 1883. London, 1884. 8vo. (2)

— Pears. Report of the committee of the National Pear Conference, held in the Society's gardens, Chiswick, October 1885. London, 1887. 8vo. (2)

Journ. R. Hort. Soc. ix.

BATEMAN, J. A second century of orchidaceous plants. . . . London, 1867. 100 col. pl. 4to. (2)

See HOOKER, W. J., for first century.

- BATES, H. W. The naturalist on the river Amazons, a record of adventures, habits of animals, sketches of Brazilian and Indian life, and aspects of nature under the equator, during eleven years of travel. London, 1863. 2 vols. il. pl. map. 8vo. (2)
- BELGIQUE HORTICOLE, LA, journal des jardins, des serres et des vergers, par C. MORREN (. . . et E. MORREN). Vol. 1-14. Liège, 1851-64. il. pl. col. pl. port. 8vo. (2)
- Annales d'horticulture belge et étrangère, par E. MORREN. Vol. 15-24. Liège, 1865-74. il. pl. col. pl. port. 8vo. (2)
- Table générale . . . vols. 1-20 (1851-70). Gand, 1871. 8vo. (2)
- Annales de botanique et d'horticulture, par E. MORREN. Vol. 25-35. Liège, 1875-85. il. pl. col. pl. port. 8vo. (2)
- BENTLEY, R., and TRIMEN, H. Medicinal plants, being descriptions with original figures of the principal plants employed in medicine and an account of the characters, properties, and uses of their parts and products of medicinal value. London, 1880. 4 vols. col. pl. 8vo. (1)
- BIVORT, A. Album de pomologie. Bruxelles, 1847-50. 3 vols. (in 1). col. pl. obl. sm. folio. (1)
- BRITISH MUSEUM (NATURAL HISTORY). Catalogue of the books, manuscripts, maps and drawings. Vol. 5. So-Z. London, 1915. 4to. (5)
- BROTERO, F. A. Compendio de botanica. . . . Paris, 1788. 2 vols. 8vo. (6)
- BURNAT, E. Flore des Alpes Maritimes . . . vol. vi. 1^{re} partie par J. BRIGUET et F. CAVILLIER. Genève et Bâle, 1916. 8vo. (1)
- BURNETT, M. A. Plantae utiles; or illustrations of useful plants, employed in the arts and medicine. London, 1842. Vol. 1. col. pl. 4to. (1)
- Wanting vols. ii., iii., and iv.
- CLEMENTS, H. Practical hints on garden culture. Garden pests and how to eradicate them. Bristol and London [1916]. 8vo. (3)
- CONDER, J. The flowers of Japan and the art of floral arrangement. Tokio, 1891. pl. col. pl. fol. (2)
- CORBETT, L. C. Garden farming. Boston, &c., 1913. 8vo. (3)
- CROCKER, E. Thirty-nine articles on gardening. London, 1908. col. pl. 8vo. (7)
- CURTIS, J. British entomology; being illustrations and descriptions of the genera of insects found in Great Britain and Ireland: containing coloured figures from nature of the most rare and beautiful species and in many instances of the plants upon which they are found. London, 1823-40. 8 vols. col. pl. 8vo. (2)
- [CURTIS, W.] A catalogue of the plants growing wild in the environs of London. London, 1774. 8vo. (1)
- DECAISNE, J. Le jardin fruitier du muséum ou iconographie de toutes les espèces et variétés d'arbres fruitiers cultivés dans cet établissement avec leur description, leur histoire, leur synonymie, &c. Paris, 1871-75. 9 vols. col. pl. 4to. (1)
- DENT, R. K. City of Birmingham. History and description of the public parks, gardens, and recreation grounds. [Birmingham], 1916. il. frontis. 8vo. (3)
- DICK, J. HARRISON. Commercial carnation culture. A practical guide to modern methods of growing the American carnation for market purposes. New York, 1915. il. frontis. 8vo. (3)
- [editor]. Gardeners' and florists' annual for 1916. New York, 1916. il. 8vo. (3)
- DUGGAN, MRS. "The door in the wall" or the story of my garden. 2nd impression. London, 1915? il. photo. plan. frontis. 8vo. (8)
- ENGELMANN, G. Cactaceae of the [United States and Mexican] boundary. [Washington, 1859.] 76 pls. 4to. (1)
- FENOLLOSA, M. Blossoms from a Japanese garden. A book of child-verses. London, 1913. col. pl. sm. 4to. (1)
- FIGUIER, L. The world before the deluge. Newly ed. and rev. by H. W. BRISTOW. London, 1872. il. pl. 8vo. (1)
- FITZGIBBON, A., and TRAILL, C. P. Canadian wild flowers. Painted and lithographed by A. FITZGIBBON, with botanical descriptions by C. P. TRAILL. Montreal, 1869. col. pl. fol. (1)
- FORTUNE, R. A residence among the Chinese: inland, on the coast, and at sea. Being a narrative of scenes and adventures during a third visit to China, from 1853 to 1856. . . . London, 1857. il. pl. frontis. 8vo. (2)
- FOSTER, M. Bulbous irises. London [1893]. il. 8vo. (2)
- FOULIS, T. N. [publisher]. Corners of grey old gardens. With illustrations in colour by M. WATERFIELD. London, &c., 1914. col. pl. sm. 8vo. (3)

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- JEKYL, G. Annuals and biennials. The best annual and biennial plants and their uses in the garden. With cultural notes by E. H. JENKINS. London [1916]. pl. col. pl. 8vo. (12)
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- JOHNSTON, A. K. The physical atlas. A series of maps and notes illustrating the geographical distribution of natural phenomena. . . Edinburgh and London, 1848. fol. (2)
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- KIRBY, W., and SPENCE, W. An introduction to entomology : or elements of the natural history of insects. London, 1815-17. 2 vols. col. pl. 8vo. (6)
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- LINDLEY, J. Collectanea botanica : or, figures and botanical illustrations of rare and curious exotic plants. London, 1821. col. pl. fol. (1)
- LINNAEUS, C. The families of plants, with their natural characters. . . . Translated [by E. DARWIN] from the last edition (as published by Dr. REICHARD) of the genera plantarum, and of the mantissae plantarum of the elder LINNAEUS, and from the supplementum plantarum of the younger LINNAEUS, with all the new families of plants from THUNBERG and L'HÉRITIER. . . . By a botanical society at Lichfield. Lichfield, 1787. 2 vols. 8vo. (6)
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- 2nd Ser. (1831-48). Vol. 1-3. London, 1835-48. il. pl. col. pl. 4to. (1)
- LONDON, HORTICULTURAL SOCIETY OF LONDON, Journal. Vol. 1-9. London, 1846-55. il. pl. col. pl. 8vo. (1) [continued as]
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- LOUDON, J. C. The suburban horticulturist ; or, an attempt to teach the science and practice of the culture and management of the kitchen, fruit, and forcing garden. . . . London, 1842. il. 8vo. (1)
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- McFARLAND, J. H. My growing garden. New York, 1915. pl. col. pl. col. frontis. 8vo. (3)
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Repr. from the *Bournemouth Guardian*, Mar. 25 and Apr. 1, 1916.
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- PUCCI, A. Les Cypripedium et genres affines, histoire, description, synonymie et culture des espèces, variétés et hybrides. Florence, 1891. 8vo. (2)
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- SEEMANN, B. Flora vitiensis: a description of the plants of the Viti or Fiji Islands with an account of their history, uses, and properties. London, 1865-73. 100 col. pl. port. 4to. (1)
- SHAMEL, A. D., and POPENOE, W. The pitanga, a valuable fruit of Brazil which deserves to be more widely cultivated—successful in Florida and California—methods of propagation. Washington, D.C., 1916. il. 8vo. (15)
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- SMITH, T. The book of dry-wall gardens. London, n.d. il. pl. 8vo. (3)
- SOILY, E. Rural chemistry: an elementary introduction to the study of the science in its relation to agriculture. London, 1843. sm. 8vo. (6)
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- THOMAS, H. H. Bulb growing for amateurs. London, 1915. il. frontis. 8vo. (3)
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- Round the year in the garden. A descriptive guide to the flowers of the four seasons, and to the work of each month in the flower, fruit, and kitchen garden. London, 1916. pl. col. pl. col. frontis. 8vo. (3)
- Everybody's flower garden. London, 1916. il. frontis. 8vo. (3)
- THOMAS, H. H., and CASTLE, F. R. Vegetable growing for amateurs. London [1916]. il. frontis. 8vo. (3)
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- WALPOLE, H. Essay on modern gardening. Essai sur l'art des jardins modernes, . . . traduit en François par M. le Duc de Nivernois en 1784. Strawberry-Hill, 1785. sm. 4to. (1)
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- WARNER, R. Select orchidaceous plants. The notes on culture by B. S. WILLIAMS. 3rd ser. London, n.d. col. pl. fol. (2)
- WATSON, R. M. The heart of a garden. London, 1906. pl. 8vo. (1)
- WATSON, W. Climbing plants. With introduction by W. ROBINSON. London and Edinburgh [1915]. pl. col. pl. col. frontis. 8vo. (3)
- WEBSTER, A. D. British-grown timber and timber trees. London, 1916. pl. 8vo. (3)
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- WHITE, E. A. The principles of floriculture. New York, 1915. il. frontis. 8vo. (3)
- WILKINSON, A. E. The apple. A practical treatise dealing with the latest modern practices of apple culture. Boston, &c., 1915. il. col. pl. col. frontis. 8vo. (3)

- WITHERING, W. An arrangement of British plants . . . 7th ed., including the most recent discoveries, and numerous enlarged annotations illustrative of the vegetable economy, by W. WITHERING [the younger]. London, 1830. 4 vols. pl. 8vo. (6)
- WOLSELEY, VISCOUNTESS. In a college garden. London, 1916. pl. port. 8vo. (3)
- Women and the land. London, 1916. pl. 8vo. (3)
- WORSDELL, W. C. The principles of plant-teratology. London, 1915. vol. i. il. pl. 8vo. (3)
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- WRIGHT, W. P. Illustrated garden guide. A practical introduction to garden formation and the cultivation of flowers, fruit and vegetables, with a monthly calendar. London, n.d. il. pl. col. pl. 8vo. (3)
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BOOK REVIEWS.

"The Chemistry of the Garden." By H. H. Cousins, M.A., F.C.S. (Macmillan, London, 1916.) 1s.

Eighteen years ago the first edition of this little work gratified the desires of many a gardener who wished for light on how to use "artificial" manures, and it has been reprinted many times since. Now it has been revised and a good many paragraphs added which increase the value of this little book, which should be at every gardener's hand. The additions are scattered all through the book, but are most numerous in the part devoted to fungicides and insecticides. We wish, however, a recipe had been given for making Burgundy mixture—it is a very effective substitute for Bordeaux mixture, and washing soda is, as a rule, more easily procurable than quick lime.

"Gardeners' and Florists' Annual for 1916." Edited by J. H. Dick. (De la Mare Ptg. Co., New York.) 50 cents.

The many friends of Mr. J. H. Dick on this side of the Atlantic will welcome this sign of his activities. The Annual contains a great amount of information gathered from both American and European sources all bearing upon horticulture, and especially upon the business aspects of horticulture. The volume for 1917, which is just received, is an even more valuable compilation.

"British Fern Gazette."

We have received a copy of this quarterly journal, which is edited by Mr. Chas. T. Druery, F.L.S., V.M.H., the recognized authority on British Ferns and their varieties, for the benefit of the members of the British Pteridological Society, of which he is the Hon. Secretary, 11 Shaw Road, Acton, W. The subscription is only 5s. per annum, which entitles to membership of the Society and four issues of the Gazette.

"Plants in Health and Disease." By F. E. Weiss, A. D. Imms, and W. Robinson. 8vo. viii + 143 pp. (Longmans, London, 1916.) 1s. 6d. net.

"Fungoid and Insect Pests of the Farm." By F. R. Petherbridge. 8vo. vii × 174 pp. (University Press, Cambridge, 1916.) 4s. net.

The first of these two books is based upon a course of lectures delivered at the University of Manchester last winter. It gives a brief but clear exposition of the functions of a plant growing healthily, and passes to a consideration of various troubles produced by fungus

and insect attacks upon plants, with details of the life and behaviour of the fungi and insects, &c., concerned.

The second deals only with a few of the diseases induced by insects and fungi on plants of the farm, and is well illustrated.

Both are reliable, and contain suggestions for remedying or preventing the recurrence of the trouble dealt with.

In neither, perhaps, is sufficient attention given to the treatment of eelworm-infested soil, probably because we are at present not in a position to deal with it effectively except on a restricted area which is well under control, as in greenhouses where soil-sterilization may be effected. There is probably no more troublesome or costly pest than the two species of eelworm, *Tylenchus devastatrix* and *Heterodera radicolica*, and none is more difficult to deal with. In the former book we find gas-lime recommended on more than one occasion for this and other soil pests, but, unfortunately for the grower, gas-lime is rarely to be obtained now, and even where it is the loss of time involved by its use is a serious thing in these days of intensive cultivation. We are sorry to see chalk suggested for use against club-root in cabbages, turnips, and the like, in the latter book, even though there is a warning that it is less good than quicklime, for in our experience it is quite valueless when once the soil is badly infested. It is, of course, a useful preventive dressing, since it prevents the accumulation of the organic acids in the soil which render it so much more favourable for the growth of the finger-and-toe organism.

“The Principles of Plant Culture.” By E. S. Goff, revised by J. G. Moore and L. R. Jones. Ed. 8. 8vo. xxiii + 295 pp. (Macmillan, New York, 1916.) 5s. 6d. net.

Nearly twenty years ago the late Professor Goff published “The Principles of Plant Culture,” the result of his wide experience and close insight into the science of plant growth. It has grown to some extent in his hands and in those of the revisers, who have included in this new edition material of value made available by scientific research since its first issue. Professor Goff died in 1902, but the work he did has been continued, and the value of his researches has outlived his brief span of years. He “combined the qualities of a real investigator with those of a delightful teacher,” and he put the best of his powers into the production of this book, which has earned the approbation of teachers of horticulture (for it was on that side of “plant culture” that his interest mainly lay) ever since its first publication. Its inclusion among the “Rural Text-books” edited by Prof. L. H. Bailey is a guarantee of its worth, even though no such recommendation as its long life were to be had, and we have every confidence in recommending it to the gardener who wants more than mere rule of thumb, and recognizes, as every progressive gardener does, the value of a knowledge of the “reason why” operations are performed in the way they are.

“The Manual of Manures.” By H. Vendelmans. 8vo. xvi + 164 pp. (“Country Life,” London, 1916.) 3s. 6*d.* net.

It is a common difficulty, which might be overcome by getting the proofs read by one more familiar with the language, for a writer in a foreign language to use technical terms unfamiliar to the users of that language, and the present book is not free from this fault. We make this comment first because it is the only fault we have to find with this excellent exposition of the value and use of manures, both natural and “artificial.” Growers of garden crops will need to pay more and more attention to the question of economical manuring as time passes, and that will mean either the study for themselves of the whole question or the calling in of expert advice. Recipes from books will not be likely to prove economical or entirely satisfactory unless their selection is guided and their application modified by knowledge of the requirements of the plants grown and the nature of manures. Towards the acquirement of the latter knowledge this book will be an excellent aid, and we confidently recommend it even to those who have no previous knowledge, and especially do we commend the remarks upon the purchase of mixed manures, the use and abuse of lime, and the storage of stable manure.

“Soils and Manures.” By E. J. Russell. 8vo. ix + 206 pp. (University Press, Cambridge, 1915.) 3s. 6*d.* net.

Dr. Russell’s books are marked by a lucidity of statement and a grasp of the essentials of practical requirements which make them of great value to the cultivator as well as to the student. Both student and cultivator may read this little book with the assurance that careful reading will be amply repaid, both in the interest the book will arouse and in the suggestions it contains as to practice to be followed in the cultivation of different crops to obtain maximum yields. The time is past for us, either in garden or farm, to be content with low yields of produce of any kind, and the mere following of plans pursued by our forbears will not improve our yields. It is by the discovery of the factor which is limiting output, and the elimination or reduction of that factor to smaller dimensions, that progress may be made, and the great merit of this book is that it shows where we may look for some of the factors that are concerned.

“Insect Pests of Farm, Garden, and Orchard.” By E. Dwight Sanderson. 8vo. xii + 684 pp. (Chapman & Hall, London, 1915.) 12s. 6*d.* net.

It is computed that the annual loss of farm and fruit crops in the United States directly due to insects amounts to £250,000,000. In our own country the loss is doubtless proportionately less, but even so the cost of maintaining the vast army of injurious insects is enormous, and while many make spasmodic efforts to control them

when their depredations exceed the limit of tolerance, and a few are systematic in their endeavours, many more take no steps at all towards checking them. This ought not to be, for in all these things general effort would be more effective than isolated.

The present work, though American and therefore dealing with some insects which do not worry us here, and giving details of others which may not fit the facts entirely in this country, is yet a valuable work for the study and reference of all concerned in cultivating crops. It is well illustrated with figures of practically all the insects referred to, the figures being particularly clear.

The insect is in each case described, an outline of its life-history and of its habits is given, the damage it does clearly indicated and frequently illustrated, and the methods suggested or already found successful in dealing with it are detailed.

One instance of the fulness with which the last part is dealt with may be given in reference to the troublesome cabbage-root maggot, which causes so much loss in this country. To avoid infestation of the cabbages in the seed-bed, coverings of cheese-cloth may be used. The covers are to be removed ten days before transplanting, and if the small, but long, thin white eggs are observed during that time, transplanting should be done at once. The placing of a hexagonal disc of tarred felt round the stem of each plant at ground-level after transplanting is the surest method of prevention.

A mixture of lime and carbolic acid may be applied to the surface of the soil (3 pints of lime slaked to a thin cream, diluted to 1 gallon with water, and a tablespoonful of crude carbolic acid added) about the plants. Kerosene and sand, gas tar and sand, tobacco dust, &c., have all been used to sprinkle about the plants. One part of gas tar (not more) to 25 parts sand is also said to be an effective mulch. Many methods of destroying the maggots are mentioned, but none so effective, says the author, as carbon bisulphide, which costs about 4s. for a thousand plants.

All the more important insects are effectively treated, and the methods of control dealt with as fully as in the instance just quoted, with recipes where required, and very frequently with estimates of the cost of treatment as well. A few which we recognize here as very troublesome pests, including the apple sawfly, the pear midge, and the black-currant mite, are omitted, and presumably have yet to find their way over the Atlantic.

“Insect Enemies.” By C. A. Ealand, M.A. 8vo., xiii + 223 pp. (Grant Richards, London, 1916.) 6s. net.

The long sub-title runs: “Enumerating the life-histories and destructive habits of a number of important British injurious insects, together with Descriptions enabling them to be recognized, and Methods by means of which they may be held in check.”

A good many of the pests dealt with are illustrated, but it is a pity that in many instances there is no indication on the plates of the size of the creatures figured. Thus on the plate facing p. 73 the woolly aphis is figured several times larger than the larva of the rose chafer; opposite p. 98 the figure of the turnip-flea beetle has an indication of the actual size of the pest, but no such indication is given on the figure of the asparagus beetle, and we are led to suppose from the figure that we have to deal with a beetle over an inch in length; but we need not multiply instances.

The author truly says that only a selection of the insects that prove pests in our fields and gardens and stores can be dealt with, but where this is the case it is perhaps a pity not to select the very worst instead of those which are less prevalent. Rarely do we see the codling moth now, though the author regards it as probably the most harmful of insect pests, but similar damage is done by the apple sawfly, which he does not mention, nor does he mention that all too common *Psylla* that is so prevalent in many an orchard in this country. Similarly, the numerous Tortrix moths that prey upon apple foliage, and are almost equally harmful with the winter, mottled umber, and March moths, are not mentioned.

It is difficult to see how one of the suggested treatments for Pear Midge could be effective, for the heavy spraying with Paris green just before the blossoms open could not reach the larvæ, which hatch inside the flowers (or buds) and feed inside the young fruits, nor would it be a "Spartan" remedy, for it would not be likely to damage the buds. The author has apparently not experienced the value of the Wisley turnip flea trap for catching the turnip flea, for he makes no mention of it, nor can we agree with the adequacy of his remedy for white fly in greenhouses, for which he recommends fumigation with tobacco, without the warning that persistent fumigation will be necessary.

Much remains to be discovered with regard to almost all the insects he mentions, as he points out, and we may mention just one of the points which occur in his book, showing how necessary it is to investigate in each district or country, and not to depend upon observations made abroad. In detailing the life-history of the cabbage root maggot, Washburn's statement that the female lays only one or two eggs on a plant is repeated. In England we have frequently seen a row of five or six on a single root, and sometimes more.

It would be unjust to leave the book at this point, for it contains much of interest and much of value, and is mostly couched in simple language. It will satisfy many who want to know something about insects, but it will not satisfy those who want really to know them. The author hopes that it will lead such to inquire further, and gives a list of useful works with that end, a hope which we can but cordially echo.

“Sub-tropical Vegetable Gardening.” By P. H. Rolfs, Director of the Experiment Station of Florida. 8vo. xviii+309 pp. With illustrations. (The Macmillan Co., New York, 1916.) \$1.50 net.

This book belongs to the “Rural Science Series,” which is under the general editorship of Prof. L. H. Bailey, the well-known American writer of horticultural text-books.

The introductory chapters deal with soils, fertilizers, methods of sowing and planting, the rotation of crops, and pests and diseases, all of which subjects are treated in the concise and practical manner characteristic of the series. These are followed by a short chapter on the marketing of vegetables.

The crops are classed for treatment into the following groups: edible leaves or stems, edible bulbs, edible fruits, edible seeds, edible tubers and roots, and miscellaneous crops. Included in these groups are most of the vegetables with which we in this country are familiar either as indoor or outdoor crops, together with less-known vegetables such as the collard, a kind of kale that is said to withstand hot weather better than the cabbage; the chayote (*Sechium edule*), the fruit of a climbing plant; the roselle or Jamaica sorrel (*Hibiscus sabdariffa*), whose acid fruit is said to be a substitute for the cranberry; the okra, plantain, and bread-fruit, all of which yield esculent fruits. Amongst pulses are included pole beans, Lima beans, cowpeas, peanuts and goober-nuts, which are unknown as crops in this country; whilst amongst tubers are mentioned the sweet potato, the yam, the rutabaga or Spanish turnip, the dasheen or taro, tanager, cassava and lleren, which are only met with in botanical gardens.

In American horticulture fertilizers play a much more important part than they do in the horticulture of this country, but in view of the decreasing supply of organic manures it may be expected that artificial fertilizers will in the future be employed here on an increasing scale. In this connexion the fertilizer formulas suited to the various crops which are given in this book will prove of interest to the vegetable grower, whilst the hints on irrigating, shading, and packing should also be of value. Intending settlers in the warmer parts of the British overseas Empire will find in this volume an indication of the extent and variety of the vegetable crops which it is possible to cultivate in warm climates, also practical information which should prove of the greatest assistance to beginners.

“Principles of Agronomy.” By Franklin S. Harris, Ph.D., and George Stewart, B.S. 8vo. xvi + 451 pp., illus. (The Macmillan Co., New York, 1915.) 6s. net.

This volume is an addition to the “Rural Text-book Series,” of which Prof. L. H. Bailey is general editor. It is intended as a text-book of crop production for high-schools and short courses in agricultural colleges in the United States, where, we are informed in the preface, agricultural instruction in the high school has extended rapidly during recent years.

The book is divided into four parts, which deal respectively with the plant, the soil, field crops, and field management. The information is concise, is conveyed in non-technical language, and is intended to supplement but not to supplant practical instruction in the field.

While intended for students in the United States, the book contains much of interest to the farmer in this country. The crops and some of the methods of cultivation in the United States naturally differ from those in this country, but the principles underlying crop-production are of course the same, and the necessity for running a farm on business-like lines, on which the authors insist, is evident wherever agriculture is practised.

The illustrations are numerous, and the pithy legends attached to them in most instances impart a lesson more forcibly than the text.

The appendix gives a list of the numerous agricultural colleges and experimental stations that are scattered throughout the United States, together with useful tables and statistical information, and a glossary of terms used in agriculture.

“A Glossary of Botanic Terms.” By Dr. B. D. Jackson. Ed. 3. 8vo. x + 428 pp. (Duckworth, London, 1916.) 7s. 6d. net.

Every science, like every trade and profession, has a number of terms peculiar to itself, either in form or meaning. Botany is no exception; indeed, some would be inclined to say that it is a science more overloaded with technical terms than any other, and it is certain that a good many are likely to be deterred from its close study by the difficulties of learning what is in many cases a new language. The present glossary contains about 10,000 references to what, for want of a better term, may be called main-terms, besides numbers of others derived from these. Many of these are not in common use, of course, but that makes it more desirable than it would otherwise be to have at hand such a book as this, to which one may turn in the confident expectation of finding even the most unusual terms and their meanings. Even so, not all the terms used in botanico-horticultural works are to be found (and of course the author does not claim to include them). The special use of “abaxial” in Hogg’s “Fruit Manual,” for instance, does not appear. On the contrary, some technical terms peculiar to horticulture are included, *e.g.* “forcing,” “grafting,” “budding,” “inarching,” and so on, but not “pruning,” “ringing,” and the like.

Amateur, student, and expert alike will find this book of constant value for reference, for not even the last can hope to carry in his mind the precise meaning attached by different authors to the terms they employ, and every new phase of the subject brings into use a new crop of terms with which none but the specializing expert can hope to make himself familiar. The last new phase of botanical study—Ecology—has added an enormous number to the already-

existing terms, and all these are included, so that this is far and away the best book of its kind to be obtained.

The book is very free from misprints; indeed, apart from those referred to on the last page, the only one we have noticed is a curious jumbling of the letters of a word meant to be "economics," on p. 54.

"Productive Bee-keeping." By F. C. Pellett. 8vo. xiv + 302 pp. (Lippincott, Philadelphia [1916].) 6s. net.

Bee-keeping in England is not quite like bee-keeping in America, but America is so large and embraces so many different climates that the practices followed in some parts of it must be similar to those adopted in this country, and as the author of this excellent and lucid hand-book is careful to state the conditions in which the various practices he describes are to be followed, this may be regarded as a reliable guide to bee-keepers in this country too.

Apart from their value as honey-producers, bees play a considerable part in carrying pollen from one tree to another in the orchard, and thus ensuring fertility of fruit where little or none would be otherwise. While various wild bees and flies play some part in this, hive bees are important too. The Isle of Wight disease has, unfortunately, devastated many of our apiaries, and, as America knows it not at present, no hints in this manual will avail in the endeavour so many bee-keepers have to make to combat it.

The book is well illustrated with reproductions of photographs which help to make the text clear, and introduce numbers of ingenious tools and apparatuses to the reader.

"Profitable Herb Growing and Collecting." By Ada B. Teetgen. 8vo. xi + 180 pp. (Country Life, London, 1916.) 3s. 6d.

The war has brought home to all of us how dependent we are upon other countries for many of even the most common necessities; things which we might easily produce in this country, but which for one reason or another, generally on account of our neglect of home industries or for economic reasons, we have, until the war began, imported from one or other of the enemy countries.

At one time our English gardens were incomplete without their beds of herbs, and many a healing medicine was made from plants collected by the wayside. The ease with which herb-concoctions could be produced, no doubt, often led to the crafty imposing upon the credulous, and the gradual growth of more systematic knowledge and the development of medicine, as well as the congress of people to towns, put a check upon the use of the herb-woman's mixtures, and upon the home-brewing of the various remedies of which Culpeper and his forerunners tell so much.

Many of the plants formerly used have "gone out," but it will come as a surprise to many to learn that over three hundred plants native in Britain, or very commonly and easily grown here, are still officinal. A few, like dill, coriander, and caraway, have been grown as farm

crops for many years, while fields devoted to the cultivation of mint and lavender are not unfamiliar to those who know our countryside, but the difficulty of obtaining supplies of some of the most active medicinal plants has given an impetus to their cultivation such as could not have been imparted in any other way. The women of England have taken up the work of herb cultivation and collection whole-heartedly, and the National Herb-growing Association, of Queen Anne's Chambers, S.W., are to be heartily congratulated upon the success which has been attained.

Whether the cultivation can be maintained after the war is a purely economic question, and the lessons learned now should go far to give an affirmative answer to it, for success depends, especially when only small cultures are attempted, not only upon knowledge of what and how to grow or collect, but upon how to prepare it for market and where to sell it, and co-operative drying and selling are the best solutions of these problems, as of many others that intimately affect the welfare of the countryside.

The author has crammed her book with useful information, and with advice as to what is wanted by the buyer and how to provide it. We have often been at a loss when asked to recommend a book on the subject, at once complete and practical, and have usually had to recommend American publications for information about medicinal plants, but that will be so no longer.

It may perhaps be as well to say that herb-growing is not likely to be an easy road to wealth, but it is an occupation suited to the means and abilities of many unable to undertake larger cultivations. Furthermore, it offers the scientifically inclined some tempting problems for solution, for undoubtedly some strains of plants, say of the deadly nightshade, produce greater quantities of the active principle upon which their value depends than others, and the future will find the buyer purchasing not on appearance but on analysis, paying for content of alkaloid and the like, just as the butter factory purchases milk, paying for the fat it contains. The first in the field with such high-bred strains as this will entail will be those to reap the benefit.

"Our Food Supply: Perils and Remedies." By Christopher Turnor. 8vo., 171 pp. (Scribners, New York: "Country Life," London, 1916.) 2s. 6d. net.

We can safely prophesy that many of the food supplies from abroad, which have hitherto been paid for by the interest due to us on our foreign investments, will in future have to be paid for by the export of goods or produced at home, and therefore a book like this cannot be too widely read, so that public opinion may speedily be prepared for the great changes in our countryside which must assuredly take place if we are to recover even in part from the present terrible strain. The book is written in a popular style, with large print and wide margins, and though containing little with which an ordinarily well-

informed man living outside the towns is not already to some extent acquainted, a thoughtful perusal of it will be a great enlightenment to many a townsman. The author says the object of the book is to "show that the land of the United Kingdom is under-cultivated, that it is not carrying the number of people it is capable of carrying. . . ." It will doubtless surprise many to hear that this fertile land of ours produces on an average about 31 bushels of wheat to the acre, while the soil of Denmark produces 40 bushels, and that in Holland and Belgium the yield from an acre for cereals is 25 per cent. higher than ours. In the matter of live stock too, while the United Kingdom has only 39 cattle, sheep, and pigs to each 100 acres, Denmark has 53, Germany 63, Holland 65, and Belgium 71, though we have a larger percentage of acreage under grass than any of them except Holland. The author deals with the causes of this low standard of production, into which space does not permit us to enter, or into his proposals for remedying the evil and its attendant rural depopulation. His main proposal is land settlement for ex-service men, and that in colonies rather than as isolated units. As illustrations of what can be and has been done in this country he quotes Fairby in Kent, Evesham, and Wisbech, and states that the New Zealand Government is deriving a clear profit of £70,000 a year from its land settlement work. Of course he advocates the establishment of credit banks, and agricultural instruction, preceded by some manual training, in the elementary schools, but when he advocates a minimum price for wheat he is getting on more contentious ground. The foreword by the Hon. Edward Strutt should help the book to a large sale.

"Reclaiming the Waste: Britain's most urgent Problem." By P. Anderson Graham. 8vo., 175 pp. (Scribners, New York; "Country Life," London, 1916.) 3s. 6d. net.

This handy little book is got up in the attractive style associated with "Country Life" publications, and though its subject may be considered stale it is written in a way which makes it as holding as a novel, and will undoubtedly insure it success in its avowed object of drawing attention to the vast possibilities of waste land reclamation.

It is estimated that in the United Kingdom there are more than 12,000,000 acres lying in complete or partial waste, and every acre of this that can be made productive adds to the taxable wealth of the country, and thus to our capacity to bear our gigantic and ever-growing burden of debt. Except the winning of the war, there is no more urgent problem to-day than the production of both food and timber, for the modern army is fed on timber to such an extent that our forests are being used up to keep it supplied, while the provision of labour to carry out the necessary work is a side issue scarcely less important than the main one. It is a remarkable fact that, while other Western European countries have been adding to their area of cultivated land, ours has considerably diminished.

Modern scientific knowledge has made reclamation a much quicker process than it was a generation ago, and remarkable instances are given of good financial results obtained by bringing Norfolk heath land into cultivation, and thin grass land on the downs into a state of high productivity. There are some chapters on similar work in Holland and Belgium, the general principle being followed there as here of afforesting only such land as is unsuitable for food production. The wild bogs of Ireland present a difficult problem, and Prof. Augustine Henry, in a chapter on the subject, considers it impossible to grow timber there at the present day, though sand dunes and cut-over bog present a fine field for the growth of maritime pine. The most unpromising areas for this work are the pit-banks of the Midlands and North of England, but such good results have already been obtained that the author states he has no doubt that almost any kind of refuse heap might be covered with trees in a few years by a liberal sowing of seed of a mixture of species considered most likely to succeed.

“Tree Wounds and Diseases; their prevention and treatment, with a special chapter on Fruit Trees.” By A. D. Webster. 8vo., xx + 215 pp. (Williams & Norgate, London, 1916.) 7s. 6d. net.

Perhaps no phase of horticulture is more neglected than the care of wounded or diseased trees, and it would scarcely be too much to say that were tree-wounds as carefully tended as they ought to be the amount of disease among trees would be reduced by more than half.

The author's long and wide experience of the care of trees in country and in town, and his knowledge of the causes which bring about disease, make this work one of the utmost value to all who have trees in their charge. All the methods of pruning, protecting wounds, encouraging healing, supporting branches liable to trouble or destruction, renovating old trees and so on, are fully dealt with, as well as the fungi and insects which are so frequently the agents of destruction, and the various modes of ill-treatment and mismanagement which lay them open to attack.

It is a book which we can cordially and confidently commend to those who have a love for trees, and wish to treat them as they ought to be treated.

“South African Botany.” By F. W. Storey and K. M. Wright. With 6 plates in colour and 113 text figures. 8vo., 220 pp. (Longmans, London, 1916.) 4s. 6d.

This book is written as suitable for the upper classes of the secondary schools, and is mainly morphological, the first seven chapters dealing with plant-structures, the eighth with pollination and fertilization, the ninth on plant physiology, and the tenth on classification, in which types of sixteen natural orders are described, with illustrations. Several foreign plants are introduced, but the reader is not informed on that point.

The important subject of ecology is not alluded to, but the physiology is assisted by experiments. The whole of the morphology is excellently given; but the importance of studying botany from Nature itself, and *not* from books, might have been emphasized with advantage.

“Parks and Park Engineering.” By W. T. Lyle. 8vo., 130 pp. (Wiley, New York; Chapman & Hall, London, 1916.) 5s. 6d. net.

The author states that “the book is principally for the benefit of the young and inexperienced engineer of construction, who, though not trained in the art, may be engaged in the work of development of private estates.”

The book is divided into five chapters, which extend to 130 pages, and is illustrated by thirty-eight plates, principally of park scenery, and the implements that are generally used in the reclaiming and laying out of waste lands. At the outset it may be well to state that the large size and generally irregular configuration of American parks, which differ greatly in these respects from those at home, call for a wide knowledge of engineering in the person who undertakes the laying out of the grounds. Bridge-building, the making of sewers, piling and lighting are works that rarely come under the average park superintendent.

In the chapter on design, much useful information is given as to the drainage of park-lands, dealing with large quantities of earth, and the formation of paths and roads.

The chapter dealing with labour and contracts is to the point, and will be found of value to all employers of labour, but particularly when works of a general kind are being carried out, and appears to be more suited to the American than the English labour market.

The Macadam pavement appears to be a favourite one with our American cousins, and the various methods of construction are interesting and to the point, though using asphaltic and other oils has not met with great success in this country.

Altogether the work has the ring of the practical about it, and is recommended for the perusal of all who have to do with the laying out of public or private parks.

“Recent Progress in the Study of Variation, Heredity, and Evolution.” By R. H. Lock, M.A., Sc.D. Revised by L. Doncaster, Sc.D., F.R.S. Ed. 4. 8vo. xxiv + 336 pp. (J. Murray, London, 1916.) 6s. net.

We reviewed this book in 1906, when it first appeared, and can say now, as then, that it is the clearest and most readable account in our language of the progress recently made in the subjects with which it deals. We have to mourn the death of the author at the early age of thirty-six—death due in no small measure to devotion to duty and neglect of necessary rest in work assigned to him soon after war broke out, by the Board of Agriculture, with the object of increasing

the nation's food supply. A biographical note is prefixed to this edition of the book, which is substantially the same as the last, with a few additional pages interpolated where necessary to bring it thoroughly up to date.

"Annuals and Biennials." By Gertrude Jekyll, with Cultural Notes by E. H. Jenkins. 8vo. xiv + 174 pp. ("Country Life," London, 1916.) 7s. 6d. net.

Miss Jekyll and her writings are so well known that it would be like painting the lily to praise her work; needless to say it is what might be expected from her, and also from Mr. Jenkins, who so ably assisted with the cultural notes. The book is admirably printed and charmingly illustrated, full of concise information, and well got up in every way. A very good index completes it.

"The Food Garden." By William F. Rowles. 8vo. 324 pp. (Headley Bros., London, 1916.) 6s. net.

We cannot do better than quote the author's description of this book: "A manual showing how to produce food in abundance from the small garden, how to organize the greenhouse and frame for food supply, and how to preserve food products from the garden. A "Foreword" by the Rev. W. Wilks, recommends the book to amateurs. It is for the amateur that the book is written, and on the whole the information given is excellent, and will be very instructive and valuable, for it indicates how better and more food can be produced with very little more labour and expense. We do not quite agree with the author's list of fruits for a garden. For instance, 'Worcester Pearmain' is recommended; it is a lovely apple to look at, but not to be compared with 'James Grieve,' ripening at the same period, and equally as heavy a bearer. 'Pitmaston Duchess' pear, too, has little to boast about, except its appearance. In vegetable cultivation, no mention is made of sowing carrots and globe beet at the end of July or early in August. For some years we have done this, and left the produce in the ground all winter, pulling them for use as wanted, and giving no protection; and where there is trouble with the carrot fly we strongly advise sowing the carrots in the months named. We have never known the fly to be at all troublesome, and excellent clean roots have always been abundant. Globe beet pulled fresh from the soil all winter are infinitely better than those that have been stored, and it will have to be a tremendous frost that will injure the roots. We suggest the author should include these and other food crops for sowing up to the first or second week in August; the land is cleared of so many crops by then, and ready for sowing again.

"A Text-book of Botany for Colleges." By W. F. Ganong, Ph.D. 8vo. xi + 401 pp. (Macmillan Co., New York, 1916.) 8s. 6d. net.

Dr. Ganong combines in a rare degree the faculty of the teacher with that of the man of science, who must verify facts before he builds

upon them. The result, as with all the author's books, is a refreshing outlook to his subject and a just appreciation of the place the botany course should occupy in various kinds of education. Its bearing towards the actions and thoughts of mankind is the place it should occupy, as the author well points out, in the general college course, and the relative importance to be attached to the different aspects of the science differs according to whether it is intended as part of a general training, or in preparation for a professional career, or as an aid in realizing the inwardness of an applied science like horticulture.

Too often, in both the first and the last types of botanical course, the student is overburdened by details dealing with exceptional instances and curious facts of limited application, instead of having almost the whole of his attention directed to the establishment of the broader principles of the science by means of well-directed laboratory courses. In our opinion the author has done well to direct his teaching into the line it follows in this book, and we can confidently recommend it to the attention of those whose business it is to conduct similar courses on this side of the Atlantic.

Form and function are the twin themes of the present volume, and this is to be followed by another dealing with the kinds and relationships of plants, to be published separately and also bound up with the present volume.

The completeness and method which characterize the book may be indicated by a list of the sections of the chapter on the morphology and physiology of leaves:—The distinctive characteristics of leaves (2 pp.); the structure of leaves (2 pp.); the synthesis of food by light in leaves (9 pp.); the cellular anatomy of leaves (7 pp.); the water-loss, or transpiration, from plants (9 pp.); the adjustments of green tissues to light (6 pp.); the various forms of foliage leaves (14 pp.); the forms and functions of leaves other than foliage (10 pp.); the nutrition of plants which lack chlorophyll (6 pp.); the autumnal and other coloration of leaves (6 pp.); the economics, and treatment in cultivation, of leaves (3 pp.); the uses of photosynthetic food (16 pp.).

No fewer than 274 illustrations illuminate the pages of this excellent manual, and not a few represent ingenious pieces of apparatus, often of the author's devising, for demonstrating some of the facts of vegetable physiology of cardinal importance.

"Fruit Growing for Amateurs." By H. H. Thomas. 8vo. 152 pp. (Cassell, London, 1916.) 1s. net.

A very useful little book for the class of readers for whom it was written, dealing as it does with all kinds of hardy fruits usually grown in this country and with vines and melons. Bottling fruits, winter washes for fruit trees, insect pests, fungus diseases, are one and all briefly dealt with. In our opinion it is a pity the 'Lowberry' is recommended on p. 81, as we have never seen it a success in the open air, *i.e.* never cropping well. Again, one would imagine from its

name that it was a distinct fruit, but we can see no difference between it and the Californian Blackberry.

“Everybody’s Flower Garden.” By H. H. Thomas. 8vo. 152 pp. (Cassell, London, 1916.) 1s. net.

A capital little book for the amateur, containing just the information required, with good illustrations, including those of useful and injurious insects; such friends amongst others may be mentioned as the devil’s coach-horse, the tiger beetle, and the ground beetle, not forgetting the ichneumon fly, of which there are numerous species, which deposit eggs in caterpillars; these hatch out inside the body of the caterpillar, on which the grub feeds till its victim dies. The chapter on construction of rock gardens will be very interesting to the amateur; in fact, the work will appeal to all who have a small garden, and enjoy looking after it themselves. A capital index completes an excellent little book.

“Simple Gardening (School Gardening).” By Laurence B. Hyde, B.A. 8vo. 104 pp. (Collingridge, London, 1916.) 1s. net.

This excellent little book has been edited by Mr. T. W. Lander, and, taken generally, is well up to date, and should prove very helpful for beginners. We may not agree with all the author says, but different people different methods, and the book is so well written and so practical that we can only praise it. The author says in the preface that since the war began more attention has been paid to the production of indispensable food crops, and we would suggest that in the next edition the author should show how the potato crops could be increased by cutting the “sets.” In the illustrations on pp. 27 and 28 it will be observed that all the “sets” are whole, and if these were cut they would make two or more sets, thus doubling or trebling the seed. Potatoes will be dear and the supply short for some years, even if peace comes soon, owing to the lack of supply; and if this supply is doubled by such an easy system as cutting the tubers into two or more “sets,” without a reduction of the weight of produce from an acre, the benefit all round will be very considerable.

“The Suburban Garden.” By F. M. Wells. 8vo. 263 pp. (Sampson Low, Marston, London, 1916.) 2s. net.

A delightfully written book, well printed and illustrated, and containing many instructive hints valuable to owners of large or small gardens. We think it would be more serviceable if there were a good index, as it is not always easy to find particulars of what is especially wanted.

“Algae,” vol. i. By G. S. West, M.A., D.Sc., A.R.C.S., F.L.S., Mason Professor of Botany in the University of Birmingham. Large royal 8vo. x + 476 pp., with 271 illustrations. (University Press, Cambridge, 1916.) 25s. net.

The title of the present work is rather more comprehensive than the preface indicates, since the title does not exclude future volumes

on Marine Algae. The volume just issued is one of the series of "Cambridge Botanical Handbooks" edited by A. C. Seward and A. G. Tansley with the view of enabling students who so desire to pursue the subject of Algae beyond the limits of a general text-book, and to keep abreast, as far as possible, of recent discoveries and contributions to the literature of the subject.

How extensive these contributions are is indicated by the long bibliographical lists on pp. 46, 81, 125, 153, 318, 381, 416, 448, the majority of the publications quoted having been issued since the publication of the author's treatise on fresh-water Algae, twelve years ago. This work has been out of print for several years, and the great accumulation of knowledge concerning the various groups of the fresh-water Algae has led to the replacement of the earlier work by two volumes.

The present one consists of a biological account only, of all the Algae included in the Myxophyceae (Cyanophyceae), Peridinieae, Bacillariaceae, and Chlorophyceae, both fresh-water and marine, but is exclusive of the systematic arrangement and description of the species, which the author is preparing in the form of a second volume. This, when issued, is to include all the British fresh-water Algae (except the Diatoms and Desmids) known to occur in the British Islands, although the morphology and life-history of these two groups are dealt with in the present volume.

One of the most useful chapters is that on the Peridinieae, since no comprehensive modern account of this group has previously been published in any English text-book, although, like the Flagellata (which are so large a group as to require separate treatment), they are important producers of organic substances, especially in the marine plankton, in that they store starch and oil as food reserves.

Nearly half the volume is devoted to the Chlorophyceae, a large group to which, for many years, Professor West has devoted close attention, and in which among British algologists he is *facile princeps*.

The author's views on the classification of the Chlorophyceae have therefore especial value, as being likely to be adopted for the future in botanical text-books in this country. He adopts the proposal of Blackman and Tansley in "The New Phytologist," in 1902, that the four primary divisions of this large group should be the Isokontae, Stephanokontae, Akontae, and Heterokontae. These Professor West subdivides as follows :

The Isokontae now include the Protococcales, Siphonales, Siphonocladiales, Schizogoniales, Ulvales, and Ulotrichales. The Akontae comprise the Conjugatae of previous authors, and the Stephanokontae include only the Oedogoniales, and the Heterokontae are subdivided into the Heterococcales, Heterotrichales, and Heterosiphonales.

In the present state of our knowledge this seems a most satisfactory classification. The retention of the Vaucheriaceae in the Siphonales is far more reasonable than its removal to Heterokontae as suggested by Bohlin.

A chapter on Ecology concludes a volume that brings the literature of the subject quite up to date. Even papers that have appeared since the volume was printed off find a brief notice at the end, under the head of Addenda.

The 271 illustrations comprise 1,284 lettered and numbered figures, of which rather more than half are from original drawings by the author.

No scientific library can afford to be without a copy of this work, which must for a number of years to come form the standard work of reference on the Algae of which it treats.

“Agricultural Geology.” By R. H. Rastall, M.A. 8vo. ix + 331 pp. (University Press, Cambridge, 1916.) 10s. 6d. net.

The title of the present book recalls another on the same subject published a few years ago, written by a working farmer, and the contrast between the two books is a reflex of the difference between the points of view from which the two authors approached their subject.

In that, the author, a professional farmer and a keen amateur geologist, looked at his geological facts with the eye of the agriculturist and sought how the problems with which he was so familiar might have light thrown upon them by geology. In this, the professional geologist states the geological facts as he conceives their bearing upon agricultural practice, but, as the preface indicates, most of his agricultural information has apparently been derived from books. Books, however, do not contain the information which is so desirable. Only recently has any real attempt been made to correlate soil with cropping capabilities, and this side of the subject has received scant treatment here. A perusal of the book, which is an exceedingly interesting one, leaves one with the impression that the title has been somewhat ill-chosen, and that geology has less bearing upon agriculture than climate, aspect, and chemical and physical composition of the soil. The underlying rocks are of less direct importance to the farmer than the conditions he finds within ten inches of the surface.

Our criticism, then, is mainly with the title. Omitting the bias the title gives, we find an eminently readable elementary treatise on geology largely in its physiographical aspects, reliable in its details, and suggestive to any who are thoroughly familiar with the problems of plant production.

The ideal agricultural geology has yet to be written; meanwhile we have the next best thing—a geology not too much concerned with controversial problems as to the date or age of a certain deposit, or with the metalliferous rocks, or even with the remarkable fossils so many of the rocks contain.

“British-grown Timber and Timber Trees.” By Angus D. Webster. 8vo. 164 pp., with 41 plates. (Rider, London, 1916.) 5s. net.

Mr. Webster uses the term “timber” in a very comprehensive sense. It means properly wood used for building, so that we are surprised to

see such woods as *Arbutus*, box, buckthorn, cherry, Cotoneaster, elder, lilac, and white-beam included in his work. Botanists will not be satisfied with his nomenclature: *Hippophaea* should be *Hippophae*; and—which is more important—*Abies* should be restricted to the Firs, *Picea* to the Spruces. Another slip of minor consequence is the reference to Tradescant as introducing the horse-chestnut in the reign of Elizabeth and cultivating it in his Botanic Garden at Chelsea. The species may have been introduced before the end of the sixteenth century; but there is no evidence that even the elder of the two Tradescants, both of whom were gardeners to Queen Henrietta Maria, travelled before 1620, and their garden was at Lambeth, not at Chelsea.

These, however, are but small matters. Mr. Webster has produced a book that will be useful to land-owners. His wide practical experience in growing and selling British-grown woods results in much useful information as to soils and prices in times of peace and war; and, in addition to descriptions of each species in alphabetic order, he has given chapters on charcoal, coppice, oak-bark, and firewood. The plates are natural-size collotypes of the woods, and, if not of much use for identification, give a fair idea of the grain; but in many cases somewhat exceptionally knotty or distorted specimens have been illustrated.

“The Standard Cyclopedia of Horticulture.” By L. H. Bailey. Vol. v. La. 8vo. v + 2423-3041 pp. (Macmillan, New York, 1916.) 25s. net.

We have already referred to the excellencies of this great book as earlier volumes have appeared. The present volume deals with plants whose names begin with letters from P to R inclusive, and contains also an enormous amount of information concerning such subjects as Pruning, Perfumery, Planting, and even Photography of Plants, and so on. We see that *Paphiopedilum* is used for most of our *Cypripedium* species (as in some British publications), but on the whole the names assimilate very well with those in general use in this country.

The completeness of the treatment may be judged by the fact that no fewer than 167 species of *Primula*, besides many hybrids, are described, and by means of a key the name of any species may be ascertained. The exact value of such keys can be gauged, of course, only by use, and care and some knowledge is required for their intelligent utilization; but they form a very marked feature of this great work, and so far as we have yet been able to test them they have proved very trustworthy guides in the “running down” of the plant one seeks, especially when the genus is known.

Here and there one might wish for a little further enlightenment upon methods of propagation where they call for something more than ordinary garden routine. For example, there are two somewhat similar Climbing *Polygonums* in gardens, *P. Baldschuanicum* and *P.*

Auberti, the former of which is by far the better plant, but it is more difficult to propagate than the latter, and consequently is less frequently met with, although the name is probably better known than *P. Auberti*. We feel sure some special note on its propagation would have been welcomed.

One more volume is to complete the work, which will be the best Encyclopaedia of Horticulture so far published.

“A Book of Garden Plans.” By Stephen J. Hamblin. 8vo. 134 pp. (Doubleday, Page & Co., New York, 1916.) \$2.00.

The main object of this book is to give suggestions by means of blue prints and plans, for plant arrangement in all kinds of gardens. Here we have not only formal gardens that surround suburban houses, but we are shown what plants to put on a naturalistic rock-garden, which aquatic ones to choose for an artificial water-garden, and what to select as fragrant flowers for a scented garden.

It is not the design or construction that we are asked to consider as much as a selection of the right plants for the home that has already been prepared for them. The book should be studied critically lest the long and varied lists tempt the novice to follow them implicitly, and thus overcrowd his garden with too many different varieties of plants. The museum of many flowers does not bring restfulness, and consequently the spot-and-dot style should be avoided. Treated, however, merely as suggestive, this book should assist those who have not strong imaginative powers; but it must be confessed that its value in this respect would have been enhanced if the plans themselves had been produced upon a larger scale. Although they show admirably the garden design, the sections and elevations, yet there is considerable difficulty in deciphering the numbers which refer to the lists of plants. These are far too small to afford that facility in plan-reading which is so important a factor in conveying to the reader the striking and bold suggestions that most gardens, both small and large, call for in plant grouping.

“Illustrations of the British Flora: a series of wood-engravings, with dissections, of British plants.” By W. H. Fitch, with additions by W. G. Smith. Ed. iv. 8vo. xvi + 338 pp. (Lovell Reeve, London, 1916.) 9s. net.

A few changes and several additions mark this new edition of a work that has been the welcome companion of many a student of British Botany in the last two generations; and the additions will make it welcome to many more. The nomenclature has been assimilated with that of the “Handbook of British Botany,” of which this is intended to be the companion; synonyms and the “English” name and flower colour have been added to each of the figures. A few typographical errors, especially in capitalization of specific names, have passed uncorrected, but they are few. The woodcuts are a pleasure to

behold after the prettinesses of the half-tone blocks, which modern conditions (and perhaps modern taste) almost compel us to use so much ; their faithful presentation of the pose of the plant, and their clear-cut directness, form so valuable a feature that we know of no other work on British Botany which we can so confidently recommend to the seeker after illustrations.

“ Johnson’s Gardeners’ Dictionary and Cultural Instructor.” Edited by J. Fraser, F.L.S., and A. Hemsley. New ed. revised and enlarged. 8vo. 923 pp. (Routledge, London, 1917.) 12s. net.

This well-known book, first published in 1846, has been used by many a gardener with advantage to himself and his craft. It contains alphabetically arranged references to flowering plants, ferns and their allies, fruits, vegetables, and herbs, and common plant diseases and pests with methods of prevention and remedy. Each generic name has a note on its derivation, the main cultural requirements of the genus are briefly noted, and the chief methods of propagation, while occasionally a note is made of the garden value of the plant. Each specific name is translated, and the height, colour, flowering period, native country, and date of introduction are recorded. Synonyms have been carefully revised in most cases, and the proof corrections have been carefully attended to. The information given is, of course, insufficient to enable any unknown plant to be “run down,” but if the genus is known, some idea of the species may be obtained, and the book will act as a general guide to cultivation and to the accurate spelling of plant names (except in one direction). The small type used is very clear and readable, and although the book contains so many pages it is not unwieldy nor heavy to hold.

It is scarcely to be expected that a book of this sort should be free from faults, but it is so good that we are sorry the few obvious ones have not been avoided. It would have been better, we think, to have followed the now recognized rule with regard to the capitalization of specific names derived from the names of persons, but we find, e.g., *Oenothera Sellowii* but *Feijoa sellowiana*, following an obsolete method. The latter specific name is translated ‘Sellowian,’ although in some other cases names of the same form, e.g., *Hymenaea candolliana*, the translation is the preferable form ‘DeCandolle’s,’ thus distinguishing the name from one derived from that of a place, as *Doronicum peruvianum* (Peruvian). The handlists and lists of new plants emanating from Kew have been largely used for information as to new plants in cultivation, and perhaps as a result of relying too greatly upon these the information and lists of species are not always up to date as is claimed for them. *Godetia Schaminii* is said to have been introduced in 1906, whereas it was grown in the R.H.S. gardens at Chiswick many years before that. The handsome *Berberis verruculosa* and *B. Sargentiana*, *Primula Winteri* (flowering freely now outdoors after all the severe and trying weather of the past

winter), *P. Beesiana*, *P. sinolisteri*, and so on, all plants well known to frequenters of the R.H.S. exhibitions and readers of this JOURNAL, and now becoming widely spread in gardens, find no mention. Some of the terms used, too, are obsolete, e.g., 'Azote,' on pp. 45 and 46; the information on artificial manures on pp. 768 and 769 is sadly in need of revision (but we must congratulate Mr. Murray (p. 769) on his active use of nitrates for 106 years—rarely indeed, even in the healthy occupation of gardening, can one make such a claim); nor are the paragraphs dealing with pests altogether reliable. The beetles commonly called 'soldiers' and 'sailors' in the south are not injurious, nor are they related to the skipjacks (p. 823); gas lime is not a remedy for club-root, nor can it now be obtained in many places; *Tylenchus devastatrix*, the stem eelworm, does not produce galls on roots; grease, if properly chosen, remains sticky on grease bands for longer than two or three days (p. 202); sometimes we are told to spray, but not what to use; sometimes we are told what to use, but not how to make it; many important troubles are either omitted or mentioned casually, and indeed the whole of the paragraphs referring to pests need revision and amplification. We hope that a reprint of this extremely useful book will soon be required, and that the opportunity will be taken for the necessary revision and completion.

"Potter's Cyclopædia of Botanical Drugs and Preparations." By R. C. Wren, F.L.S. With additions by E. M. Holmes, F.L.S. 2nd ed. 8vo., xl + 339 pp. (Potter & Clarke, London, 1915.) 3s. 6d.

This encyclopædia comprises a list of all drugs of vegetable origin employed in pharmacy in this country. The plan of the book is as follows: The arrangement is alphabetical, the common name in general use for the drug being placed as a heading on the left-hand side of the page, with the Latin name and natural order on the right-hand side; then follows descriptive matter divided into paragraphs with the following headings—synonyms, action, preparation, and distinctive character. The descriptions of the distinctive characters are a new and valuable feature, for which the eminent authority on drugs, Mr. E. M. Holmes, F.L.S., is responsible. Following the list are articles devoted to descriptions of the different forms of medicinal preparations and herbal compounds, also a glossary of botanical terms, and an interesting note on botanical names and their authorities. There is an excellent and full index to all the names of drugs mentioned.

The appearance of this encyclopædia at this time is particularly fortunate in view of the shortage of many common drugs and the efforts that are being made to cultivate supplies in this country. The work illustrates the scope of the subject and at the same time furnishes authoritative information which cannot fail to be of great value to all who cultivate or use botanical drugs.

NOTES ON RECENT RESEARCH
AND
SHORT ABSTRACTS FROM CURRENT PERIODICAL
LITERATURE, BRITISH AND FOREIGN,
AFFECTING
HORTICULTURE & HORTICULTURAL SCIENCE.

THE endeavour commenced in volume xxvi. to enlarge the usefulness of the Society's Journal, by giving an abstract of current Horticultural periodical literature, has met with much appreciation. It has certainly entailed vastly more labour than was anticipated, and should therefore make the Fellows' thanks to those who have helped in the work all the more hearty.

The Editor would be grateful if any who have time at command, and who are willing to help in any special direction in this work, would communicate with him. He desires to express his most grateful thanks to all who co-operate in the work, and he ventures to express the hope that they will all strictly adhere to the general order and scheme of giving references to papers, as the observance of an identical *order* renders subsequent reference to the original easy. The order is as follows :—

1. To place first the name of the plant, disease, pest, &c., being noticed ; and in this, the prominent governing or index word should always have precedence.

2. To place next the name, when given, of the author of the original article.

3. Then, the abbreviated form of the name of the journal, &c., in which the original article appears, taking care to use the abbreviation which will be found on pp. 367, 368.

4. After this, a reference to the number, date, and page of the journal in question.

5. If an illustration be given, to note the fact next, as "fig.," "tab.," or "plate."

6. After these preliminary necessities for making reference to the original possible for the reader, the abstract or digest should follow, ending up with the initials of the contributor affixed at the close of each Abstract or Note.

NAMES OF THOSE WHO HAVE KINDLY CONSENTED TO HELP
IN THIS WORK.

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 Webster, A. D., F.R.H.S.
 Whittles, W., F.R.H.S.
 Williams, S. E., F.R.H.S.
 Wilson, Gurney, F.L.S., F.R.H.S.

JOURNALS, BULLETINS, AND REPORTS

from which Abstracts are made, with the abbreviations used for their titles.

Journals, &c.	Abbreviated title.
Agricultural Gazette of New South Wales	Agr. Gaz. N.S.W.
Agricult. Journal, Cape of Good Hope	Agr. Jour. Cape G.H.
American Journal of Botany	Amer. Jour. Bot.
Annales Agronomiques	Ann. Ag.
Annales de la Soc. d'Hort. et d'Hist. Naturelle de l'Hérault	Ann. Soc. Hé.
Annales de la Soc. Nantaise des Amis de l'Hort.	Ann. Soc. Nant. des Amis Hort.
Annales des Sciences Naturelles	Ann. Sc. Nat.
Annales du Jard. Bot. de Buitenzorg	Ann. Jard. Bot. Buit.
Annals of Applied Biology	Ann. Appl. Biol.
Annals of Botany	Ann. Bot.
Annual Report Agricultural Research Station, Long Ashton	Ann. Rep. Agr. Res. Stn., Long Ashton.
Beiheft zum Botanischen Centralblatt	Beih. Bot. Cent.
Boletim da Real Sociedade Nacional de Horticultura	Bol. R. Soc. Nac. Hort.
Boletim da Sociedade Broteriana	Bol. Soc. Brot.
Bollettino della R. Società Toscana d'Orticoltura	Boll. R. Soc. Tosc. Ort.
Botanical Gazette	Bot. Gaz.
Botanical Magazine	Bot. Mag.
Bulletin de la Société Botanique de France	Bull. Soc. Bot. Fr.
Bulletin de la Soc. Hort. de Loiret	Bull. Soc. Hort. Loiret.
Bulletin de la Soc. Mycologique de France	Bull. Soc. Myc. Fr.
Bulletin Department of Agricult. Brisbane	Bull. Dep. Agr. Bris.
Bulletin Department of Agricult. Melbourne	Bull. Dep. Agr. Melb.
Bulletin of the Botanical Department, Jamaica	Bull. Bot. Dep. Jam.
Bulletin of Bot. Dep. Trinidad	Bull. Bot. Dep. Trin.
Canadian Reports, Guelph and Ontario Stations	Can. Rep. G. & O. Stat.
Centralblatt für Bacteriologie	Cent. f. Bact.
Chronique Orchidéenne	Chron. Orch.
Comptes Rendus	Comp. Rend.
Contributions from U.S.A. Herbarium	Contr. fr. U.S.A. Herb.
Department of Agriculture, Victoria	Dep. Agr. Vict.
Department of Agriculture Reports, New Zealand	Dep. Agr. N.Z.
Dictionnaire Iconographique des Orchidées	Dict. Icon. Orch.
Die Gartenwelt	Die Gart.
Engler's Botanische Jahrbücher	Eng. Bot. Jah.
Gardeners' Chronicle	Gard. Chron.
Gardeners' Magazine	Gard. Mag.
Gartenflora	Gartenflora.
Journal de la Société Nationale d'Horticulture de France	Jour. Soc. Nat. Hort. Fr.
Journal Dep. Agriculture, Victoria	Jour. Dep. Agr. Vict.
Journal Imperial Department Agriculture, West Indies	Jour. Imp. Dep. Agr. W.I.
Journal of Agricultural Research	Jour. Agr. Res.
Journal of Agricultural Science	Jour. Agr. Sci.
Journal of Botany	Jour. Bot.
Journal of Chemical Society	Jour. Chem. Soc.
Journal of Ecology	Jour. Ecol.
Journal of Economic Biology	Jour. Econ. Biol.
Journal of Economic Entomology	Jour. Econ. Entom.
Journal of Genetics	Jour. Gen.
Journal of the Board of Agriculture	Jour. Bd. Agr.
Journal of the Linnæan Society	Jour. Linn. Soc.
Journal of the Royal Agricultural Society	Jour. R.A.S.
Journal of the Society of Chemical Industry	Jour. Soc. Chem. Ind.

Journal S.E. Agricultural College, Wye	Jour. S.E. Agr. Coll.
Kaiserliche Gesundheitsamte	Kais. Ges.
La Pomologie Française	Pom. Franç.
Le Jardin	Le Jard.
Lebensgeschichte der Blütenpflanzen Mitteleuropas	Lebens. d. Blütenpfl.
Mycologia	Mycologia,
Naturwiss. Zeitschrift Land und Forst	Nat. Zeit, Land-Forst,
New Phytologist	New Phyt.
Notizblatt des Königl. Bot. Gart. und Museums zu Berlin	Not. König. Bot. Berlin.
Oesterreichische Garten-Zeitung	Oester. Gart. Zeit.
Orchid Review	Orch. Rev.
Orchis	Orchis,
Phytopathology	Phytopathology.
Proceedings of the American Pomological Society	Am. Pom. Soc.
Quarterly Journal of Forestry	Quart. Jour. of Forestry.
Queensland Agricultural Journal	Qu. Agr. Journ.
Report of the Botanical Office, British Columbia	Rep. Bot. Off. Brit. Col.
Reports of the Missouri Botanical Garden	Rep. Miss. Bot. Gard.
Revue de l'Horticulture Belge	Rev. Hort. Belge.
Revue générale de Botanique	Rev. gén. Bot.
Revue Horticole	Rev. Hort.
The Garden	Garden.
Transactions Bot. Soc. Edinburgh	Trans. Bot. Soc. Edin.
Transactions of the British Mycological Soc.	Trans. Brit. Myc. Soc.
Transactions of the Massachusetts Hort. Soc.	Trans. Mass. Hort. Soc.
Transactions Royal Scot. Arboricultural Soc.	Trans. Roy. Scot. Arbor. Soc.
U.S.A. Department of Agriculture, Bulletins	U.S.A. Dep. Agr.*
U.S.A. Experimental Station Reports	U.S.A. Exp. Stn.†
U.S.A. Horticultural Societies' publications	U.S.A. Hort. Soc.†
U.S.A. State Boards of Agriculture and Horticulture	U.S.A. St. Bd.†
Woburn Experiment Farm Report	Woburn.

* The divisions in which the U.S.A. Government publish Bulletins will be added when necessary.
† The name of the Station or State will in each case be added in full or in its abbreviated form.

NOTES AND ABSTRACTS.

Acacallis cyanea (*Bot. Mag.* t. 8678).—Upper Amazon. Nat. Ord. *Orchidaceae*, tribe *Vandeae*. Herb, epiphytic. Leaves obovate-elliptic, petiolate. Scapes 6–8 inches long, racemes few or many-flowered. Flowers showy. Sepals 1 inch long. Petals orbicular-ovate, $1\frac{1}{2}$ inch wide. Lip emarginate, $1\frac{1}{2}$ inch wide. Sepals and petals white above, purple below, the lip being russet, with yellow border.
G. H.

Acclimatization of Plants by Grafting. By J. B. Dental (*Rev. Hort.* March 16, 1916).—On the supposition that for every plant there exists a species adapted for grafting, and that the species of the same genus may not have precisely the same requirements, it is possible to find one amenable to propagation by grafting. A number of suggestions in this connexion.—C. T. D.

Alkaloids, Latex and Oxidases in *Papaver somniferum*, Physiological Observations on. By Rodney H. True and W. W. Stockberger (*Amer. Jour. Bot.* vol. iii. No. 1, Jan. 1916, pp. 1–11).—It appears from work done upon the opium poppy (*Papaver somniferum*) that the oxidase reaction is most active in the upper parts of the plant, especially the floral structures, capsules, and actively growing parts. The peroxidase reaction shows less variation in its intensity in different parts of the plant.

It is found that the intensity of the oxidase reaction roughly parallels the distribution of the latex, which in itself is most active, and, with the exception of the root, the intensity of the oxidase reaction runs roughly parallel with the alkaloidal content. In the root the alkaloidal content is relatively higher than the intensity of the oxidase reaction.

Alkaloids do not seem to exist as such in the poppy plant, but appear as products of the action of the oxidases on constituents present in the latex reacting in the presence of oxygen. In this the alkaloids of *Atropa Belladonna* differ from those of the poppy, for they are found to exist as such in the plant, and without contact with free oxygen.—A. B.

Alnus cordata (*Bot. Mag.* t. 8658).—Italy and Corsica. Nat. Ord. *Cupuliferae*, tribe *Betulaceae*. Tree of pyramidal shape, 80 feet. Leaves wide ovate, $3\frac{1}{2}$ inches long. Male catkins 4 inches long, six in a terminal raceme. Cones 1–3 together, $1\frac{1}{2}$ inch long, $\frac{3}{4}$ inch across.—G. H.

Aloe arborescens* var. *natalensis (*Bot. Mag.* t. 8663).—Natal. Nat. Ord. *Liliaceae*, tribe *Aloineae*. Shrub, freely branching at the base. Leaves densely clustered at the tips of the branches, $1\frac{1}{2}$ ft. long, 2 inches wide. Marginal teeth incurved. Peduncle erect, $1\frac{1}{2}$ ft. long. Raceme 8–10 inches long. Perianth $1\frac{3}{4}$ inch long, red.—G. H.

Alpinia Elwesii (*Bot. Mag.* t. 8651).—Farinosa. Nat. Ord. *Scitamineae*, tribe *Zingiberaceae*. Herb, perennial, up to 5 feet in height. Leaf linear-lanceolate, narrowed at the base, 18 inches long. Inflorescence racemose, 4–5 inches long. Flower $1\frac{1}{2}$ inch long, lip crimson with white borders. The rest of the flower white.—G. H.

Alstroemerias, The. By S. Mottet (*Rev. Hort.* July 16, 1916).—Coloured plate showing two fine varieties with notes.—C. T. D.

“Amphiclinous Hybrids.” By this term De Vries (“Ueber amphikline Bastarde,” *Ber. Deutsch. Bot. Gesells.* xxxiii. pp. 461–468, 1915) designates F₁ hybrid progenies, in which a portion of the individuals resemble the one parent, and the remainder resemble the other parent, not uncommon among crosses in the species of *Oenothera*. The percentage of *nanella* among the F₁ offspring of *O. Lamarckiana* × *O. L.* mut. *nanella* can be modified by the conditions under which the mother plant is grown, from nearly 0 per cent. to near 100 per cent.

When *L.* mother was grown as an annual, average per cent. of *nanella* was 22; *L.* as biennial average per cent. of *nanella* was 65. Corresponding with

this result, there is a much higher percentage of *nanella* from capsules developed early in the season, *i.e.* when the mother is most vigorous. Thus capsules ripening July 12-23 yielded 73-88 per cent. *nanella*, July 24-August 4 61-67 per cent. *n.*; August 5-16, 48-57 per cent. *n.*

Transplanting also had a marked influence; if reset on April 25, yielding 50 per cent. *n.*, while plants set out on May 15 produced only 29 per cent. *nanella*. The *L.* mothers were annuals. Keeping the plants well watered also resulted in an increase in the percentage of *nanella* plants among the F_1 progeny. G. H.

Androsace coccinea (*Bot. Mag.* t. 8653).—South-Western China. Nat. Ord. *Primulaceae*, tribe *Primuleae*. Herb, biennial. Leaves numerous, rosulate, 1-1½ inch long, spathulate. Scapes 1-6, 2-4½ inches long, 5-20-flowered. Corolla salver-shaped, ½ inch across, vermilion.—G. H.

Anemone obtusiloba f. patula (*Bot. Mag.* t. 8636).—Himalaya, Burma, and China. Nat. Ord. *Ranunculaceae*, tribe *Anemoneae*. Perennial herb. Leaves rosulate, 2 inches long, 3-partite, with 3-fid segments. Flowering branches decumbent, 8 inches long. Flowers purplish-blue, 1½ inch across.—G. H.

Aphis Injurious in Apple Orchards. By P. J. Parrott and others (*U.S.A. Exp. Stn., Geneva, New York, Bull.* 415, 53 pp.; 8 plates).—A test of various insecticides and times of application. Nicotine and soap and nicotine and lime-sulphur proved successful when the insect was reached by the fluid. Crude carbolic acid emulsion caused only slight damage to leaves. Sodium sulphide and soap in combination caused serious damage to buds. The value of the nicotine washes was enhanced by lime. The perfect spray with lasting toxic qualities is yet unfound.—E. A. Bd.

Aphis, Pear Woolly. By A. C. Baker and W. M. Davidson (*Jour. Agr. Res.* vol. vi, No. 10, June 1916, pp. 351-360).—A new species of pear aphid (*Eriosoma pyricola*) is herein described. It occurs in the orchard districts of northern and central California, and attacks the roots of pear trees, especially the French wild stock so largely used in California.

The insect attacks especially the small fibrous roots, and is usually found within 3 feet of soil. The rootlets nearest the trunk are generally heavily infested. The woolly pear aphid destroys entirely great numbers of young rootlets and frequently causes the death of the trees.

A short account of the characteristics of the insect is given, and a comparative table of differences between *Eriosoma pyricola*, *E. lanigerum*, and *E. americanum* is shown.—A. B.

Apple and Pear Tree Manure (*Qu. Agr. Jour.* Nov. 1915, p. 257).—1½ lb. bone-meal, 1½ lb. superphosphate, 1 lb. sulphate of potash, 1 lb. nitrolim to a tree.—C. H. H.

Apple Aphis, Morphology and Biology of the. By A. C. Baker and W. F. Turner (*Jour. Agr. Res.* vol. v, No. 21, Feb. 1916, pp. 955-994; plates lxxvii-lxxv, 4 figs.).—An exhaustive investigation into the life-history and biology of the Apple Aphis (*Aphis pomi* (De Geer)) is herein described. According to the authors the life-history may be outlined as follows:—

The egg is laid upon the younger twigs of the apple and is at first of a light-yellow colour, which, however, soon changes to a shining black. Development is very rapid for a few days, after which the egg rests for the winter. Further development of the embryo occurs in the spring, and an increase in temperature will cause the egg to hatch. Hatching takes place by splitting of the shell over the head region of the insect. The first form is wingless and matures in about ten days. She then produces summer forms, winged and wingless, the first predominating. There may be from nine to seventeen generations of the summer forms produced. After the second generation the wingless forms always outnumber the others, but winged forms are produced in every generation. The wingless sexes appear about September, and occur in the eleventh to the nineteenth generations inclusive. Both sexes feed. The fertile eggs develop to the resting stage and remain over winter, and then continue their development in the following spring.—A. B.

Apple Cankers and their Control. By L. R. Hesler (*U.S.A. Agr. Exp. Stn., Cornell, Cir.* No. 28, May 1915, pp. 17-28; 16 figs.).—Cankers in apple trees are a constant source of danger, because they persist from year to year and are likely to cause the death of the tree.

A distinction is to be drawn between the various forms of cankers on apple trees. The author classifies them as follows: Frost cankers; apple-tree canker, caused by *Phylospora Cydoniae*; fire-blight canker, caused by *Bacillus amylovorus*; apple-tree canker, caused by *Nectria ditissima*; and blister canker, caused by *Nummularia discreta*. There are also the apple-bark canker, caused by *Myxosporium corticolum*, and the bitter-rot canker, caused by *Glomerella cingulata*; these two being of lesser importance.

Frost Cankers.—In severe winters frost is a very active agent in the production of cankers. Some varieties of apples (e.g. 'Tompkins King,' 'Twenty Ounce,' 'Hubbardston') are more susceptible than others. The cankers are frequently formed on the bark of the trunk and at the origin of the chief branches.

New York Apple-tree Canker, caused by *Phylospora Cydoniae*, may attack the limbs as a canker, or the fruit, forming a black rot; or the leaves, forming a leaf-spot. The canker arises from a wound in the bark, and forms a series of concentric rings on the bark. This after a period falls and exposes the wood and a callus, from which arise numerous scattered pustules containing spores.

European Apple-tree Canker, caused by *Nectria ditissima*, attacks the cambium of successive years and produces a series of concentric calluses from year to year. This form produces spores and perithecia.

Fire-blight Canker, caused by *Bacillus amylovorus*, also attacks the bark. In the spring, when the causal bacteria are active, the advancing margin is indefinite. Occasionally drops of liquid exude from the lenticels. When the bacteria are less active, the margin of the canker becomes very definite and a prominent crevice marks it. The diseased bark sinks and remains relatively smooth.

Blister Canker, caused by *Nummularia discreta*, may produce blackened areas on the bark, which fall off and expose the wood. On these portions stromata of the fungus develop, which present a blistered appearance and are large and black.

The control of cankers presents much difficulty, but the affected limbs must be removed and burnt together with the diseased bark from the trunk. Then the wound may be treated with some preservative (e.g. tar, asphaltum) to prevent entrance of further spores. Sometimes grafting a non-susceptible variety upon an erect-growing variety such as 'Twenty Ounce' is useful.—A. B.

Apple Drying. By J. Farrell (*Jour. Dep. Agr. Vict.* April 1916, pp. 196-211).—This article gives plans of buildings for evaporating fruit, construction of evaporator, its trays, also of the sulphuring chamber, with material required for constructing an evaporator, illustrations of peeling machine and trimming apples; it explains the method of peeling, coring, slicing, trimming, brining, sulphuring, drying, and packing. The dried product is 10 to 15 per cent. in weight of the fresh apple; the cores and peels are made into cider or jelly, or dried for stock food.—C. H. H.

Apple Orchard, Protecting by Dusting. By D. Reddick and C. R. Crosby (*U.S.A. Exp. Stn., Cornell, Extension Bull.* 1, May 1916).—Excellent results are reported in dealing with apple scab and codling-moth by dust-spraying, which is said to be easier, more efficacious, and quicker than spraying with a liquid. The mixture applied was 85 per cent. of exceedingly fine sulphur (95 per cent. of which would pass a sieve with 200 meshes to the lineal inch) and 15 per cent. of equally finely powdered lead arseniate. The amount of the mixture required is about 1¼ to 2½ lb. to a tree each time, and it is best applied on a calm morning while dew is still on the leaves. The times for application are (1) when the blossom buds show pink; (2) just after the petals have fallen; (3) three weeks after the petals fall, and (4) four weeks later still.—F. J. C.

Apple Orchards, Economics of. By C. I. Lewis and H. A. Vickers (*U.S.A. Exp. Stn., Oregon, Bull.* 132, 104 pp.; 14 figs.).—Facts and figures for fruit farmers.
E. A. Bā.

Apple, Fungi producing Heart-rot in. By B. O. Dodge (*Mycologia*, viii, p. 5, Jan. 1916; figs.).—*Polyporus admirabilis*, *Spongipellis fissilis*, and *S. galactinus* are said to cause rotting of wood of apple-trees, generally entering through a wound. The author doubts the value of painting over large wounds, as he believes cracking is bound to occur and spores may thus find their way in. It will, in any case, give a partial protection from such entrance.—F. J. C.

Apple Root-rot. By C. H. Crabill (*Phytopathology*, vi, p. 158, April 1916).—The root-rot here described is characterized by cessation of growth, loss of

some foliage, and then death of a portion of the top of the tree affected. The roots are by that time nearly all dead, spongy, brittle, and filled with white fungus mycelium; they break off readily near the stump. The deep-lying roots are generally the first to be affected. The fungus involved proved to be *Trichoderma Koenigii* Oudemans. Since this fungus grows well on all sorts of culture media except those containing lime and alkaline in reaction, it seems probable that liming the soil will have a deterrent effect upon its threatened spread.—F. J. C.

Apple Root-rot. By C. H. Crabill (*Phytopathology*, vi. pp. 159-161; figs.).—A root-rot traceable to the attack of *Trichoderma Koenigii* is described, in which the roots are invested in a white mycelial growth as in the "white root-rot" of apples and other trees in this country. No methods of control are proposed.
F. J. C.

Apple Rust. By N. J. Giddings and A. Berg (*Phytopathology*, vi. p. 79, Feb. 1916).—The apple rust, due to *Gymnosporangium Juniperi virginianae*, occurs also on *Juniper virginiana*. Destruction of this tree for half a mile around the apple plantation does not suffice to prevent infection, and the mode of dissemination of spores from the Juniper is not entirely understood.—F. J. C.

Apple Sucker, Observations on the Egg. By A. H. Lees (*Ann. Econ. Biol.* iv. p. 251, Apr. 1916; figs.).—The structure of the egg and its membranes is described, and the strikingly close relationship between the date of egg hatching and apple bud bursting commented upon.—F. J. C.

Apple Sucker, Spraying for. By F. R. Petherbridge (*Ann. Econ. Biol.* ii. p. 230, Apr. 1916).—As a result of experiments carried out in Cambridgeshire, the author concludes that lime and salt spray may be effective in preventing a large proportion of apple sucker (*Psylla mali*) eggs from hatching. Lime wash alone is also fairly effective. Soft soap (10 lb.) and nicotine (98 per cent.) (8 oz.), water 100 gallons, or treacle (6 lb.) and nicotine (98 per cent.) (8 oz.), water 70 gallons, were most effective when the sucker was in an active condition. Creosote oil and soft soap, while it killed the Psylla, also caused leaf-scorch (the trees sprayed were of the variety 'Keswick Codlin'). The lime-salt spray (applied at the beginning of March) is not by itself sufficient to keep the sucker in check.—F. J. C.

Apple Syrup (*Jour. Dep. Agr. Vict.* Nov. 1915, p. 674).—The Fruit and Vegetable Utilization Laboratory of the Department of Agriculture of the United States of America has been studying the utilizing of cull apples after passing through the cider mill. A gallon of syrup is made from seven gallons of the expressed cider juice; it is a clear ruby or amber-coloured syrup of about the consistency of cane and maple syrup; properly sterilized and put up in sealed tins or bottles, it will keep indefinitely, and when opened will keep under household conditions as well as other syrups. It can be used for griddle cakes, cereals, household cookery, and as flavouring in desserts. During the process of manufacture, calcium malate is produced as a by-product, and is sold for medicinal purposes at 8d. per lb.—C. H. H.

Apples, Black Rot of. By G. T. Spinks (*Ann. Rep. Agr. Hort. Res. Stn., Long Ashton*, 1915, p. 94).—Certain cider apples became entirely black and were at first smooth and firm, but later shrivelled to some extent, remaining quite dry. The fungus *Monilia fructigena* was found to be present in them, and cross inoculations have proved that while brown rot is caused in most culinary and dessert apples by this fungus, black rot is also produced in other varieties, especially bitter-sweet ones. 'Gascoyne's Scarlet,' however, among culinary apples, shows some tendency to blackening.—F. J. C.

Apples, Dusting and Spraying Experiments with. By D. Reddick and C. R. Crosby (*U.S.A. Exp. Stn., Cornell, Bull.* 369, Jan. 1916).—Mixtures of very finely powdered sulphur (85 lb.) and finely powdered lead arsenate (15 lb.), applied by suitable machinery (which is described) to apple trees (standards) at the rate of 1½ to 2½ lb. a tree, gave excellent results in suppressing insects and scab. Calm weather is best, and thorough dusting can only be done when the tree is treated from all sides, and the dust-treatment is carried out at the same seasons as ordinary spraying for these pests.—F. J. C.

Apples, Enzymes of, and their Relation to the Ripening Process. By R. W. Thatcher (*Jour. Agr. Res.* v. pp. 103-116, Oct. 1915).—The author examined the juices of apples in order to discover what enzymes were active during the ripening process. He found no diastase (starch disappears early in the ripening process, and apparently the diastases also disappear), invertase, tannase, emulsin, esterase, oxidases, proteases, and pectinases. Only oxidases and a small quantity of protease and esterase were found. The discoloration of apple flesh on cutting is due to oxidases, and therefore quantitative measurements of the oxidases were made and in every case considerable quantities were found. It was found that keeping apples in an atmosphere of carbon-dioxide prevented changes, as is to be expected if oxidases are the chief agents of change in the apple fruit.
F. J. C.

Apples, Pears, and Quinces, Blight of. By B. S. Pickett (*U.S.A. Agr. Exp. Stn., Illinois, Cir.* No. 172, June 1914, pp. 1-10; 3 figs.).—The disease is caused by *Bacillus amylovorus* and frequently attacks apple, pear, quince, as well as mountain ash, hawthorn, and occasionally plum and apricot. The disease affects all parts of the tree, including blossoms, twigs, fruit, branches, trunk, and roots, and is particularly prevalent in southern and central Illinois. It is the cause of fire-blight canker in the apple (see p. 476).

The bacteria may enter through a puncture in the epidermis or at the growing points of the stems. About nine days to twenty-one days after infection, the leaves wither, turning brown on the apple tree, black on the pear tree, and giving the appearance of having been scorched by fire. When the bacteria cease their activity, either through death or through conditions which check their growth, a distinct line of demarcation separates the healthy from the diseased tissue.

To control the blight, the following measures are suggested:—All infective sources should be removed. These include seriously diseased apple, pear, quince, hawthorn, service berry and crab-apple trees within considerable distances of the orchards to be protected. All blighted twigs, blossoms, spurs, and branches should be destroyed, and the wounds on the trees disinfected with corrosive sublimate (1 to 1000).

Sprays are of dubious benefit.—A. B.

Apples, Pruning in Summer. By L. D. Batchelor and W. E. Goodspeed (*U.S.A. Exp. Stn., Utah, Bull.* 140, 14 pp.; 2 figs.).—A study of the yield of apples during four years under various systems of pruning. Summer pruning gave no advantage over the usual winter methods.—E. A. Bd.

Apples, Recognition of, by Truellis Line. By H. E. Durham (*Gard. Chron.* Nov. 18, 1916, p. 239; with fig.).—The name "Truellis Line" is suggested, in honour of its discoverer, for lines distinctly visible in a transverse central section of certain apples, and faintly marked or absent in others. They divide the parenchyma within the core area from that without, and are so variable generally, though constant for certain varieties, that they may be useful as a means of identification. A long list is given of varieties in which the character or absence of this line have been examined and noted.—E. A. B.

Apples, Varieties in Ohio. By W. J. Green, Paul Thayer, and J. B. Keil (*U.S.A. Exp. Stn., Ohio, Bull.* 290, 184 pp.; 22 figs.).—Full description of varieties, with photographs of many. Disease susceptibility, cooking qualities, and adaptation to soil specially treated.—E. A. Bd.

Aquilegia Leaf-miner. By E. N. Cory (*Jour. Econ. Entom.* vol. ix, pp. 419-424; Aug. 1916; figs.).—*Phytomyza aquilegiae* mines the foliage of columbines, the attack commencing in May. The author gives details of the life-history of the insect, which pupates during winter in the earth, and suggests winter cultivation as the best means of controlling the pest.—F. J. C.

Aristolochia Lawrenceae (*Bot. Mag.* t. 8650).—Argentine. Nat. Ord. *Aristolochiaceae*. Shrub, stem turning. Leaves, blade 3-4½ inches long and broad. Perianth one-lipped, yellowish white, with brown-purple veins; mouth 5 inches long, 3 inches broad at base, 2½ inches above, oblong. Tube curved upwards, striped only, while the inner surface of the mouth is spotted with dark veins.
G. H.

Arsenic as a Spray for Weeds, The Effect and Fate of. By W. T. McGeorge (*Jour. Agr. Res.* v. No. 11, Dec. 1915, pp. 459-463).—The control of weeds is a very important problem, and in some experiments at the Hawaii Experimental Station it was found that the most economical means of weed

control lay in the use of chemical sprays. Comparative tests were made with sodium arsenate, ferrous sulphate, carbon bisulphide, &c. Of these, sodium arsenate is the most effective and is recommended for use. This substance has been used for five years for weed eradication in Hawaii with most successful results.

In view of the possible injury to crops from the continued use of this spray, a series of experiments were undertaken to determine its fate and influence upon plant growth and upon nitrification and ammonification of the soil. It was shown that soils possess strong fixing power for arsenic, and where the sodium arsenate spray is used for destroying weeds the arsenic will be deposited in the surface soil and will remain in spite of the leaching action of rains or irrigation. The chemical reactions involved are a replacement of the solution of iron, calcium, magnesium, and humus, owing in part to a hydrolysis of the sodium arsenate in solution; also a combination with the dibasic and tribasic elements to form the difficultly soluble arsenites and arsenates.—*A. B.*

Asparagus Beetle Egg Parasite. By F. A. Johnston (*Jour. Agr. Sci.* iv. p. 363; July 1915; pl.).—The insect *Tetrastichus asparagi* was believed to develop in and feed upon the eggs of the asparagus beetle, but observations upon its life-history show that it oviposits in the host's egg and the egg subsequently hatches into the beetle larva, which feeds in the normal way and enters the soil in order to pupate, but is unable to do so. The parasites have, by this time, totally consumed the larva and pass from it into the cell it has formed, pupate there, and later emerge as adults. The winter is passed in the host cell in the earth, so that it would not be difficult to distribute the parasite by transporting some of the soil.—*F. J. C.*

Asparagus, Ornamental. By E. Plateau (*Rev. Hort.* May 16, 1916).—Description of the various types of Asparagus available for decorative purposes.—*C. T. D.*

Bacillus radiculicola of Canada Field Pea, Physiological Studies of. By Martin Prucha (*U.S.A. Agr. Exp. Stn., Cornell, Mem. No. 5*, March 1915, pp. 3-83).—The objects of this memoir were (1) the isolation and identification of the organism causing nodules on the roots of Canada field pea; (2) a study of the influence of various factors on nodule development in this plant when grown in water and soil cultures; (3) a study of the influence of various environmental conditions on the infecting power of the organism.

As a result of the author's experiments, the following conclusions were arrived at:—

The causal organism in the case of the Canada field pea nodules is *Bacillus radiculicola*. Its flagella are peritrichic, eight the largest number found, and its group number on chart of American bacteriologists is B222.2322033.

Nodules developed both in light and in darkness. A larger number, however, developed in darkness.

Nodules developed readily in soil extract and in synthetic nutrient solutions in which the nitrates were omitted or replaced by chlorides. The nodules continued to increase in number as long as the plants continued to grow.

In a full nutrient solution containing nitrates a few nodules may develop immediately after inoculation, but a subsequent continual development of nodules seems to be inhibited.

The addition of KNO_3 , $\text{Ca}(\text{NO}_3)_2$, NH_4Cl , FeCl_2 , KCl , or peptone to sandy soil, in the proportion of 0.25 gram of the salts to 300 grams of the soil air-dry, had an inhibiting effect on nodule development, but the addition of MgSO_4 , KH_2PO_4 , $\text{Ca}(\text{H}_2\text{PO}_4)_2$ and tannic acid had a beneficial effect on nodule development in this plant. The organism multiplies readily in some soils and in various substances; as many as 10 million organisms per gram developed in wheat bran and in ground peas.

The infecting power of *B. radiculicola* was not affected after the organism had been kept on medium 335 (*i.e.* containing nitrogen) for 2½ years in the laboratory, the culture being transferred once each month.—*A. B.*

Bacteria, Life Cycles of. By F. Löhnis and N. R. Smith (*Jour. Agr. Res.* vol. vi. No. 18, July 1916, pp. 675-702; 7 plates, 1 fig.).—A comparative study of forty-two strains of bacteria show that the life cycles of these micro-organisms are not less complicated than those of other micro-organisms. All the bacteria studied live alternately in an organized and in an amorphous stage. The latter has been called the "symplastic" stage, because the living matter previously enclosed in separate cell walls undergoes a thorough mixing, either by complete disintegration of both cell wall and cell contents, or a mixing together of cell

contents without cell walls. According to the quality of the symplasm, the development of new individual cells from this stage follows different lines. In all cases at first "regenerative units" become visible. These increase in size, turning into "regenerative bodies," which later, by germination or stretching, become cells of normal shape.

A process of "conjunction" has also been observed in some cases. Bacteria reproduce by fission, but also by the production of "gonidia."

The life cycle of each species studied is composed of several subcycles showing wide morphological and physiological differences. These are connected with each other by the symplastic stage.

The discovery of the full life cycles of bacteria will be of immense importance in many problems in agricultural and medical sciences.

The paper is illustrated with an interesting figure showing graphically the life cycle of *Bacillus azobacter*, and a series of micro-photographs of the several types of *Bacillus azobacter*, *B. subtilis*, *B. bulgaricum*, *B. fluorescens*; *Sarcina flava*, and *Streptococcus lactis*.

A short bibliography is appended.—A. B.

Bananas. By W. J. Alden (*Agr. Gaz. N.S.W.* vol. xxvi. pp. 953-964; 9 figs.).—The banana requires moisture, good drainage, and abundant nourishment. A suitable supply of artificial manure to the acre would be $4\frac{1}{2}$ cwt. of super-phosphate, $1\frac{1}{2}$ cwt. potassium sulphate, and 3 cwt. of dried blood or 2 cwt. of ammonium sulphate. If it is difficult to obtain potassium sulphate, substitute 27 cwt. of wood ashes. This should be applied two weeks before the other fertilizers.—S. E. W.

Bean, Kidney, An Anthracnose Resistant. By M. F. Barrus (*Phytopathology*, v. p. 303, Nov. 1915).—The author has found a variety, known as "Wells' Red Kidney," which remains uninfected or is only slightly infected by the fungus *Colletotrichum Lindemuthianum* when growing among others badly attacked. All strains of the fungus (which the author has shown to vary in infective power) equally fail to produce any considerable amount of disease when inoculated into this variety.—F. J. C.

Beet, Curly-top of. By R. E. Smith and A. Bonquet (*Phytopathology*, v. pp. 103-108, Apr. 1915; figs.).—The experiments of the authors confirm the relation between the curly-top of the sugar-beet and the leaf-hopper, *Eutettix tenella*. The attack upon the leaf is followed by phloem necrosis, and often later the formation of wound-healing cells in the same region. The trouble is transmissible by grafting, and an organism resembling *Bacillus Dianthi* has been isolated from the lesions. The bacillus, when inoculated into the plant, has not, however, reproduced the disease, and it therefore remains doubtful whether the disease is due to it.—F. J. C.

Beet Scab, Some Observations on Ordinary. By B. F. Lutman and H. F. Johnson (*Phytopathology*, v. pp. 30-34, Feb. 1915; figs.).—The organism producing scab in beet is identical with that which produces scab in potatoes, viz. *Actinomyces chromogenus*, but, while in the potato the lesions are only skin-deep, those in the beet are larger and more bulging, and the brown outer portion may be wiped off exposing the uncoloured cork tissue below. Figures illustrate the production of these bulging scabs. The different strains of *Actinomyces* isolated from different roots of beet and tubers of potato possessed different infective powers.—F. J. C.

Bitter-pit (Stippen and Spray Injury). By C. H. Crabill and H. E. Thomas (*Phytopathology*, vi. pp. 51-54; Feb. 1916).—Bitter-pit (called "stippen" in America, and known also as stippenflecken, apple fruit-spot, Baldwin fruit-spot, Jonathan-spot, and brown-spot), is described, and the results of various experimental attempts to produce it are detailed. The authors conclude that "these depressed, highly coloured areas of skin underlaid by a corky mass of dead, brown cells, may be produced in several ways, viz., by bruising, by insect puncture, by injected poisons, by insufficient water, or by any other agent which may kill a few cells before the apple is full grown." The results also show that stippen is "almost certainly not caused by spray materials as they are commonly applied."
F. J. C.

Bitter-pit. By G. P. Darnell-Smith (*Agr. Gaz. N.S.W.* vol. xxvii. pp. 279-281).—Bitter-pit is not due to a parasite nor to spraying with lead arsenate. Young trees are specially liable to it. Excessive pruning and poor drainage are favourable conditions for its development.—S. E. W.

Boots, Preserving the Soles of (*Qu. Agr. Jour.* March 1916, p. 174).—In view of the increasing cost of hides, leather, and consequently of foot-wear, a correspondent points out that shoe leather can be made to last for twice the ordinary time by simply rubbing Stockholm tar into the wearing surface with the fingers. Use as much tar as the leather will take up; allow it to dry; then repeat the operation. Two coats will be sufficient.—*C. H. H.*

Brachystelma dianthum (*Bot. Mag.* t. 8670).—South Africa. Nat. Ord. *Asclepiadaceae*, tribe *Ceropegieae*. Herb; tuber flat, 2 inches across. Stem erect, 2 inches long. Leaves lanceolate, 2 inches long. Flowers solitary. Corolla ovoid-campanulate, 1 inch long, greenish-yellow with purple spots.—*G. H.*

Brown-rot Fungus in N. Vermont. By H. E. Bartram (*Phytopathology*, vi. p. 71, Feb. 1916).—The common cause of brown-rot of stone fruit in Vermont is *Sclerotinia cinerea*, as it is in Europe. The conidia in many cases remain alive on mummified fruits over winter, and with those produced in spring from the dormant mycelium in the mummified fruits may produce early spring infections. All such mummified fruits should therefore be collected and burned.—*F. J. C.*

Cabbage "Yellows," The Control of, through Disease Resistance. By L. R. Jones and J. C. Gilman (*U.S.A. Agr. Exp. Stn., Wisconsin, Res. Bull.* 38, Dec. 1915, pp. 1-70; 23 figs.).—Cabbage-growing is extensively practised in various parts of Wisconsin, and a large industry has become established. The variety grown is a winter one known as 'Hollander' or 'Danish Ball Head,' and it is frequently attacked by a parasitic soil fungus, *Fusarium conglutinans*, which, invading the roots and the stems, causes extensive "yellowing" of the leaves. This ultimately causes the death of the plants, and on badly infected soil the loss may be from 50 to 95 per cent. of the total crop.

Various methods of treatment of seed, seedlings, and soil, including disinfectants and fertilizers, were without any practical result. The only method of control seemed to lie in the possibility of securing disease-resisting varieties or strains. By repeated selection, strains of the 'Hollander' type have been obtained, which have proved disease-resistant against the *Fusarium* and at the same time of excellent commercial qualities. Seeds from this resistant strain have been obtained from 2,000 heads in 1915, and will be distributed for planting in 1916 under the name 'Wisconsin Hollander No. 8.'—*A. B.*

Campanula Zoysii (*Bot. Mag.* t. 8666).—North Italy and Austria. Nat. Ord. *Campanulaceae*, tribe *Campanuleae*. Herb, 4 inches high. Leaves radical, $\frac{1}{2}$ inch long, margin ciliate. Racemes terminal, 3-4 flowered. Corolla oblong-tubular, light purple, 1 inch long.—*G. H.*

Carbohydrates in Plants, Studies of the Formation and Translocation of. I.—The Carbohydrates of the Mangold Leaf. By William A. Davis, Arthur John Daish, and George Conworth Sawyer (*Jour. Agr. Sci.* vol. vii. pt. iii. pp. 255-326, Feb. 1916; figs.).—The object of the investigation was to throw light on the fundamental problems of the formation of carbohydrates in the leaves, their translocation to the storage reservoirs, and the way in which they are broken down for utilization in subsequent growth. Down to the year 1893 the generally held view was that put forward in 1862 by Sachs and modified in 1885 by the work of Schimper, according to which formaldehyde is first formed in the leaf by the reduction of CO_2 under the influence of light and chlorophyll, this being then polymerized to glucose, which on reaching a certain concentration undergoes conversion into starch. The work of Brown and Morris in 1893 on the *Tropaeolum* leaf went to show that all the carbohydrate formed in the leaf did not pass through the starch stage, and that cane sugar with its hydrolytic products dextrose and lævulose were present in the leaf in considerable quantities. They also showed that leaf diastase acts on starch, giving rise to maltose. Since 1893 the two main views have been (1) that saccharose is the first sugar formed in photosynthesis, and (2) that the primary products are hexoses, from which saccharose is afterwards formed either in the leaf or the root.

The earlier work on the problem was largely qualitative. This and later quantitative work was vitiated by failure to ensure the destruction of enzymes which may break up the saccharose in the expressed juice of the leaf tissue. The present authors avoid this source of error by dropping the fresh leaf material (1 kilogram) in small quantities into boiling alcohol (2 litres) which contains a little ammonia to neutralize the acids of the plant tissue. The enzymes are at once destroyed by this method. Certain errors in the quantitative estimation

of starch by ordinary diastase and that of cane sugar by citric acid inversion were avoided also by new methods, of which full details are given.

The (a) leaves and (b) stalks of mangolds were analysed for sugars at three different stages of their growth, samples being taken every two hours over a complete twenty-four hour period on August 20, September 10, and October 11. Starch and maltose were always absent. Saccharose and hexoses were always present. The ratio of hexoses to saccharose increases in passing from leaf to stalk, suggesting that it is cane sugar which is first formed in the chloroplasts of the leaf directly from the CO₂ of the air, and that it undergoes regular and increasing inversion as it passes downwards to the root. The inversion may be brought about by invertase on the surface of the sieve tubes. If it were possible to analyse the contents of the mesophyll tissue alone, excluding all the small veins which act as conducting channels to the midribs, the authors are of opinion that no reducing sugars would be found in that tissue. The conversion of saccharose into hexoses for purposes of translocation is necessary, as otherwise diffusion would be proceeding from a place of low to one of high concentration. Moreover, the work of various observers goes to show the probability that the protoplasm of the beet is impervious to cane sugar. The reconversion of the hexoses into saccharose in the root is not accounted for, but a special synthesizing mechanism is postulated, such as the "saccharogenic enzyme" of Barbet.

J. E. W. E. H.

Carbohydrates in Plants, Studies of the Formation and Translocation of. II.—The Dextrose-Lævulose Ratio in the Mangold. By William A. Davis (*Jour. Agr. Sci.* vol. vii. pt. iii. pp. 327-351, Feb. 1916; figs.).—The polarimetric determination of the dextrose-lævulose ratio in extracts of plant tissue is vitiated by the presence of optically active substances, such as amino-acids and amides, which are not completely removed by the basic lead acetate (or other substance) used to clear the solution. Hence differences of results are obtained for saccharose determinations in the mangold by polarimetric and reduction methods respectively. The results are also affected by the reducing power and rotation of the pentoses (arabinose, xylose, and *d*-ribose) which may be present in the alcoholic extract [see preceding abstract]. Until more reliable results can be obtained for the true dextrose and lævulose contents, independent of polarimeter data, it seems justifiable to assume that the two sugars travel in nearly if not exactly equal proportions to the root, where re-transformation takes place.—J. E. W. E. H.

Carbohydrates in Plants, Studies of the Formation and Translocation of. III.—The Carbohydrates of the Leaf and Leaf-stalks of the Potato. The Mechanism of the Degradation of Starch in the Leaf. By William A. Davis and George Conworth Sawyer (*Jour. Agr. Sci.* vol. vii. pt. iii. pp. 353-384; figs.).—The potato, unlike the mangold, forms considerable quantities of starch in its leaf. The object of the investigation was to ascertain whether, assuming that the starch is removed from the leaf after being broken down to maltose by diastase, maltose is correspondingly an intermediate stage in the synthesis. It was ascertained that maltose is entirely absent from the leaf and leaf-stalks of the potato both by day and by night. This striking result led the authors to review Brown and Morris's work of 1893. The latter experimenters found considerable quantities of maltose in the *Tropaeolum* leaf. The present authors show, however, that the presence of maltose was a result of Brown and Morris's method of analysis, which included the preliminary drying of the material in an oven. In such circumstances the enzymes present in the tissue would ultimately be destroyed, but not simultaneously. The most sensitive to heat and therefore the first to disappear would be maltase. A temperature above the point at which maltase is destroyed would be an optimum for the action of diastase, which would therefore break down starch to maltose, but the latter would remain as such in the absence of maltase, and thus would account for Brown and Morris's results. The authors hold that the removal of starch from the leaves at night is effected by more than one enzyme, that the degradation does not stop, as Brown and Morris supposed, at maltose but at dextrose. They cite other considerations tending to show that plant tissue cannot utilize either starch, or maltose, or saccharose, but must first break them down to simple hexoses.

The remainder of the paper is occupied with a discussion of the experimental results of the analysis of the leaves and stalks of the potato. The experimental methods adopted were the same as those in the case of the mangold experiments. The general results, moreover, were similar, for, in the case of the potato, saccharose is greatly in excess of the hexoses in the leaf and greatly in defect of them in the stalk.

From these results and from data obtained with many other plants it is concluded that cane sugar is produced, generally in a predominant proportion, in the leaf of all plants, whatever be the form (cane sugar, starch, inulin, or dextrose) in which the sugars are finally stored.—*J. E. W. E. H.*

Carbon Bisulphide, The Relation of, to Soil Organisms and Plant Growth.

By E. B. Fred (*Jour. Agr. Res.* vol. vi. No. 1, April 1916, pp. 1-20; 2 plates).—As a result of his experiments the author concludes that the addition of carbon bisulphide (CS_2) to the soil exerts a decided effect on the organisms in the soil. A temporary reduction is at first observed in the number of micro-organisms, followed by an enormous multiplication of bacteria, and a large increase in the by-products of soluble nitrogen and sulphur.

Carbon bisulphide also improves the growth of buckwheat, oats, and mustard. In non-acid soils carbon bisulphide is most beneficial to sulphur crops, e.g. mustard; while on peaty soils it causes an increased growth of red clover. In sand cultures with soluble plant food, carbon bisulphide favours the growth of certain plants.—*A. B.*

Carnation Wilt or Crown-rot Disease Caused by *Fusarium* sp.

By P. A. Van der Bijl (*Ann. Econ. Biol.* ii. p. 267, Apr. 1916; pl.).—The symptoms of the disease here described are the death of the lower leaves, which turn upwards at the sides and become of a sickly white colour, while the whole of the leaves are of more upright growth than is normal; the upper leaves appear shrivelled and the plant soon dies; the bark easily separates from the wood and the stem easily breaks away at the collar when pulled, the wood being brownish in colour. A fungus which is fully described, belonging to the genus *Fusarium*, has been isolated, and when inoculated into healthy carnations reproduced the disease. The infection appears to come from the soil, and the methods of control suggested are (1) propagation from healthy plants only; (2) the avoidance of infected soil; (3) the pulling up and destruction by fire of diseased plants. Soil treatment with formalin gave no benefit, but treatment with quicklime produced some beneficial result.—*F. J. C.*

***Cercospora Beticola*, Climatic Conditions as Related to.**

By V. W. Pool and M. B. McKay (*Jour. Agr. Res.* vol. vi. No. 1, April 1916, pp. 21-60; 2 plates, 10 figs.).—Climatic conditions bear an important relation to the vitality and development of *Cercospora Beticola* (a fungus attacking growing sugar beets, *Beta vulgaris*). When exposed to outdoor conditions, the conidia die in from one to four months; but if kept dry, they can live nearly eight months. The sclerotia, however, are more resistant, for they can live through the winter when but slightly protected, and become a source of infection for the succeeding crop.

Thermal tests with cultures show (a) that exposure to constant temperatures of 35° and 36° C. is fatal to the growth of the fungus; (b) that growth occurred when cultures after exposure for three days to either of these temperatures were changed to 30·8° C., and also when they were held at either for eight hours and then at 20° C. for sixteen hours; (c) that a temperature of 40·5° C. was fatal in all combinations tested.

Temperature and relative humidity influence the production of conidia and infection in much the same way.—*A. B.*

***Chamaedorea nana* (Bot. Mag. t. 8652).**—Costa Rica. Nat. Ord. *Palmaceae*, tribe *Arecaceae*. Shrub, 1-2 feet high. Leaves, 2-fid, 8 inches long. Flowers loosely spicate in a racemose manner, minute, green.—*G. H.*

Changing Sex of the Papaw.

By the Editor of the *Queensland Agricultural Journal* (*Qu. Agr. Jour.* June 1916, p. 342).—The method of changing the sex of the male papaw tree by cutting it down to about three feet from the ground was accidentally proved in a garden at Milton this season. The owner cut down three male trees and inserted a female shoot on top of each. Owing, probably, to the very dry weather, all the shoots died, and two of the trees were rooted out. The third was left, and it sent out two strong shoots about a foot below the top. These shoots bore female flowers, and three fruits matured, one of them remaining on the tree last May (as shown in an illustration).—*C. H. H.*

Cherries and Prunes, Handling and Shipping.

By H. J. Ramsey (*U.S.A. Dep. Agr., Bull.* 331, 28 pp.; 11 figs.).—Experiments in preservation of fruit during transit to market.—*E. A. Bd.*

Cherry Tree Manure (*Qu. Agr. Jour.* Nov. 1915, p. 258).—2 to 4 lb. superphosphate, 1 to 2 lb. sulphate of potash, 1 to 1½ lb. nitrolium or sulphate of ammonia to a tree; or 1 lb. superphosphate, 2 to 4 lb. bone-meal, 1 to 2 lb. sulphate of potash, and 1 to 2 lb. dried blood to a tree.—C. H. H.

Chestnut Blight Fungus (*Endothia parasitica*), **Ascospore Expulsion of.** By F. D. Heald and R. A. Studhalter (*Amer. Jour. Bot.* vol. ii. No. 9, Nov. 1915, pp. 429-448; 6 figs.).—The effect of moisture upon the expulsion of the ascospores of *Endothia parasitica* (Murr.) And., has been frequently studied, but little work has been done on the seasonal duration of ascospore expulsion in this organism. It seemed desirable to have continuous records of the behaviour of definite groups of perithecia throughout one or more seasons under natural field conditions.

For the carrying out of this work, "ascospore traps" were devised and placed over selected groups of perithecia under three different field conditions: first, in a young chestnut coppice; second, in a chestnut orchard; third, in a forest. The "ascospore traps" consisted of a glass slide slotted into a light wooden bracket which was permanently fixed in the bark above or below a group of perithecia. Seventy-six traps were placed on trees 4 to 8 inches in diameter, showing the perithecia in different stages of development. The observations extended over two years.

It was found that expulsion of the spores begins in the spring with the first warm rain, and increases to a maximum as conditions become more favourable; then follows a decline when lower temperatures prevail in the autumn, and it finally ceases in the cooler portions of the year, though there may be abundant rainfall. During 1913 the period of expulsion extended from the middle of March to the middle of September. There were nineteen rain periods during autumn, winter, and spring in 1912-1913 with no expulsion of ascospores, and in 1913-1914 there were eighteen rain periods with similar results.

Perithecial pustules of this fungus show a remarkable power of spore production. This power is not exhausted during the course of a single season, and is as marked during the second season as during the first. This is due to the successive maturing of asci, to the successive maturing of perithecia, and of stromata throughout the season.—A. B.

Chrysanthemum forniculatum (*Bot. Mag.* t. 8644).—Tenerife. Nat. Ord. *Compositae*, tribe *Anthemideae*. Shrublet, 2-5 feet high, glabrous and glaucous. Leaves up to 4 inches long, pinnatipartite; segments linear. Heads 2 inches across, white.—G. H.

Chrysanthemums, New. By Max Garmer (*Rev. Hort.* Feb. 16, 1916; five illustrations).—Description of several new *Chrysanthemums* and of other novelties.—C. T. D.

Cirrhopetalum concinnum var. **purpureum** (*Bot. Mag.* t. 8668).—Malay Peninsula; Nat. Ord. *Orchidaceae*, tribe *Epidendreae*. Herb, epiphytic. Pseudobulbs 1-foliolate. Leaves oblong, 3-5 inches long. Scapes 3 inches long, umbels many-flowered. Flowers ½ inch long, rose-purple.—G. H.

Citrus Canker. By F. A. Wolf (*Jour. Agr. Res.* vol. vi. No. 2, April 1916, pp. 69-99; 4 plates, 8 figs.).—The causal organism (*Pseudomonas Citri*, Hasse) of this disease is studied very completely from its cultures on various media by the author, who finds that infection occurs through natural openings and wounds on the host plants. The bacteria take up a position between the cells and cause them to become hypertrophied. This is caused by the dissolution of the middle lamellæ by enzymes.

Besides *Pseudomonas Citri*, various fungi have been isolated from Citrus cankers. These include *Phoma*, *Fusarium*, and *Gloeosporium*, the first being especially active in the disintegration of the plant's tissues. This fungus has been given the name *Phoma socia*, n. sp., by the author.

A short bibliography is appended.—A. B.

Citrus Canker, III. By H. E. Stevens (*U.S.A. Agr. Exp. Stn., Florida, Bull.* 128, Nov. 1915, pp. 1-20; 6 figs.).—Citrus Canker is one of the worst of the plant diseases that have appeared in Florida, and has cost many thousands of dollars to eradicate it.

It has been established by the author that the disease is caused by a bacterium, *Pseudomonas Citri*, Hasse, not by a fungus, as was formerly suspected.

All varieties of citrus grown in Florida have been affected, and all parts of the trees above-ground are susceptible to it. The bacteria are capable of growing in sterilized soil, and under favourable conditions may retain their vitality for long periods. They can withstand considerable drying or desiccation, which may be a factor in spreading the disease.

It appears that high temperatures and high humidity favour a rapid development of the disease, and are largely responsible for its spread throughout Florida.

A complete destruction of all infected trees is the only effective method known of checking the disease.—A. B.

Citrus Fruits in the Gulf States, Handling and Shipping. By H. J. Ramsey (*U.S.A. Dep. Agr., Farm. Bull.* 696, Nov. 1915, 28 pp.; 10 figs.).—Deals, *inter alia*, with the prevention of decay in transit, which is principally caused by blue mould, and, to a much smaller degree, by stem-end rot.—A. P.

Citrus "Mottle-leaf." By L. J. Briggs, C. A. Jensen, and J. W. McLane (*Jour. Agr. Res.* vol. vi. No. 19, Aug. 1916, pp. 721-739; 3 plates, 4 figs.).—"Mottle-leaf" of Citrus trees is characterized by the disappearance of chlorophyll from parts of the leaves, the portions farthest removed from the midrib and larger veins being first affected. These yellow spots increase in size until the chlorophyll is restricted to areas along the midrib and the larger veins. No organism has yet been proved to be causally associated with "mottle-leaf," but the Citrus root nematode is widely distributed in "mottled" districts. Soil analyses show a marked inverse correlation between the humus content and the mottling, the latter diminishing as the humus content increases, in the case of oranges.

The humus content of the soils bearing lemon trees is less than that of the orange soils, and is apparently too low to produce a normal foliage growth, as the whole of the lemon groves were badly mottled.

No relation was found between the percentage of leaves mottled and the total nitrogen content in the soil in either the orange groves or the lemon groves studied.

The percentage of mottled leaves on orange trees is definitely correlated with the increase of the ratio of organic carbon to humus, indicating the importance of the organic matter in the soil being well decomposed.—A. B.

Citrus Trees in Florida, Some Bark Diseases of. By J. G. Grossenbacher (*Phytopathology*, vi. pp. 29-50, Feb. 1916; figs.).—The symptoms and causes of the following diseases of Citrus trees are discussed fully: Gummosis, foot-rot or crown-rot, die-back, withertip, canker.—F. J. C.

Clematis florida bicolor (C. Sieboldii). By S. Mottet (*Rev. Hort.* Sept. 16, 1915).—One illustration, showing a fine specimen from Miss Willmott's garden.
C. T. D.

Clematis grata Hybrids. By Hortulus (*Le Jard.* vol. xxx. p. 45; 1 fig.).—The following hybrids were obtained from seed of *Clematis grata*:—'Campanile' forms a neat bush about five feet high, somewhat resembling *C. Davidiana*. The flowers are lilac-blue, with white centres. 'Côte d'Azur' resembles *C. tubulosa* in foliage, and its flowers are deep azure-blue. 'Oiseau Bleu' has slender foliage, with delicate panicles of lilac-blue flowers, changing to lilac-pink.—S. E. W.

Clematis Pavoliniana (Bot. Mag. t. 8655).—China. Nat. Ord. *Ranunculaceae*, tribe *Clematideae*. Shrub. Leaves 3-foliolate. Leaflets 2-4 inches long. Flowers 3-umbellate. Sepals 4, green externally, white above, 2 inches across, from tip to tip.—G. H.

Colletias. By N. E. Brown (*Gard. Chron.* Sept. 2, 9, and 16, 1916, pp. 108, 121, and 131; 2 figs.).—Reviews and rejects the evidence as to *C. spinosa* being the immature condition of *cruciata*, and declares the branches with slender spines, sometimes developed on *cruciata*, to be distinct in the flattened bases of the spines from those of true *spinosa*.

The plant generally grown in gardens as *spinosa* is declared to be *infausta*, and here described. Descriptions are also given of *armata* Miers, and two new species, *assimilis* and *trifurcata*.—E. A. B.

Colorado Potato Beetle, Life-history Studies of the. By Pauline M. Johnson and Anita M. Ballinger (*Jour. Agr. Res.* vol. v. No. 20, Feb. 1916, pp. 917-926; 1 plate).—Details a series of observations upon the life-history of this destructive pest. It was found that the entire developmental period from egg

to adult occupies approximately four weeks. It was also established that the female, far from laying the small number of eggs often attributed to it, is capable of laying over 1,800 eggs. The experiments recorded show there are three completed generations of this beetle; part of the adults in the first and second generations hibernating, while the remainder lay eggs from which the second and third generations develop. The possibility of a partial fourth generation is suggested by the fact that the adults of the third generation were active and feeding voraciously during September. The insect is to be found in all stages during the summer months, and there is much overlapping of generations.—*A. B.*

Columnnea gloriosa. By C. Wercklé (*Rev. Hort.* Sept. 16, 1915).—Remarkable difference between character of foliage under wild and cultivated conditions.—*C. T. D.*

Comandra umbellata, Parasitism of. By G. G. Hedgcock (*Jour. Agr. Res.* v. No. 3, Oct. 1915, pp. 133-135).—The *Comandra* are of importance in that they serve as intermediate hosts to the highly-destructive blister rust of pines (*Peridermium pyriforme* Peck). It has been found that the *Comandra umbellata* and *C. pallida* are themselves semi-parasitic upon the roots of numerous plants, including *Acer rubrum* L., *Quercus* spp., *Castanea dentata*, *Betula nigra* L., *Populus tremuloides*, *Aster* spp., *Carex* sp., *Rubus* spp., *Poa pratensis*, *Rosa canina* L., *Solidago* spp., *Vaccinium* spp., and *Spiraea salicifolia* L. Experiments prove, however, that *Comandra* can live without parasitism if necessary.

These new facts render the destruction of plants of *Comandra* in the neighbourhood of forest trees even more necessary than hitherto supposed.—*A. B.*

Cotoneaster horizontalis. By S. Mottet (*Rev. Hort.* Sept. 16, 1916).—An illustration showing the habit of this beautiful plant.—*C. T. D.*

Cranberry Substation, Report of, for 1915. By H. J. Franklin (*U.S.A. Exp. Stn., Massachusetts, Bull.* 168, May 1916; 48 pp.).—This station has specialized in cranberry-growing for six years, and this report ranges over the whole subject. It discusses the factors affecting the keeping qualities of the berries, such as ventilation and temperature during storage, methods of handling and packing, &c. Several insect pests are dealt with, especially in relation to the effect of the regulating of the winter flooding of the bogs. On the subject of bog management, the writer advocates the adoption of the plan of cropping in alternate years, claiming for the practice the advantages of fewer weeds, an inexpensive and satisfactory means of controlling insect pests, and decreased expenses without reduction of yield.—*A. P.*

Crinum deflexum Ker. By D. Bois (*Rev. Hort.* Aug. 16, 1916).—Two illustrations and description.—*C. T. D.*

Crown-gall, Resistance to. By C. O. Smith (*Phytopathology*, vi. pp. 186-194, April 1916; figs.).—Inoculations of *Bacterium tumefaciens* were made into a large number of species of *Prunus*. Crown-gall was not produced on *P. pumila*, but all other species proved more or less susceptible. Varieties of *P. domestica* tried proved fairly resistant, as did damson, *P. Planteriensis*, and *P. Besseyi*, but crown-gall resulted in 100 per cent. of the inoculations in *P. cerasifera* type, *P. monticola*, and *P. Simonii*. Other species and varieties were intermediate in their powers of resistance.—*F. J. C.*

Crown-gall Studies showing Changes in Plant Structures due to a Changed Stimulus. By Erwin F. Smith (*Jour. Agr. Res.* vol. vi. No. 4, April 1916, pp. 179-182; 6 plates).—Some interesting discoveries in connexion with experiments with the crown-gall organism (*Bacterium tumefaciens*) are set forth in this preliminary paper.

When the internodal cambium is inoculated with *Bacterium tumefaciens*, the usual physiological tendencies are replaced by entirely new phenomena.

1. The elements of the mature tissues are produced in fewer numbers than ordinarily, and these elements lose their polarity, so that the most bizarre complexes of twisted and distorted tissues arise.

2. The parenchymatous elements are greatly increased in number and reduced in size, since under the bacterial stimulus many of the cambium cells appear to lose all power to produce mature tissues, but at the same time acquire a new growth impetus, a tendency to an uncontrolled, pathologically embryonic

cell multiplication, which results in the formation of a tumour—the ordinary naked crown-gall—containing the distorted elements and showing a marked hyperplasia of the parenchyma.

3. A tendency to open wounds and to early decay, and to the formation of daughter tumours, is produced in the plant.

When the internodal cortex is similarly treated cell proliferation occurs, the elements of which are small when compared with those from which they have developed, because under this stimulus they remain embryonic and never reach maturity in size or function.

When the crown-gall organism (hop strain) is inoculated into the leaf axils of young growing plants (*e.g.* Pelargonium, Nicotiana, Lycopersicum, Citrus, Ricinus, &c.), the buds of which are dormant unless the top of the plant is removed, a new type of tumour develops. These tumours are covered with small abortive leafy shoots, flower-shoots, or if the flower anlage has been disturbed, forming twisted, fused, and fasciated shoots.

The author explains this as follows:—The growth of the tumour disturbs and distorts the tissues, tearing the anlage into small fragments which are variously distributed and which develop on or in the tumour into organs of a size proportional to the size of the included fragment; here as part of an ovary or anther, there as a shoot. These pathological shoots live but a short time, and are unable to carry on the normal activities of the plant when the other leaves are removed. This seems to show that fasciation is due to bacterial infection.

After inoculations in places where no bud anlage are known to exist—in the middle of the leaves—shoots were formed. These were produced on the midribs or side veins of the leaves of Nicotiana, and were more numerous on young leaves than on older leaves.

Thus a changed stimulus produces a more embryonic and primitive condition, and is a proof that the immature cell, wherever located, carries the inheritance of the whole organism; and what it will finally become, as it matures, depends upon the stimulus withheld from it or applied to it. That is, any young cell may become a totipotent cell if subjected to the proper stimulus, and this stimulus may be either *physiological*, resulting in a normal structure, as when the top of a plant is removed, and a new top grows in its place from the adventitious buds; or *pathological*, resulting in an embryonic teratoma, as when a tumour-producing schizomycete is introduced into sensitive growing tissue.

The paper is illustrated with some striking photographs of various tumours on *Pelargonium*, *Ricinus communis*, and *Nicotiana* spp.—A. B.

Cucumber, Angular Leaf-spot Disease of. By E. F. Smith and Mary K. Bryan (*Jour. Agr. Res.* v. No. 11, Dec. 1915, pp. 465–476; 7 plates).—This disease is commonly met with on cucumbers (*Cucumis sativus*), and is characterized by the formation of numerous angular, dry, brown spots which drop out and give the leaves a ragged appearance. In the early stages a bacterial exudate collects in drops on the lower surface of the leaves and dries white. Young stems and petioles may be also attacked and destroyed by soft rotting.

The causal organism is *Bacterium lachrymans* (n. sp.), which enters through the stomata. It is characterized by the presence of one to five polar flagella, liquefies gelatine, is a strict aerobic, and is able to form acid from saccharose and dextrose. On agar plates it produces round surface colonies. It is $0.8 \times 1-2 \mu$ in size.

It is suggested that Bordeaux mixture is a remedy for the disease, and thorough field tests should be undertaken where the disease is prevalent.

A. B.

Cucumber Mosaic Disease. By W. W. Gilbert. A new Infectious Mosaic Disease of Cucumber. By S. P. Doolittle. Experiments with the Cucumber Mosaic Disease. By J. C. Jagger (*Phytopathology*, vi. pp. 143–151, Apr. 1916; plates).—“The cucumber mosaic disease shows most markedly on the fruits, the first sign being a yellowish mottling near the stem-end.” These light patches are found later over all parts of the fruit, the darker parts being frequently raised. In bad cases stems and petioles are dwarfed, leaves become mottled and often wrinkled. It appears on the leaves with a yellowing of some part, often at the angle of the larger leaf veins. Badly affected branches grow slowly, blossom sparingly, and set only occasional fruits. A similar and probably the same, disease has been seen on pumpkin, squash, wild cucumber (*Echinocystis lobata*), and musk melon. It spreads rapidly and is highly infectious. The contagium passes through a Berkefeld filter.—F. J. C.

Cucumbers, The Control of Bacterial Wilt of. By F. V. Rand and E. M. A. Enlows (*Jour. Agr. Res.* vol. vi. No. 11, June 1916, pp. 417-434; 2 plates).—The experiments show that cucumber beetles (*Diabrotica* spp.) are the most important of the summer carriers of the wilt organism (*Bacillus tracheiphilus*), and that the beetle (*Diabrotica vittata*) is capable of carrying the wilt over winter and infecting the spring seedlings of cucumbers. It is also proved that the twelve-spotted cucumber beetle (*Diabrotica duodecimpunctata*) can carry the disease. It is therefore necessary to devise methods of control for these insects in order to prevent the disease.—A. B.

Cucurbits, Dissemination of Bacterial Wilt. By F. V. Rand (*Jour. Agr. Res.* v. p. 257, Nov. 1915; pl.).—The beetle *Diabrotica vittata* has been regarded as the agent in disseminating the bacillus of cucumber wilt disease (*Bacillus tracheiphilus*) from plant to plant in summer. The author shows by a series of experiments that the hibernating beetles which have fed on wilted cucumbers are capable of carrying the disease over winter and infecting fresh plants in the next season.—F. J. C.

Cupressus thyoides. By A. Bruce Jackson (*Gard. Chron.* Aug. 19, 1916, p. 85; with 2 figs.).—The fifteenth of this series of notes on conifers. This American species is not happy in English gardens, and few specimens are known. A shrubby form is known as var. *leptoclada*.—E. A. B.

Cytisus ratisbonensis (*Bot. Mag.* t. 866r).—Siberia to Central Europe. Nat. Ord. *Leguminosae*, tribe *Genisteae*. A small shrub. Leaflets $\frac{1}{2}$ inch long. Inflorescence in long racemose sprays, 6 inches long. Corolla $\frac{3}{4}$ inch long, yellow. G. H.

Cytisus sp. (Les Cytises Fourragers). By G. V. Perez (*Bull. Soc. nat. d'Acclim. de Fr.* vi. June 1916).—Deals with 'Tagasete' (*Cytisus proliferus* var. *palmensis* Christ), 'Gacia' (*C. maderensis* Masf.), and 'la Herdanera' or 'Gacia blanca' (*C. pallidus* Poir. = *Genista splendens* W. et B.), and the identification of these plants mentioned in ancient writings.—F. J. C.

Dahlia, Introduction of, into England. By C. Harman Payne (*Gard. Chron.* Sept. 23, 1916, p. 143).—Provides evidence that the Dahlia was introduced to England by means of seeds obtained by the first Marchioness of Bute from Dr. Ortega, Director of the Madrid Botanical Garden, and grown at Kew in 1798, and that the accepted date of 1789 is due to a printer's error (see p. 305).
E. A. B.

Dahlia, Origin of Pompon. By C. Harman Payne (*Gard. Chron.* Sept. 2, 9, and 16, 1916, pp. 107, 119, and 133; with 2 figs.).—A careful review of negative and positive evidence from old Dahlia literature, leading to the conclusion that the Pompon Dahlia was not raised, as has been stated, by Hartweg of Carlsruhe from *D. coccinea* in 1808, but more probably originated in Germany in the middle of the nineteenth century.—E. A. B.

Dahlias, Classification of. By F. Cayeux (*Rev. Hort.* April 16, 1916). By Antoine Rivoire (*Rev. Hort.* May 16, 1916).—Two interesting articles on this subject, treating of the several distinct classes into which the Dahlia has diverged.
C. T. D.

Diseases, Plant, Grouping and Terminology of. By L. E. Melchers (*Phytopathology*, v. pp. 297-302; Nov. 1915).—The author proposes a distribution of plant diseases into the following groups: (1) Non-parasitic diseases, including (a) Exanthema, bitter-pit, lightning injury, leaf scorch, sun scalds, &c.; (b) Autopathogenic diseases, including leaf-roll of potato, chlorosis, œdema, blossom-end rot of tomato, brachysm of cotton, &c. (2) Diseases of unknown origin, including mosaic disease, peach yellows, little peach, curlytop of beets, straight head of rice, oat blast (thrips?) &c. (3) Parasitic diseases, including all diseases caused by fungus or bacterial organisms. Notes are given on each group.
F. J. C.

Drug and Dye Plants, Report on Cultivation. By H. H. Rusby (*Jour. New York Bot. Gard.* xvi. pp. 155-172, Aug. 1915).—The committee reporting considers that those who engage in the work of growing drug and dye plants should be assured that (1) there is a steady and sufficient demand for the product; (2) soil and climate are adapted to its growth; (3) they are sufficiently familiar with its individual requirements to grow it successfully; and (4) the market price will leave a margin over the cost of production and marketing. Success in

growing fruit, &c., demands knowledge and experience, and this is at least equally true in growing drug plants.

The plants briefly dealt with are Burdock root, Cimicifuga, Symphytum or Comfrey, Senega (*Polygala Senega*), Dandelion, Foxglove, Aconite, Cramp Bark (*Viburnum Opulus*) (for which the spurious *Acer spicatum* has been almost universally sold), Wormseed (*Chenopodium ambrosioides*, or *C. anthelminticum*), Canadian hemp (*Apocynum cannabinum*), Angelica, Lovage, Green Hellebore (*Veratrum viride*), *Iris versicolor*, Unicorn root (*Aletris farinæ*), Lily of the Valley, Valerian, *Caulophyllum thalictroides*, *Hydrastis canadensis*, Ginseng, *Rhamnus Frangula*, Peppermint and Spearmint, Mustard (white and black), Stramonium, Horehound, Virginian Snakeroot (*Aristolochia Serpentaria*), Belladonna, Pinkroot (*Spigelia marilandica*), Colchicum, Sage, Thyme, *Origanum Onites* and *O. hirtum*, Arnica, Cascara Sagrada (*Rhamnus Purshiana*), *Capsicum fastigiatum*, Pyrethrum, Hemlock, Anise, Male Fern, Santonica (*Artemisia pauciflora*), Ergot, *Cannabis indica*, Cone flower (*Brauneria pallida*), Larkspur, Caraway, Coriander, Dill, Fennel, Catnip, Henbane, Chamomile (*Anthemis nobilis* and *Matricaria Chamomilla*, the former not much used), Marigold, Tansy, American Pennyroyal (*Hedeoma pulegioides*), Elecampane, Calamus, Orris root, Marsh Mallow, Boneset (*Eupatorium perfoliatum*), Lavender (*Lavandula angustifolia*), *Lobelia inflata*, Pokeroot, Wintergreen, Alkanet. Pamphlets and books upon the cultivation of the plants are listed.—F. J. C.

Dry-rot. By Prof. Percy Groom, D.Sc., M.A. (*Jour. Bd. Agr.* vol. xxiii. no. 5, August 1916).—In practically every house in this country fungi are to be found growing on the woodwork or floor. Some are harmless or relatively harmless, but others cause deep-seated rotting and are known as "dry-rot" fungi. By "dry-rot" practical men mean the decay that is induced in timber that is apparently sound when used.

The fungi involved are not identical, but *Merulius lacrymans* is the most destructive in this country, other important types being *Coniophora cerebella* and *Polyporus vaporarius*. *Merulius lacrymans* is usually found as large pancake-shaped, flat, rust-coloured structures showing white margins. These are the fructifications which produce the spores which, though thin-walled, are, when kept dry, long-lived and retain their vitality for at least many months.

Recently it has been shown that its association with other "dry-rot" fungi, especially *Coniophora cerebella*, has important practical bearings, for *Merulius* once established can manufacture water and thereby attack and moisten the driest wood and incidentally render the latter open to attack from *Coniophora*, which requires a wet matrix. *Merulius*, having once gained an entrance to wood, can send hyphæ into it and also along its surface. These hyphæ form a spawn which can extend to other wood over innutritious surfaces, such as brick walls, metal pipes &c., even penetrating the mortar of walls and thus gaining an entrance to other rooms. The paper then goes on to distinguish the hyphæ of the common species and to suggest measures of control.—G. C. G.

Educational Courses, Home Projects in Secondary Courses in Agriculture. By H. P. Barrows (*U.S.A. Dep. Agr., Bull.* 346, Feb. 1916).—Students in secondary schools in the States are now receiving vocational instruction in agriculture and horticulture. The present bulletin contains suggestions for the student's actual observations and records of work done at home as part of his educational training and as an aid to his career. It develops an idea commented upon in an earlier bulletin (No. 281, Aug. 1915).—F. J. C.

Eria ornata (*Bot. Mag.* t. 8642).—Malaya. Nat. Ord. *Orchidaceae*, tribe *Epidendreae*. Herb, epiphytic. Leaves 8-10 inches. Scape suberect, 1-1½ foot long, clothed with imbricate sheaths. Many-flowered. Bracts large, 1½ inch long, bright, reddish-orange. Flowers 2 inches long, brown, tomentose; column clavate.—G. H.

Eria tomentosa (*Bot. Mag.* t. 8662).—Indo-China. Nat. Ord. *Orchidaceae*, tribe *Epidendreae*. Herb, epiphytic. Leaves to 9 inches long. Scapes 10-13 inches long. Flowers 1 inch long, brown-tomentose externally, pale yellow perianth.—G. H.

Eucharis Lowii (*Bot. Mag.* t. 8646).—Western Tropical America. Nat. Ord. *Amaryllidaceae*, tribe *Amarylleae*. Herb. Bulb globose. Leaves ovate-cordate, shortly cuspidate, 9 inches long, 7 inches wide. Peduncle, 2 feet, 2-5 flowered. Perianth white, 4½ inches across.—G. H.

Euonymus Bungeanus (*Bot. Mag.* t. 8656).—Manchuria and N. China. Nat. Ord. *Celastraceae*, tribe *Celastraeae*. Shrub or small tree, 15 feet high. Leaves elliptic, blade tapering below and acute. Flowers tetramerous, $\frac{3}{8}$ inch across. Fruit 4-lobed, pale rose. Seeds dull rose. Aril bright red.—*G. H.*

Euonymus oxyphyllus (*Bot. Mag.* t. 8639).—Japan and Corea. Nat. Ord. *Celastraceae*, tribe *Celastraeae*. Shrub or small tree, 25 feet high. Leaves pseudostichous, 3 inches long. Flowers greenish-yellow, $\frac{1}{2}$ inch across, forming loose panicles. Fruit carmine, depressed-globose, 3-4 seeded. Seeds with scarlet arillus.—*G. H.*

Euphorbia Caput-Medusae (*Bot. Mag.* t. 8673).—South Africa. Nat. Ord. *Euphorbiaceae*, tribe *Euphorbieae*. Shrub, dwarf, succulent stems, a sub-globose mass, 6-8 inches high; central 2-4 inches long, the outer spreading 6-18 inches. Involucre $\frac{1}{2}$ inch across, tawny-purple, glands green, appendages petaloid, white.—*G. H.*

Evolution of Species in Ceylon, with reference to the Dying Out of Species. By J. C. Willis (*Ann. Bot.*, Jan. 1916, vol. xxx. no. cxviii; and figs.).—In this paper, which is a continuation of others, the opinion is brought forward that the theory of Natural Selection is untenable as regards geographical distribution of species or the areas they occupy, and that the area occupied at any given time in any given country depends mainly on the age of the species in that country (not its absolute age). The species of all genera examined are classed as Very Common, Rather Common, Common, Rather Rare, Rare, and Very Rare, and tables of statistics are given to show that the figures of rarity are nearly always approximate, whether they belong to the endemic species of Ceylon, or those of Peninsular India or those of wider distribution. This points to an underlying cause, viz. age, which is found to act with equal pressure on every family (where the species are twenty or over), and—a posteriori—if it applies to the above it will apply to flora in general.

It is maintained that the endemic species are the youngest, and of these the very rare the most recent, and that the figures of distribution of the Ceylon plants give no reason to suppose that any angiospermous species are dying out at the present time, which supposition is borne out by a comparison of the floras of Ceylon, Java, and Rio de Janeiro.—*G. D. L.*

Fatsia japonica (*Bot. Mag.* t. 8638).—Japan. Nat. Ord. *Araliaceae*, tribe *Panaceae*. Shrub, 3-13 feet. Leaves 7-9-lobed, 5-12 inches wide. Inflorescence of globose umbels, 2 inches across. Flowers, $\frac{3}{8}$ inch across, white. Fruit globose.—*G. H.*

Fig Canker, caused by *Phoma cinerescens*. By E. S. Salmon and H. Wormald (*Ann. Appl. Biol.* iii. p. 1, June 1916; figs.).—The canker of figs has been attributed to *Libertella ulcerata* Masee. The authors failed to find a fungus agreeing with the description of that species, but isolated *Phoma cinerescens* from all the specimens examined and proved by inoculation that the disease was produced by that fungus. The authors recommend the cutting out and burning of the cankered parts of the stems down to sound wood, and the painting of the wounds with Stockholm tar. Wounds made in pruning should also be painted over.
F. J. C.

Fire-blight Bacteria, Rôle of Insects in the Dissemination of. By V. B. Stewart and M. D. Leonard (*Phytopathology*, vi. pp. 152-158, April 1916). Sucking insects (as distinct from piercing) apparently do little in disseminating the fire-blight organism (*Bacillus amylovorus*), although they freely feed upon the exudations from diseased tissues. This, no doubt, results from the fact that infection takes place only through punctures in the tissues.—*F. J. C.*

Flooded Fenland, Some Observations on the Flora and Fauna of. By F. R. Petherbridge (*Jour. Agr. Sci.* vol. viii. pt. 4, pp. 508-511; pl. 2).—Thousands of acres of Fenland were flooded by the bursting of the Little Ouse through its bank at a point near Feltwell Pumping Station in January 1915. The land was pumped clear of water by September, and the observations were made on a portion of the flooded area, free from silt, in December of that year. This portion was then covered completely with a mat, one inch thick, of the carpet alga (*Cladophora flavescens*), which made ploughing a difficult operation; *Polygonum amphibium* was also very abundant. Lists are given of all the plants found both on the arable and the grass land. In the gardens all vegetables

(with the exception of horse-radish), flowers, and bushes were killed. As regards the fauna, eelworms, earthworms, and *Limnaria truncatula* (the snail host of the liver fluke) were looked for, but not found. Larvæ of various species of *Chironomus* were abundant.—J. E. W. E. H.

Flora of British Columbia. By J. Davidson (*Rep. Bot. Off., Brit. Col.* i. 3; 1916).—Accounts are given of two or three journeys in little-known parts of British Columbia and lists of the plants met with, with photographs of some of them, and notes upon the botanical aspect of the country traversed. The region inhabited by *Lewisia rediviva* particularly comes in for mention, and an account of the collection of its roots by Indians and two or three capital photographs of the plants as they grow add value to the paper.—F. J. C.

Fruit Fly, Mediterranean, Effect of Cold Storage on. By E. A. Back and C. E. Pemberton (*Jour. Agr. Res.* v. pp. 657-666; Jan. 1916).—The authors found that no eggs or larvæ of the Mediterranean fruit fly (*Ceratitis capitata*) survived refrigeration at 40° to 45° F. for seven weeks, at 33° to 40° F. for three weeks, or at 32° to 33° for two weeks. Where there is danger of introducing this pest it seems probable that refrigeration of fruit liable to be attacked would destroy any of the insects contained in the fruit.—F. J. C.

Fruit Growing, Temperature in Relation to. By L. D. Batchelor and F. L. West (*U.S.A. Dep. Agr., Bull.* 141, 26 pp.; 20 figs.).—A study of air drainage and temperature in a valley fruit orchard in Utah.—E. A. Bd.

Fruit Thinning. By V. E. (*Rev. Hort.* April 16, 1916).—On the proper thinning out of fruit.—C. T. D.

Fruits, Hardy, Flowering Season of. By U. P. Hedrick (*U.S.A. Exp. Stn., Geneva, New York, Bull.* 407, 24 pp.).—Tables of the flowering seasons of various hardy fruits at Geneva Station. They are grouped into very early, early, mid-season, late, very late. The author points out that excessive warmth hastens development of the stamens before that of the pistils, and thus may lead to infertility. The harmful influence of rain in bursting pollen cells at flowering time is emphasized.—E. A. Bd.

Fruits, Hardy, Length of Season and Ripening Dates. By U. P. Hedrick (*U.S.A. Exp. Stn., Geneva, New York, Bull.* 408, 26 pp.).—Actual dates of ripening and number of weeks in storage are given for Apples and Pears. Other fruits early mid-season, &c.—E. A. Bd.

Fungi and Bacteria, Effect of Natural Low Temperatures on. By H. E. Bartram (*Jour. Agr. Res.* v. No. 14, Jan. 1916, pp. 651-655).—The effect of intense cold of northern winters on the life and viability of fungi and bacteria does not seem to have been tested extensively, yet its importance in checking the spread of plant diseases would appear to be very great.

In the present paper, certain known fungi and bacteria were exposed in pure cultures to the low temperatures of the winter months. They were grown upon nutrient agar at ordinary laboratory temperatures, and then exposed to the outside air throughout the winter. The minimum temperature of -24°C. was reached during an exposure from December to April. The cultures were then brought inside and transferred to fresh nutrient agar, and allowed to develop at ordinary temperatures. All but one (*Actinomyces chromogenus*) germinated freely. Further trials were made the following winter, but dry cultures were used. These were prepared by removing the growth of the fungus from the culture agar, and placing in a plugged sterile tube without agar.

It was found that five fungi, *Sclerotinia cinerea*, *Cephalothecium roseum*, *Glomerella rufomaculans*, *Venturia inaequalis*, and *Ascochyta colorata*, lived over the winter months under all conditions of exposure; while four fungi, *Alternaria Solani*, *Cylindrosporium Pomi*, *Plowrightia morbosa*, and *Phytophthora omnivora*, lived on some media but not on others. One fungus, *Fusarium* sp. of conifers, died.

Of the bacteria, only two out of six kinds survived: *Bacillus Melonis* and *Actinomyces chromogenus*. The various organisms withstood exposure better in the dry condition than when moisture and food were present.—A. B.

Fungi, Timber-destroying. By J. B. Cleland and E. Cheel (*Agr. Gaz. N.S.W.* vol. xxvii, pp. 201-202; 2 col. plates).—The well-known phosphorescent toad-

stool (*Pleurotus nidiformis*) and the Sticky Timber Pholiote (*Pholiota adiposa*) are destructive to timber. The latter is a handsome brown-gilled agaric, and is found attached to the sides of tree trunks up to a height of 20 feet. It should be exterminated by cutting down and burning the trees.—S. E. W.

Funkia lanceifolia var. **tardiflora** (*Bot. Mag.* t. 8645).—Japan? Nat. Ord. *Liliaceae*, tribe *Hemerocalleae*. Herb. Leaves radical, broadly lanceolate, 5 inches long. Sheath white, blotched with purple. Raceme 50-flowered, flowers densely clustered. Bracteoles and perianth pale lilac. Flowers 1 inch across. G. H.

Galls, Gymnosporangium, Anatomical Study of. By Alban Stewart (*Amer. Jour. Bot.* vol. ii. No. 8, Oct. 1915, pp. 402-417; plates xv-xvi, 1 fig.).—The common "cedar apple" on *Juniperus virginiana*, caused by *Gymnosporangium Juniperi-virginianae* Schw., is one of the commoner galls upon coniferous plants. While the organism which causes the gall has been closely studied, but little work has been done upon the changes in the tissues of the host plant induced by the activities of the parasite. In preparation of the material for study, the galls were embedded in celloidin, as there was too much lignified tissue present to obtain good sections when embedded in paraffin. The sections were mounted in series and stained with safranin, with Delafield's hæmatoxylin or "licht Grün" used as counter stains.

The following conclusions were arrived at:

1. *G. Juniperi-virginianae* and *G. globosum* cause the formation of large galls on the younger branches of *Juniperus virginiana*.
2. The galls arise from the axils of the leaves, and are evidently transformed axillary buds.
3. Young galls have two distinct vascular systems, one of which is a leaf-trace bundle, and the other a stem bundle.
4. The more or less modified stem which enters the base of the older galls gradually breaks up and radiates outward, deeper in the gall tissue.
5. Leaf tissue is also involved in gall formation, and remains are often found adhering to older galls.
6. Normal stems sometimes appear to have grown out from surface of older galls.
7. Broad ray-like masses of parenchyma, surrounded by tracheids, are frequent, and cells which are of a transitional nature between parenchyma and tracheids are abundant.
8. The bundles are largely composed of scalariform tracheids.—A. B.

Ginseng, Phytophthora Disease of. By Joseph Rosenbaum (*U.S.A. Exp. Stn., Cornell, Bull.* 363, Oct. 1915, pp. 61-106; 18 figs.).—The American ginseng (*Panax quinquefolium* L.) is a member of the family Araliaceae and has been under cultivation for about twenty years in America, though it has been grown in Korea for over two centuries. It requires shade, good drainage, and an acid soil, otherwise it is susceptible to mildew or soft rot, which attacks the leaves, stems, and roots of the plant.

The characteristic symptoms are a wilting of the leaflets at the top of the petioles; the leaves then become spotted and discoloured, the stems become hollowed, and the roots, if attacked, rot and decay. The causal organism is *Phytophthora Cactorum* (Cohn et Leb.) Schröt. The author's experiments show that the fungus produces conidia and oospores, as well as zoospores (swarm-spores), and that germination can be induced under favourable conditions.

The measures of control suggested fall under the following heads:—1. Spraying with fungicides; 2. Removal of diseased plants; 3. Deep planting; 4. Crop rotation; 5. Sterilization of the soil; 6. Drainage. A short bibliography is appended.—A. B.

Ginseng Troubles. By E. A. Bessey and J. A. McClintock (*U.S.A. Exp. Stn., Mich., Special Bull.* 72, Feb. 1915, pp. 1-15; 5 figs.). **Ginseng Diseases and their Control.** By H. H. Whetzel, J. Rosenbaum, J. W. Braun, and J. A. McClintock (*U.S.A. Dep. Agr., Bur. Pl. Ind., Farm. Bull.* 736, July 1916, pp. 1-22; 26 figs.).—These papers give brief details of the following diseases of the ginseng: Alternaria blight and root-rot, caused by *Alternaria Panax* Whetzel; Phytophthora blight and root-rot, caused by *Phytophthora Cactorum* (Cohn et Leb.) Schröt.; Acrostalagmus wilt, caused by *Acrostalagmus* sp.; Thielavia root-rot, caused by *Thielavia basicola* (B. and Br.) Zopf.; Sclerotinia white rot, caused by *Sclerotinia Libertiana* Fckl.; Sclerotinia black rot, caused

by *Sclerotinia smilacina* Dur.; Damping off of seedlings caused by *Pythium Debaryanum* Hesse; Papery leaf-spot, caused by lack of shade and due to dryness; Nematode root-gall, caused by *Heterodera radicolica* (Greef) Müller. For control measures, see above.—A. B.

Grape Manure (*Queensland Agr. Jour.* Nov. 1915, p. 259).—Excellent results have been obtained in South Australia with a yearly application of 1 cwt. superphosphate, $\frac{1}{4}$ cwt. sulphate of potash, $\frac{1}{4}$ cwt. sulphate of ammonia to the acre, applying about 3 oz. of the mixture to each vine.—C. H. H.

Grape Varieties in the Vinifera Regions of the United States, Testing. By George C. Husmann (*U.S.A. Dep. Agr., Bull.* 209, 157 pp.; 10 plates).—The greater part of this bulletin consists of a table dealing with the relative behaviour and value for different purposes of grape varieties tested by grafting on resistant stocks and growing on their own roots in eleven experiment vineyards in California. About 350 varieties are dealt with on various stocks of native species and hybrids. In this State more than 200,000 acres of once flourishing vineyards have been destroyed by disease, mainly through Phylloxera, and after all known remedies have been tried it is considered that the only way to re-establish vinifera vineyards is by growing the vines on Phylloxera-resistant stocks (p. 12).—A. P.

Grapes, Powdery Mildew of, and its Control. By D. Reddick and F. E. Gladwin (*Rep. Inter. Congress of Viticulture, California, 1915*).—Dusting vineyards with flowers of sulphur as a method of controlling the powdery mildew of the vine was followed in 25 cases out of 30 by very serious damage to foliage &c. The authors consider that peculiar climatic conditions contributed to the burning which followed the application of the sulphur, and offer two or three alternative explanations of its cause.—F. J. C.

Green Manures, Relation of, to the Failure of Certain Seedlings. By E. B. Fred (*Jour. Agr. Res.* v. pp. 1161–1176; March 1916; figs.).—The germination of certain seeds in soil to which 1 per cent. of fresh chopped clover had been added was studied, the amount of green clover being about that added to the soil in green manuring. Buckwheat, castor bean, peanut, flax, hemp, white mustard, sunflower, cotton, soy bean, white lupine, oats, maize, and wheat were used in the experiment. The germination of many of the seeds was injuriously affected by the presence of the clover, especially during the first stage of decomposition of the latter. Oily seeds were generally more injured than starchy ones, and the damage was traced to fungi which develop in great numbers during the few weeks immediately following the introduction of the clover to the soil. Small applications of calcium carbonate seemed to increase the injury to germination.—F. J. C.

Growth of Forest Tree Roots. By W. B. McDougall (*Amer. Jour. Bot.* vol. iii. No. 7, July 1916, pp. 384–392).—This paper describes a series of observations, extending over two years, upon the growth of the roots of certain forest trees in Illinois. The trees used for experiment were *Acer saccharinum* L.; *Tilia americana* L.; *Carya laciniosa* (Michx. f.) Loud.; and *Quercus alba* L. Two methods were used for making observations on the same roots at intervals during the growing season: (1) the horizontal glass-plate method, and (2) the vertical glass-plate method. For the first, the earth was removed to expose some healthy roots. These were covered with a square of glass one foot square; over this was placed a square of felting, and the whole was then covered with soil. When observations were made the glass was removed, and then the earth and glass were replaced. At each observation a chart was made and the position of each fresh-looking rootlet indicated; at the same time its length was measured and recorded.

The vertical plate method was similar to the first, but the square of glass was placed vertically over the roots which were deeper in the earth. The glass was covered with felting to exclude the light and held in place by wooden props.

The following conclusions were arrived at:

The root growth of forest trees begins as early in spring as the soil becomes warm enough for absorption, and ceases in autumn when the soil becomes too cold.

There is not necessarily a summer resting period.

When there is a summer resting period, it is due to a decrease in the water supply and not to any inherent tendency towards periodicity.—A. B.

Hardy Heaths for the Rock Garden. By H. S. W. (*Irish Gard.* xi. p. 113, Aug. 1916).—A useful list of hardy heaths suitable for a rock garden.—F. J. C.

Horse-chestnut Leaf-blotch. By V. B. Stewart (*Phytopathology*, vi. pp. 5-20, Feb. 1916; pl.).—A full account of the isolation and study of the fungus *Guignardia Aesculi* (Pk.) Stewart, and of the disease in the form of a red irregular blotch which it produces on leaves of *Aesculus Hippocastanum* and *A. glabra*.—F. J. C.

Horse Chestnut Leaf-blotch. By V. B. Stewart (*U.S.A. Exp. Stn., Cornell, Bull.* 371, Feb. 1916; figs.).—The leaves are at first slightly discoloured and water-soaked; the central part of the affected area becomes dark red to brown with a yellowish margin, and finally dries and dies. Minute black specks may be seen scattered over the spot. The fungus is sometimes found on the petioles, and similar spots occur on the fruits. Nursery stock suffers most. The cause of the disease is *Guignardia Aesculi* (Peck) Stewart. Both lime-sulphur and Bordeaux mixture proved effective, as did dust-spraying with sulphur and lead arseniate (see above, "Apple Orchard").—F. J. C.

House-fly, Distribution. By R. R. Parker (*Jour. Econ. Entom.* vol. ix. p. 325, June 1916; figs.).—**House-fly, Breeding Habits.** By A. T. Evans (*ibid.* p. 354). Large numbers of marked house-flies were liberated at certain points in a town and many recaptured at distances varying from fifty yards to two miles from the point at which they were liberated. The search for (and smell of) food and suitable situations for egg-laying appear to be the causes contributing to this wide distribution. The experiments were carried out in a town and do not relate to country conditions. In the second article accounts are given of searches in garbage pails and rubbish heaps and in manure heaps for the larvæ of the house-fly, which were, except in one instance, only found in the last. The manure was alkaline in reaction and the garbage acid, the solitary case in which house-fly larvæ were found in a garbage pail occurring when the garbage was neutral. All strengths of hydrochloric acid were found to inhibit the hatching of eggs or development of larvæ. Manure stored in bins proved a bad place for the development of house-flies, owing to the growth of moulds on the surface of the manure. The larvæ are very sensitive to moisture and leave the manure when it becomes too wet.—F. J. C.

House-fly in Relation to the Farm Manure Heap, Some Experiments on the. By H. Eltringham (*Jour. Agr. Sci.* vol. vii. pt. 4, pp. 443-457, April 1916; figs.).—The object of the experiments was to test the universally accepted belief that all manure breeds house-flies. Experimental heaps of manure from a variety of sources, and varying in their degree of compactness, were established. They were covered in such a way that all flies hatched out were trapped. In only one case was any considerable number of *Musca domestica* found. In this instance a quantity of horse manure was obtained from a stable closely surrounded by houses and adjacent to a bakery. The number of flies hatched out was 865, and of these 798 were house-flies. With this may be contrasted the hatching from a heap of manure near farm buildings, but remote from houses (excepting two cottages 70 yards away). Out of some 1,200 flies hatched from this heap only three were house-flies. From nineteen such experiments the author concludes that, whilst the house-fly breeds in large numbers in stable refuse which is stored in close proximity to dwellings, the governing factor is found in the dwellings rather than in the manure heap, the latter serving as a secondary convenience for flies which are attracted to the human habitations in search of food. Incidentally it was observed that farm manure heaps far away from houses, though but little frequented by house-flies, are a prolific breeding-ground for *Stomoxys calcitrans*, a blood-sucking insect which torments farm animals, horses in particular.—J. E. W. E. H.

Humogen, Experiments with. By C. T. Gimingham (*Ann. Rep. Agr. Res. Stn., Long Ashton*, 1915, p. 110).—In these experiments, carried out in pots with tomatos, humogen or bacterized peat gave a higher yield than any other treatment tried when used at the rate of 1 lb. to a pot in which one tomato was grown; 2½ lb. (average 1,259 grammes) stable manure and nitrate of soda came next (1,160 grammes), while heated but not bacterized peat used at the rate of 1 lb. to the pot gave 827 grammes, the control giving 374 grammes average only. The humogen contained 2.39 per cent. nitrogen, the heated peat 1.08 per cent., and the manure 0.49 per cent.; and the author considers the extra growth obtained is to be accounted for by the amount of nitrogen supplied.—F. J. C.

Hybridization, Specific, by Grafting. By G. T. Grignan (*Rev. Hort.* Jan. 16, 1916).—C. T. D.

Inheritance of Pod Length in Certain Crosses. By J. Belling (*Jour. Agr. Res.* v. p. 405, Dec. 1915; pl.).—The author shows that a single genetic difference is responsible for the main difference between short and long pods, and in breeding this character behaves in the Mendelian manner. Minor factors are also involved, producing longer or shorter pods.—F. J. C.

Insectivorous Birds of New South Wales (cont.). By W. W. Froggatt (*Agr. Gaz. N.S.W.* vol. xxvi. pp. 765, 766, 865–870; 4 col. plates).—The Delicate Owl, *Strix delicata*, is closely related to the Barn Owl. Like the Boobook Owl, *Ninox boobook*, it eats insects, but its food chiefly consists of mice and rats. The Pacific Gull, *Gabianus pacificus*, eats noxious insects, snails, and slugs. The crow is a useful scavenger and does more good than harm, but is undoubtedly a pest in some localities when he is too numerous.—S. E. W.

Iris bracteata (*Bot. Mag.* t. 8640).—Oregon. Nat. Ord. *Iridaceae*, tribe *Irideae*. Herb. Leaves 4–5 inch tufts, 1½ feet long, linear. Stems with flowers, 4–6 inches long. Flowers, two together, 3 inches across, golden, three outer larger and veined with purple.—G. H.

Iris Hoogiana, sp. nova. By W. R. Dykes (*Gard. Chron.* Nov. 4, 1916, p. 216; with fig.).—A Regalia Iris of vigorous habit with flower of a uniform pale lavender collected in Turkestan.—E. A. B.

Larvæ as a Possible Food Supply, Lachnosterna. By L. O. Howard (*Jour. Econ. Entom.* vol. ix. pp. 389–392, Aug. 1916).—Trials of the grubs of *Lachnosterna* (allied to the cockchafer) were made, cooked in various ways, and approved by all but one of those who tried them.—F. J. C.

Lawn Manure (*Qu. Agr. Jour.* Oct. 1915, p. 183).—1 cwt. fine bone-meal, 1 cwt. superphosphate, 1 cwt. nitrate of lime, 1 cwt. muriate of potash to the acre, or 4 to 6 lb. of the mixture to every 43 square yards. As a change the following may be used alternately: 3 cwt. Thomas phosphate, 1 cwt. sulphate of potash, 1 cwt. dried blood to an acre.—C. H. H.

Leguminous Plants, Ascochyta on. II. By R. E. Stone (*Phytopathology*, v. pp. 4–10, Feb. 1915).—An *Ascochyta* was found on *Lathyrus sativus*, producing spots on foliage; it formed ascospores also in the summer on the same leaf-spots, as in the case of *Ascochyta Pisi*, but it is not identical with that fungus and will not infect the culinary pea. The author proposes the name *Mycosphaerella ontarioensis* for the ascus stage.—F. J. C.

Lobelia Helstii (*Bot. Mag.* t. 8648).—Tropical East Africa. Nat. Ord. *Campanulaceae*, tribe *Lobelieae*. Herb, perennial, 8–12 inches high. Leaves aggregated below, lanceolate, 1½ inch long. Inflorescence laxly racemose. Corolla lilac, ½ inch long.—G. H.

Lonicera etrusca. By G. Blanc (*Le Jard.* vol. xxx. p. 28).—*Lonicera etrusca* flourishes in the arid, sunburnt districts of the south-east and south of France. It forms a decorative object in a large park, when planted in a dry, sunny position. In May it is covered with orange-yellow flowers, which are succeeded by vermilion-coloured berries.—S. E. W.

Lonicera tatarica (*Bot. Mag.* t. 8677).—South-Eastern Russia to Siberia. Nat. Ord. *Caprifoliaceae*, tribe *Lonicereae*. Shrub, 10 feet high. Leaves ovate, 2½ inches long. Flowers in pairs. Corolla white or flushed with rose-pink, ¾ inch across, slightly irregular. Berries red, ¼ inch across.—G. H.

Lupinus Chamissonis (*Bot. Mag.* t. 8657).—California. Nat. Ord. *Leguminosae*, tribe *Genisteae*. Undershrub, compact habit, 1–3½ feet high. Leaves 5–7-foliate. Raceme 7 inches long. Flower, ¾ inch, lilac, with a basal yellow blotch. G. H.

Market-Garden District of Biggleswade, The Soils and Crops of the. By Theodore Rigg (*Jour. Agr. Sci.* vol. vii. pt. iv. pp. 385–431, April 1916; figs.).—This is the first attempt made in this country to examine the physical and chemical properties of the soils in a market-gardening district with a view to their suitability for horticultural purposes. An area of about 100 square miles, characterized by extensive valley gravel deposits on either side of the

Ivel and Ouse, was examined. The author has followed Hall and Russell ["Agriculture of Soils in Kent, Surrey, and Sussex"] in using the geological formation to mark the extent of series of soils having a somewhat similar mineral structure, the members of each series being differentiated by their varying agricultural properties. Thus the seven geological formations met with give rise to seven series, each of which furnishes one to three different types of soil, some differing in colour, others in texture. There was a notable uniformity of properties in the soils thus classified. For example, three analyses of clay loams derived from the Oxford Clay formation show coarse sand from 20 to 23.3 per cent., clay 19.7 to 21.2 per cent., K_2O .74 to .76 per cent., P_2O_5 .08 to .19 per cent. The clay loams are distinguished from the other Oxford Clay derivative, namely the pure clay soils, by containing about 9 per cent. less clay. Both derivatives are distinguished from all the other clay soils dealt with in the paper by extremely low percentages of calcium carbonate and of phosphoric acid. In a similar way there are two derivatives of the Greensand formation, namely dark sands and brown sands. Each of these contains 51 to 59 per cent. of coarse sand, 8.7 to 11.8 per cent. of Al_2O_3 and Fe_2O_3 , and .06 to .09 of $CaCO_3$, but the dark sands contain only about half the percentages of potash and phosphoric acid found in the brown sands. Details are given, supplemented by maps, of the distribution of crops over the area studied. Market gardening occupies from 80 to 95 per cent. of the Greensand derivatives, from 50 to 70 per cent. of derivatives of the valley gravel, glacial, and brick earth formations, and only 4 to 7 per cent. of soils derived from pure Oxford Clay and pure gault. On red land (on gault), on pure boulder clay, and on boulder clay overlying Greensand the percentage varies between 16 and 24. Finally the author suggests that, in county soil surveys where there are extensive "quaternary" deposits giving rise to variations in the soils overlying the geological formations, or where numerous geological formations outcrop within a small area, the ordinary soil survey should be supplemented by a minute investigation of one or two small areas of about 30 square miles. In this way many characteristics of soil and crop relationships would be brought out which might otherwise escape notice.

J. E. W. E. H.

Mass Mutation in *Oenothera pratincola*. By H. H. Bartlett (*Bot. Gaz.* lx. pp. 425-456; 15 figs.).—"Mass mutation consists in the production of large numbers of mutations, in some cases amounting to 100 per cent." . . . "It cannot be explained by Herebert-Nilsson's Mendelian hypothesis." . . . "As far as tested, the characteristic mutations adhere to the following scheme of inheritance: Mutation \times Mutation \rightarrow Mutation. Mutation \times Parent \rightarrow Mutation. Parent \times Mutation \rightarrow Parent. . . Mass mutation is associated with a high degree of sterility, which manifests itself in the production of a greatly reduced number of seeds, or in the production of many empty seeds."

This seems to agree with Darwin's experience in crossing; *i.e.* though a cross at first stimulates and may increase the fertility, subsequently the self-fertilized surpassed those crossed.—G. H.

Mesembryanthemum transpadense (*Bot. Mag.* t. 8674A).—South Africa. Nat. Ord. *Ficoideae*, tribe *Mesembryeae*. Herb, small and stemless. Leaves 8-11, spreading, $1\frac{1}{2}$ inch long, thick. Flowers nearly sessile, $1\frac{1}{2}$ inch across. Petals very many, $\frac{1}{3}$ inch long, yellow, with a red central line.—G. H.

Mesembryanthemum tuberosum (*Bot. Mag.* t. 8674B).—South Africa. Nat. Ord. *Ficoideae*, tribe *Mesembryeae*. Herb, small and stemless. Leaves 6-8, 1 inch long, thick. Flowers sessile, $1\frac{1}{2}$ inch across. Petals very many, yellow. G. H.

Mosaic Disease of Tobacco. By H. A. Allard (*Jour. Agr. Res.* v. p. 251, Nov. 1915; pl.).—The author shows that the virus of the mosaic disease is distributed in the tissues of the ovary and ovules, and in the anthers as well as, as the author has already shown, in the roots, apparently healthy lower leaves, and corollas of the plant. Various malformations may occur as a result of the presence of the virus in these tissues, but the disease is not known to be transmitted into the embryos of the seeds directly from the mother plant. It is not clear, however, to what the effective barrier which appears to be present preventing this infection is due.—F. J. C.

Mulberry, Die-back Disease of. By E. S. Salmon and H. Wormold (*Gard. Chron.* Aug. 26, 1916, p. 95; with 3 figs.).—*Fusarium lateritium*, hitherto regarded as a harmless saprophyte in this country, has lately damaged mulberry trees in Sussex and Kent. It causes serious havoc in Italy. Pure cultures prove the

genetic connexion of this fungus with *Gibberella moricola*. Burning all affected shoots and old wood should be practised wherever the fungus appears.—E. A. B.

Mushrooms, A Bacterial Disease of Cultivated. By A. G. Tolaas (*Phytopathology*, v. pp. 51–53, Feb. 1915; pl.).—A bacillus (perhaps *B. fluorescens*) producing spots at first pale yellow, but finally rich chocolate brown, on the caps of cultivated mushrooms is described. The discoloration is usually only on the surface, but where the attack is severe the flesh is frequently yellowish white. A similar attack has been described from near Paris. Fumigation of the beds with sulphur before spawning proved entirely successful, 1½ lb. sulphur being used for each 1000 c. ft. of space in the caves.—F. J. C.

Mussel Scale, Winter Treatment of. By A. H. Lees (*Ann. Rep. Agr. Res. Stn., Long Ashton*, 1915, p. 84).—Caustic soda (2 lb. to 10 gallons), paraffin emulsion (paraffin 10 per cent., soft soap 10 per cent.), and lime-sulphur (1 gallon commercial concentrate to 12 gallons water) were used against mussel scale in winter, and the caustic soda alone proved effective, and that completely.
F. J. C.

Mycorrhiza, Endotrophic, Recent Developments in the Study of. By M. Chevely Rayner (*New Phyt.* vol. xv. No. 8; Oct. 1916).—This interesting paper is concerned chiefly with the Orchidaceae and Ericaceae and their respective symbiotic fungi, and is of particular importance with regard to the problems of soil ecology and in view of the edaphic peculiarities of Ericaceous plants.

Noël Bernard was the first to demonstrate—(1) by germinating the seeds of orchids under aseptic conditions in sterilized media, (2) by isolating the root fungi, growing them in pure culture and identifying them with certainty—that, while the seeds of some species will germinate, in no case will they produce well-developed plants unless infected with an endophytic fungus and in most cases a specific endophyte must be present. The fungus at first vegetates actively in the living cells of the root, but to keep it within bounds, the orchid plant digests the mycelium in certain root cells and excludes all hyphæ from the chlorophyllous tissues of the shoot.

Of practical interest to Orchid growers is the evidence that in some cases the fungus isolated from endemic species will induce germination in the seeds of tropical species.

The case of *Calluna* is probably characteristic of Ericaceous plants in general. Here the root fungus not only forms mycorrhiza, but extends into the tissues of the shoot and leaves; it infects the seeds in the ovary chambers, and these, when ripened and shed, carry with them their fungal partner in the form of delicate hyphæ on the surface of the testa.

Gastrodia elata, a saphrophytic orchid and a native of Japan, is described by Kusano. It is a colourless tuber invested with a corky covering like a potato, is destitute of chlorophyll and has no root system. A remarkable case of symbiosis exists between this orchid and the rhizomorphs of the fungus *Armillaria mellea*. The more striking features are as follows: Young tubers are uninfected and continue to grow only so long as they are attached to the parent tuber. Failing infection by the rhizomorphs of *Armillaria mellea* they never reach the flowering stage, and the majority die without flowering. The tuber is infected locally by a branch of the rhizomorph, a continuation of the mycelium outside, and only in this way can it gain food material from the soil. In one region of the plant the rhizomorph is parasitic, in another—which Kusano describes as the chief metabolic centre—the mycelium is itself ultimately digested after introducing an accumulation of food material upon which the flowers of the Orchid and the nutrition of its offsets are entirely dependent. At this stage the plant is seen to be completely parasitic on the fungus. It should be noted that the term mycorrhiza must be extended to embrace a case of this kind where there is an association between a fungus mycelium and the shoot tissues of a flowering plant. Nothing is at present known as to the behaviour of the seeds of this orchid at germination.—G. D. L.

Nematode, Root-knot, Experiments on the Control of the. By J. A. McClintock (*U.S.A. Exp. Stn., Mich., Tech. Bull.* 20, July 1915).—The root-knot eelworm, *Heterodera radicum* (Greef) Müller, has for a long time been a serious pest to many crops, and the author records a large number of experiments on the control of this nematode. The experiments were devised to test the relative value of various chemicals, with the possibility of finding one that would be effective and economical to apply. Infected ground was treated with carbon-bisulphide, tobacco dust, formaldehyde, naphthaline, tobacco stems, ammonia,

"black-leaf 40," kerosene, and gasoline, and in all cases plants grown in the treated soils contracted the root-knots so characteristic of the disease. Carbon-bisulphide, strong formaldehyde solution, and tobacco stems greatly reduce the number of nematodes in the soil, and the author believes that treatment with such chemicals might be of value in the case of rapidly-growing crops. With such crops as ginseng—a crop which occupies the ground for as long as six years—the treatment would be worthless, as the nematodes left in the soil would completely repopulate it within a very short time. He concludes that "in the light of these experiments, no chemical could be recommended for the control of root-knot nematodes."

Theories as to the failure of the field experiments are next set forth, and a long series of experiments on the action of various chemicals on the eggs is recorded. Of the numerous chemicals experimented with, it was found that in no case were the eggs prevented from hatching, and this fact, amongst others, is given as a possible reason for the failure of the chemical treatments in the field experiments. Circumstances did not permit of the author conducting complete experiments on the control of *Heterodera* by steam sterilization, but he is of the opinion that the nematodes are killed by a thirty-minute treatment with steam at a pressure of eighty pounds. The results of these experiments are not sufficiently conclusive for the author definitely to recommend this treatment.—*J. K. R.*

Nitrogen-fixing Organisms of the Soil, The Effect of Arsenic upon the. By J. E. Greaves (*Jour. Agr. Res.* vol. vi. No. 11, June 1916, pp. 389-416; 5 figs.).—The author finds that arsenic, when applied to a soil in the form of lead arsenate, sodium arsenate, arsenic trisulphide, or zinc arsenite, stimulates the nitrogen-fixing powers of the soil. This stimulation is greatest when lead arsenate is applied, and least when zinc arsenite is applied. Paris green did not stimulate in any of the concentrations. This compound becomes very toxic when the concentration reaches 120 parts per million, and the toxicity of this compound is due to the copper, and not the arsenic contained in it. Sodium arsenate became toxic when a concentration of 40 parts per million of arsenic was reached, and when 250 parts per million were added it entirely stopped nitrogen fixation. Lead arsenate was not toxic even at a concentration of 400 parts per million of arsenic; while the toxicity of arsenic trisulphide and zinc arsenite were very small at this concentration.

The stimulation noted was not due to any inherent peculiarity of the soil used; for soils which vary greatly in physical and chemical properties had their nitrogen-fixing powers greatly increased when arsenic was applied to them.

Only one type of *Azotobacter* was isolated which was stimulated by arsenic, and in this case the stimulation was due to the organism utilizing more economically in the presence of arsenic its source of carbon than it did in the absence of arsenic. The stimulation noted is due largely to the arsenic inhibiting injurious species.

Arsenic stimulates the cellulose ferments, and these in turn react upon the activity of the nitrogen-fixing organisms.

A fairly complete bibliography is appended.—*A. B.*

Nitrogen in Certain Legumes, A Biochemical Study of. By Albert L. Whiting (*U.S.A. Exp. Stn., Illinois, Bull.* 179, March 1915, pp. 471-542; 17 plates, 6 figs.).—The experiments show that the cowpea and soy bean utilize atmospheric nitrogen through their roots, not through their leaves. No combined nitrogen could have been assimilated in these gas experiments. The total nitrogen determination shows that 74 per cent. of the nitrogen of cowpeas and soy beans at the time of harvest is in the tops, while the remainder is distributed between the roots and the nodules. In the earlier periods the roots contain the larger part, while later they contain much the smaller part.

The percentage of soluble nitrogen in soy beans and cowpeas varies with the different parts of the plant and with the period of growth. On an average the soluble nitrogen in the tops was 45 per cent. of the total; in the roots 34 per cent.; in the nodules of soy beans 14 per cent., and in nodules of cowpeas 34 per cent.

Phosphotungstic acid usually precipitates some form of nitrogen. In these experiments the amounts of nitrogen so precipitated averaged 12 per cent. in the tops of both soy beans and cowpeas; 5 per cent. in the roots; 1 per cent. in the nodules of soy beans; 17 per cent. in nodules of cowpeas. Other forms of soluble nitrogen occur which are not precipitated by phosphotungstic acid.

Fixation takes place at a very early period in the growth of the seedling—sometimes within 14 days. It is rapid in the case of the cowpeas.

Plants grown under the conditions of these experiments contain no ammonia nitrites or nitrates, as measured by the most accurate chemical methods.—*A. B.*

Novelties in War-time. By Hortulus (*Le Jard.* vol. xxx. p. 36; 2 figs.).—Lemoine has brought out the following new plants: *Hydrangea hortensis* 'Étin-celant,' 'Satinette,' and 'Trophée.' All bear beautiful heads of flower. 'Étin-celant' is brilliant carmine, 'Satinette' is bright satin carmine, and 'Trophée' is deep carmine, probably the deepest red of all the *Hydrangeas*.

Philadelphus 'Girandole' is not so large as *P.* 'Virginal,' but excels it in shape and in the beauty of its milk-white flowers.

P. 'Fleur de neige' resembles *P. grandiflorus*; the shrub is covered with pure white semi-double flowers. *P.* 'Coupe d'argent' bears immense white flowers with a pleasant odour.—S. E. W.

Novelties in War-time. By M. Houssy (*Le Jard.* vol. xxx. pp. 352, 353; 3 figs.).—'Le Poilu' is a hybrid rose with *Wichuraiana Mossu* and *Muscoca japonica* for parents. It forms a robust shrub with hairy branches; the peduncles, sepals, and ovaries are very mossy. The large flowers are borne in clusters; they are double and of a good shape. Their colour is satin rose, changing to lilac-pink. The dwarf polyantha rose 'La Marne' is the offspring of 'Madame Norbert Lavasseur' and 'Comtesse de Cayla.' The dark-green glossy foliage is disease-proof. The flowers are semi-double, the petals are pale pink at the base and bright salmon-pink at the tips. This rose is very floriferous; the flowers appear early and may last for a month, changing from bright pink to pale pink and finally to white.

The chrysanthemum 'Victoire de la Marne' is of dwarf habit and very floriferous. The flowers are of good shape and are bright red in colour, like a geranium.

The peach 'Franco-espagnole' bears large fruit of excellent flavour, which is ripe in mid August.

The strawberry 'Erigé de Poitou' is a vigorous grower. Its fruit is held well above the soil.

The pear 'Beurré d'Avril' is vigorous and fertile. The fruit is ready in March; it is sweet and of good flavour.

Syringa Sweginzowi, from Central China, is very floriferous. In June it is covered with flesh-coloured sweet-scented flowers.

Alyssum maritimum compactum lilacinum is easily raised from seed. In June it is covered with sweet-scented lilac-coloured flowers. It flowers again in August or September, and continues to do so until cut down by the frost.

S. E. W.

Nursery Stock, Dusting for Control of Leaf Diseases. By V. B. Stewart (*U.S.A. Exp. Stn., Cornell, Circ.* 32, Jan. 1916).—Based on results in *Bull.* 369 of this station; see these Abstracts: Apples, Dusting and Spraying Experiments with.—F. J. C.

Nursery Stock, Some Important Leaf Diseases of. By V. B. Stewart (*U.S.A. Exp. Stn., Cornell, Bull.* 358, April 1915, pp. 165–226; 28 figs.).—This bulletin gives a general account of the life-history, symptoms, and control measures for the commoner fungoid diseases, causing leaf-spot in various fruit trees. The list includes apple and pear scab (*Venturia inaequalis* and *V. pirina*); apple powdery mildew (*Podosphaera leucotricha*); yellow leaf-disease of the cherry and plum (*Cylindrosporium Padi*); powdery mildew of the cherry (*Podosphaera Oxyacanthae*); Anthracnose of currants and gooseberries (*Pseudopeziza Ribis*); Septoria leaf-spot in currants and gooseberries (*Septoria Ribis*); the gooseberry mildew (*Sphaerotheca mors-uvae*); leaf-blotch of horse-chestnut (*Laestadia Aesculi*); peach leaf-curl (*Exoascus deformans*); leaf-blight of pear and quince (*Fabraea maculata*); Septoria leaf-spot of pear (*Mycosphaerella sentina*); black-spot of rose (*Actinonema Rosae*); and rose and peach mildew (*Sphaerotheca pannosa*).—A. B.

Oenothera gigas, nanella, A Mendelian Mutant. By Dr. Hugo De Vries (*Bol. Gaz.* lx. p. 337).—The author's object was to "show that the dwarf character which in so many instances complies with the formulæ of Mendel, but behaves in a different way in crosses of the derivatives of *O. Lamarckiana*, may, at least in one instance in this group, follow that law as exactly as in any other pure Mendelian case."

The author first gives a table of ten seed-bearers, derived from "some good biennial specimens of the third generation." Of the ten plants, one had 2 dwarfs; four had only 1; four had 0, while one had 34, giving 17.8 per cent.

In another table, of 9 offspring of biennials, six had 0; one had 1; while one had 25, and another 19, these two giving 15.7 and 15.0 respectively per cent.

Of these three with highest percentage he says : " I consider them to be due to Mendelian segregation."

Nevertheless they fall short of the necessary 25 per cent. " This is due to the difficulties of cultivation and to less viability of the dwarfs as compared with the normal specimens. I chose the one with 17.8 per cent. for continuing the experiment. I succeeded in having a dozen of plants flower and ripen their seeds as annuals."

Table IV. gives us the results. Three have either 1 or 2 ; while seven had dwarfs ranging from 25 to 57, the average percentage being 22 per cent. This is not far from the required number 25. A question arises, why were there so few dwarfs in the first two experiments, viz. 1 and 2 only with two figures, while in the third the number rose to 7 ?

As annuals are normally, *i. e.* when wild, far more prolific than biennials and perennials, may not this increase of dwarfs be due to their greater fertility, as the seven were derived direct from annuals ?—*G. H.*

Orchard Spraying Experiments. By J. C. Blair and others (*U.S.A. Exp. Stn., Illinois, Bull.* 185, 212 pp. ; 10 plates).—A long and careful account of trials with various spray-fluids in field trials.—*E. A. Bd.*

Paeonia Willmottiae (*Bot. Mag.* t. 8667).—China. Nat. Ord. *Ranunculaceae*, tribe *Paeonieae*. Herb, perennial. Leaves twice-ternate, 6 inches long, 3 inches wide. Flowers, 6 inches across. Petals, about 10, pure white.—*G. H.*

Pandanus furcatus (*Bot. Mag.* t. 8671).—India. Nat. Ord. *Pandanaceae*. Tree, 10–13, rarely to 30 feet high, sparingly branched. Leaves linear, 10–16 feet long, 2–4 inches wide, with marginal spines. Male inflorescence terminal, pendulous. Female spadix solitary. Cone oblong, 6–18 inches long, orange-brown, fleshy. *G. H.*

Parsley Disease. By J. A. McClintock (*U.S.A. Exp. Stn., Virginia, Bull.* 18, Jan. 1916, pp. 379–384 ; 3 figs.).—This disease is caused by *Sclerotinia Libertiana* which has already been described by Hall and Stevens in 1910.

The control measures suggested are steam sterilization of the soil and a suitable rotation of crops. Drenching the soil with a watery solution of formaldehyde is useful for single-beds and frames in which the plants are but lightly attacked. *A. B.*

Pathology of Ornamental Plants. By Mel. T. Cook (*Bot. Gaz.* lxi. p. 67, 1916). " Though the literature on diseases of field crops, fruits, and vegetables is extensive, that on the diseases of ornamental plants is very meagre." The author observes that this neglect is due to three causes : "(1) The supposition that they are of no economic importance ; (2) Growers have received little or no satisfaction from plant pathologists ; (3) The latter find the work with ornamental plants unsatisfactory and complicated by physiological problems which make the returns uncertain."

In reply he observes : "(1) The growing of ornamental plants is of very great importance and involves millions of dollars annually ; (2) The pathologists are insufficiently informed ; (3) Of outdoor work little is as yet known beyond the treatment of Chrysanthemum diseases. The indoor problems are by far the most complicated and the most difficult, and are not yet attacked.—*G. H.*

Peach Cankers and their Treatment. By R. A. Jehle (*U.S.A. Exp. Stn., Cornell, Cir.* No. 26, Sept. 1914, pp. 52–62 ; 8 plates).—Cankers are prevalent on all varieties of peach trees, and may be found on the wood of all ages from the trunk of the tree to the growth of the current year. Two types of cankers occur, brown-rot canker and frost cankers.

Brown-rot canker is caused by a fungus (*Sclerotinia fructigena*) which produces a brown rot in the fruit and which may pass down the twig into the tree. The fungus now spreads in all directions, and the bark cracks and splits with a copious exudation of gum. Ultimately a canker is formed, which may persist from year to year.

Frost cankers are usually found on the main trunk, near the surface of the soil, and appear as slight depressions in the bark. No growth takes place at these points, and, like the cankers produced by *Sclerotinia fructigena*, a copious gum flow occurs during wet weather.

The control measures suggested are the destruction of all affected blossoms, fruits, and twigs, and the smearing of gas tar upon the open wounds on the trees.—*A. B.*

Peach Leaf-curl, Spraying for. By D. Reddick and L. A. Toan (*U.S.A. Exp. Stn., Cornell, Cir.* 31, Sept. 1915, pp. 65-73; 1 fig.).—A number of substances applied as a dormant spray will give perfect control of peach leaf-curl, provided every bud on the tree is covered with the material. The best spraying solution is undoubtedly lime-sulphur if applied in the autumn. The author details a number of spraying experiments with the lime-sulphur in the proportion of 1 to 8, at various stations in New York State, in which the results have proved to be highly satisfactory in checking the ravages of *Exoascus deformans*, the causal organism of the peach leaf-curl.—*A. B.*

Peach Leaf Glands. By C. T. Gregory (*U.S.A. Exp. Stn., Cornell, Bull.* 365, 24 pp.; 9 plates).—A study of the taxonomic value of glands of Peach leaves. While adding no new facts generally, it is an interesting survey of the question, treating the histological side in an able manner.—*E. A. Bd.*

Peas, Sweet, in Winter. By H. Theulier (*Rev. Hort.* Oct. 16, 1915).—Advice on treatment.—*C. T. D.*

Pectins of Cider Apples and their Uses. By B. T. P. Barker (*Ann. Rep. Agr. Res. Stn., Long Ashton*, 1915, p. 56).—The pectins, which are the chief constituents of jellies formed from fruits, have been examined by the author in the case of the apple, who finds that gelling does not occur unless a certain proportion of sugar and of acid, such as tartaric acid, is in the fruit juice. Concentration by boiling does not alone bring about the formation of "gel," and the failure of jam to set may be due either to the presence of insufficient pectin, or sugar, or acid.—*F. J. C.*

Pegomyia hyoseyami, Notes on. By E. N. Cory (*Jour. Econ. Entom.* vol. ix. p. 372, June 1916; figs.).—This insect, which mines the leaves of henbane (see p. 139), also attacks spinach, goosefoot (*Chenopodium album*), and species of Amaranthaceae (e.g. *Amaranthus retroflexus*). Three broods apparently occur during the year. No measures of control were attempted.—*F. J. C.*

Pentstemons, Hybrid. By S. Mottet (*Rev. Hort.* March 16, 1916; coloured plate).—Description and illustration of large-flowered Pentstemons.—*C. T. D.*

Pentstemon rupicola (*Bot. Mag.* t. 8660).—North America. Nat. Ord. *Scrophulariaceae*, tribe *Cheloneae*. Herb, dwarf, prostrate and branching at the base, rosette-like in form, 3 inches across. Leaves $\frac{1}{4}$ inch long, opposite and crowded below. Corolla, $1\frac{1}{2}$ inch long, carmine.—*G. H.*

Pests, Fruit. By P. Lesne (*Rev. Hort.* May 16, 1916, June 16, 1916).—Coloured plate showing a number of insects which attack fruits.—*C. T. D.*

Phascolus vulgaris, Genetic Study of. By R. A. Emerson (*U.S.A. Exp. Stn., Nebraska, Bull.* 7, 73 pp.; 16 figs. and tables).—A close and detailed study of inheritance in dwarf and tall beans. The author adopts the assumption of inequality in dominance and potency of some of the factors concerned.—*E. A. Bd.*

Phlox Drummondii, Colour Varieties of. By J. P. Kelly (*Jour. N.Y. Bot. Gard.* xvi. pp. 179-191; Sept. 1915).—About two hundred varieties of *Phlox Drummondii* have arisen during the seventy-nine years since its introduction to cultivation as a little-varying plant in 1835. The history of the varieties is traced by the author and references to literature are given.—*F. J. C.*

Phosphorus in Plant and Animal Substances, Studies on the Estimation of Inorganic. By E. B. Forbes, F. M. Beegle, and A. F. D. Wussow (*U.S.A. Exp. Stn., Ohio, Tech. Bull.* 8, June 1915, pp. 1-48).—When studying the metabolism of plants and animals, it is frequently desired to distinguish between simple inorganic phosphates and phosphorus in combination with organic groups. Two different methods, one for plants, the other for animal substances, were described in *Ohio Bull.* 215, 1911, and the present bulletin is an extension of work and improvement in the methods there set forth.—*A. B.*

Phytophthora infestans occurring in Tomatos. By S. P. Wiltshire (*Ann. Rep. Agr. Res. Stn., Long Ashton*, 1915, p. 92).—The common potato-disease fungus *Phytophthora infestans* was found on tomatos at Long Ashton, and the opportunity of comparing the infectivity of spores of the fungus from potato and tomato respectively was taken. The spores from the potato readily infected the potato, but in no case did they infect the tomato. The spores from the tomato readily infected the tomato, but in only a few cases were potatoes

infected by them. At the same time it is probable that injured portions of tomato foliage might be readily inoculated by spores from the potato.—*F. J. C.*

Plasmopara viticola, Studies on. By C. T. Gregory (*Rep. Inter. Congress of Viticulture, California, 1915*).—This is a careful and full study of the fungus which causes the "downy mildew" of the vine, which should be consulted by all interested. Three points in particular merit reference. The spores germinate best at about 50° F., not at all at a high temperature. No hibernating mycelium has been found, and the author considers oospores are the principal, and probably the only, method by which the disease is carried over from one year to another. Some varieties of vine are less susceptible than others, but the degree of susceptibility does not appear to be connected with morphological differences, but rather with some physiological difference hitherto undiscovered.—*F. J. C.*

Pollen-grains of Apple and other Fruit Trees, On the Germination of the. By T. Adams (*Bot. Gaz.* lxi. p. 131).—After enumerating several reasons why an individual flower may fail to produce fruit, the author describes his observations on the germination of the pollen-grain in a cane-sugar solution. He endeavours to answer the questions (1) What strength of sugar solution gives the most rapid germination? (2) How is the germination of pollen-grains affected by temperature? (3) What is the rate of growth of the pollen-tube? (4) How long, under the most favourable conditions, do the pollen-grains retain their vitality?

The following are some of the general conclusions arrived at:

The strengths of the sugar medium were best for:—Apple 2.5–10 per cent., pear 4–8 per cent., strawberry 8 per cent., loganberry 4 per cent., raspberry and black currant 16 per cent.

Some pollen-grains of apple germinated in twelve hours; temperature, 3.5° and 7° C. Some varieties of the same species appeared to have more vigorous pollen-grains than others.

Of the temperatures employed, 20°–23° C. gave the quickest germination.

A few pollen-grains of apple formed short pollen-tubes after being kept dry for three months, of pear after ten weeks, black currant, ten weeks, but all others were dead after two months.—*G. H.*

Pollination. By J. B. Dental (*Rev. Hort.* Aug. 16, 1916).—An interesting article on the principles of fertilization of plants and nature's devices in that connexion.—*C. T. D.*

Pollination of Pomaceous Fruits: Bud Formation. By F. C. Bradford (*U.S.A. Exp. Stn., Oregon, Bull.* 129; May 1915; figs.).—It is shown that in the case of the apple the differentiation of the flower bud begins in early July and continues until a resting stage is reached about the end of November. Later developments occur somewhat rapidly in February and March and appear to be more dependent upon external influences than are the early changes. Climate, it is said, has little effect on the rate of the first changes.—*F. J. C.*

Pomaceous Fruits, Black-rot, Leaf-spot, and Canker of. By L. R. Hesler (*U.S.A. Exp. Stn., Cornell, Bull.* 379, Aug. 1916).—This bulletin gives a very full account of black-rot, leaf-spot, and canker of pomaceous fruits, which is primarily a disease of the apple, although other hosts recorded include the pear, quince, and crab. "Black-rot" is the name applied to the disease in fruit, while the term "leaf-spot" is given to foliage lesions. "Canker" is an unqualified term commonly applied to the disease when it occurs on the bark. The history of each form of the disease is dealt with in detail, and the geographical occurrence of the fungus, which appears to be very generally distributed throughout the temperate regions, is also considered. The loss annually arising from the disease is difficult to estimate, more especially because the canker form is often confused with other cankers, and difficulty thus arises in obtaining reliable information. Much damage occurs to fruits in storage, and when attacked they are rendered worthless so far as their market value is concerned. The damage to foliage depends on the extent of the infection, and in severe cases the tree may be defoliated from six to eight weeks before the ripening of the crop. It is reported that the canker stage is responsible for much injury to branches, while young nursery stocks also suffer. The writer deals with the symptoms of the disease on the fruit, leaves, and branches, and records the pathogene to be the fungus *Physalospora Cydoniae* Arnaud, the morphology of which is admirably treated. Isolation and inoculation experiments receive full attention.

The methods of control for black-rot are (1) spraying with a 0.03 per cent. solution of copper sulphate or Burgundy mixture, the first application taking

place when the disease is just appearing; (2) careful handling of fruits; and (3) the temperature of store room to be kept about 31°–34° F. The leaf-spot stage is controlled by spraying with Burgundy mixture or lime-sulphur wash. Trees growing in grass appear to be more susceptible to the leaf-spot form of the disease than when the trees are grown in cultivated ground; consequently it is recommended that the soil should be well worked. The control of the canker stage falls into three classes, viz.: (1) Surgical methods (pruning, removal of diseased bark); (2) Wound treatment (disinfection and protection); and (3) Wound healing. Orchard management and resistant varieties are other headings under which a deal of information has been amassed, while an excellent bibliography completes a useful pamphlet illustrated by photographs and drawings.
J. K. R.

Potato Black-rot, Caused by *Fusarium radicleicola*. By O. A. Pratt (*Jour. Agr. Res.* vol. vi. No. 9, May 1916, pp. 297–309; 4 plates).—This disease is confined chiefly to potatoes of the round type, such as 'Idaho Rural' and 'Pearl'; it causes a jelly-like rot as well as a black-rot in potato tubers in Southern Idaho, and the organism appears to be well distributed throughout the desert soils of this region. The author finds that the disease is checked at a temperature of 50°F., and suggests keeping storage pits at this temperature as a control. The disease may also be controlled by planting potatoes only on lands which have been under other crops for a number of years, and by good tillage.—A. B.

Potato Dry-rot Disease caused by *Fusarium trichothecioides*. By O. A. Pratt (*Jour. Agr. Res.* vol. vi. No. 21, Aug. 1916, pp. 817–831; 1 plate).—This disease is apparently restricted to the arid and semi-arid regions of the Western States of America, and may be described as a powdery dry-rot, which is external, and arises from bruises in the skin of the tubers. In advanced stages a pinkish white growth of the mycelium of the fungus may be observed, and the decayed tissue presents shades of colour from black to light brown. The causal organism was first described by Jamieson and Wollenwebber in 1912, and named *Fusarium trichothecioides* Wollenw. Under ordinary field conditions the fungus does not attack any part of the growing potato plant; only potato tubers in storage are attacked through bruises. The organism appears to be widely distributed throughout Western desert soils.

Since the fungus does not develop at temperatures below 2°C., a control measure is suggested of keeping the storage pits below 2°C. Treatment with formaldehyde or mercuric chloride is useful in checking the disease, provided the disinfecting is done within twenty-four hours after digging.—A. B.

Potato Fusaria. By C. D. Sherbakoff (*U.S.A. Exp. Stn., Cornell, Mem.* No. 6, May 1915, pp. 85–270; 50 figs., 7 plates).—The purpose of this memoir was to lay down a basis for the study of the disease known as fusarial wilt and dry rot of potatoes.

The author has collected from all possible sources many different varieties of the *Fusarium* fungus, and has cultivated them in pure cultures on suitable media and under similar conditions of growth since the autumn of 1911.

Over 80 species and varieties of *Fusarium* are described and figured, as well as the related genus *Ramularia*. Some beautiful three-colour plates of living cultures, 40 days old, and grown at a temperature ranging from 20°C. to 25°C. are shown. These include sixty of the chief forms of *Fusarium*. The whole memoir is worthy of the great institution in New York State, and represents the highest point of scientific literature in plant pathology.—A. B.

Potato, Late Blight of the (*Phytophthora infestans*). By I. E. Melhus (*U.S.A. Exp. Stn., Wisconsin, Res. Bull.* 37, Aug. 1915, pp. 1–64; 8 figs.).—The germination and infection with the fungus (*Phytophthora infestans*) are largely dependent upon environmental conditions. How and to what extent they react on the spread of the disease is not yet well understood, and the present paper is a contribution towards the solution of these important problems.

The summary of the author's results is as follows:—The spores of this fungus may germinate either indirectly by the production of zoöspores, or directly by germ tubes. The type of germination is determined chiefly by external conditions, such as temperature, moisture, and the medium in which the spores are placed.

Temperatures below 20°C. have been found to be more favourable for indirect or zoöspore germination in water than higher temperatures. The minimum lies between 2° and 3°C., the optimum between 12° and 13°C., and the maximum between 24° and 25°C.

For direct or germ tube germination the limits are higher. Direct germina-

tion was very scanty below 15°C. Above 20°C. it became most abundant, increasing with the temperature. The minimum is probably between 10° and 13°C., the optimum about 24°C., and the maximum very near 30°C. Indirect germination occurs generally in a 10 per cent. dextrose solution, sparingly in a 16 per cent. solution, and not at all in a 20 per cent. solution. In the last, direct germination occurs.

The time required for spores of *P. infestans* to germinate depends upon (a) the viability of the spores, (b) the external influences. The shortest period for indirect germination was 45 minutes, though it usually requires two or three hours. The time decreases as the temperature increases up to 13°C. Above this the ratio is reversed. Direct germination is a slower process. The number of spores germinating was also dependent upon the temperature, 80 per cent. germinating at 10° to 13°C.

The motility of the zoöspores was also influenced by temperature. Its duration varied inversely with the temperature, ranging from 22 hours at 5°-6°C. to 19 minutes at 24°-25°C.

The spores are killed in from 6 to 24 hours when exposed to such dry atmospheric conditions as exist in an ordinary room.

Leaf juices from the softening of infected tissues have an inhibiting effect on germination.

Increasing the amount of nascent oxygen in the medium containing the spores inhibits germination.

When the spores were subjected to optimum temperature conditions for indirect germination, .0159 per cent. of copper was necessary to prevent germination. Infection of the potato plant with *P. infestans* takes place at conditions favourable to germination. Plants chilled for periods of from 12 to 24 hours at 10°-13°C. showed a greater amount of infection than the controls held at higher temperatures.

Infection becomes visible in two or three days at temperatures between 23° to 27°C. It requires a longer period at lower temperatures. Foliage infection may only take place by direct germination of the spores, and may take place either through the upper or lower surface of the leaf. Usually, however, infection occurs through the lower surface of the leaf, and is due to the presence of the stomata.

The most favourable temperature for the growth of the mycelium in the tissue (probably about 24°C.) is about the same as the optimum for direct germination in water, and considerably higher than the optimum temperature for indirect germination.

A list of references is attached.—A. B.

Potato Leaf-roll Disease: Nature, Mode of Dissemination, and Control of Phloëm-necrosis (Leaf-roll) and Related Diseases. By Dr. H. M. Quanjer (Wageningen, 1916).—The disease known as leaf-roll, in which the leaf, instead of being flat as in healthy plants, is rolled or curled in various ways, frequently discoloured, and far less efficient as a food-making organ than it ought to be, as is evident from the small number of tubers which the plant produces, is very common in Potatoes in England. Various suggestions have been made with regard to the cause of the disease, and three or four forms have been distinguished. (See JOURNAL R.H.S. xli. p. 383, 1916.) Dr. Quanjer here deals with what is probably the most important of these.

The characteristics of the disease are these: Young plants do not show signs of the trouble, but when about a month old the lower leaves become rigid and pale yellowish in colour, while the margins are rolled upwards. Later the upper leaves also show symptoms of the disease. The discoloration is confined at first to the tips, but later spreads gradually over the whole leaf; while in some varieties a red or violet tinge is evident along the edges of the discoloured part, and the under-sides of the curled leaves often have a bluish gloss, while the plants rattle as one passes among them. The affected plants are scattered here and there in the field, and the disease does not spread from one centre as would be the case with ordinary fungus diseases. Later still the leaf tissue dies here and there, starting from the tips and margins and causing brownish-black spots to appear, which afterwards spread. Diseased plants grow slowly, and unfavourable conditions accelerate the development of the symptoms. When the conditions are particularly unfavourable the plant remains quite small, and the seed tubers will be found unexhausted at the time the crop is lifted. Some plants are attacked only after considerable growth has been made, and these may produce a fair crop. Some varieties seem to be more susceptible than others. Most of the experiments performed by the author have been done with the variety 'Paul Kruger' (raised in Holland in 1896 by crossing 'Imperator' with 'Wilhelm Korn'). This variety

was introduced to this country some years ago, and its name was changed from 'Paul Kruger,' or 'President Kruger' (by which it was also known), to 'President,' and under that name it was widely grown both in Scotland and England. It was found to suffer increasingly from leaf-curl, and at last was practically discarded, not before an attempt was made to select healthy tubers and so to secure an immune stock, which was put on the market under the name of 'Iron Duke,' and which succumbed too. 'Magnum Bonum,' another old variety, and others now in commerce are liable to the disease.

Two or three years ago Dr. Quanjer published an account of observations he had made going to show that in plants affected with leaf-roll the phloëm was altered and its function interfered with. He has extended and confirmed his observations, which met with some amount of criticism at the time they were first published—mainly on the part of those who confused the form of leaf-curl with which he was dealing with other forms—and has made a series of experiments with the object of ascertaining the cause of this diseased condition of the phloëm.

Since the first appearance of the disease, watch has been kept upon it, and it has been found to increase in a district after its first introduction; while, as already noted, selection has given anything but certain results, although at first they appeared quite favourable. This uncertainty suggested that the disease was either communicable or that the Potato was subject to sudden and frequent mutations, or changes produced by no assignable cause. Dr. Quanjer has now experimentally proved by well-controlled experiments that (1) the disease attacks plants from healthy tubers placed in diseased surroundings. (2) If diseased pieces of Potato plants were grafted upon healthy stocks, the latter also became diseased, while other plants from the same tubers not so grafted remained quite healthy. Tomato plants similarly grafted also contracted the disease, but to a much slighter extent. (3) Infection took place when pieces of diseased tubers were grafted upon healthy ones. (4) Soil in which diseased plants had been grown carried the infection, and the infective power of the soil may (in badly tilled ground) be retained for so long as five years. (5) Plants growing in the neighbourhood of diseased plants often contract the disease, although frequently not to a serious extent in the first year, but in the succeeding year their tubers will produce diseased plants. (6) Experiments made with seedlings were somewhat inconclusive, but suggest the probability that the disease is also transmissible to seedlings.

All these experiments point to the contagious character of the disease, but the microscope and cultural experiments have failed so far to demonstrate the nature of the contagium, nor has injection of the juices of diseased plants reproduced the disease. It seems apparent, however, that some sort of virus is concerned, and that it often enters the plant by way of the root and may spread quite early in the season from diseased to neighbouring healthy plants, although the symptoms in these may not be very marked.

From the grower's point of view the practical points that emerge are these: Tubers from diseased plants, even when the disease is but slight, will produce diseased plants, and the symptoms of disease will be most marked when the conditions of cultivation are least favourable to the Potato plant. Susceptible varieties (perhaps all are susceptible, more or less) are likely to contract the disease when planted in infected soil; but in the first year the disease is not likely to be very serious. The remedy lies in the cultivation of Potatos intended for seed purposes in uninfected soil and from healthy tubers. Considerable difficulties lie in the way of this, but until at least the nature of the contagium is known, and the actual method of transference made clear, this is the only means likely to lead to the production of healthy stocks of this most important crop.

F. J. C.

Potato "Leak" Disease. By L. A. Hawkins (*Jour. Agr. Res.* vol. vi. No. 17, July 1916, pp. 627-640; 1 plate, 1 fig.).—Two organisms are found to be the cause of Potato "Leak" Disease, namely *Rhizopus nigricans* and *Pythium Debaryanum*, the latter being more frequently found in the infected tubers. Infection takes place through wounds in the skin, and soon a wet rot is set up which ultimately destroys the entire tuber.

The control measures suggested are a careful sorting of wounded tubers, and care in harvesting and storing the potatos.—A. B.

Potato "Silver Scurf" caused by *Spondylocladium atrovirens*. By E. S. Schultz (*Jour. Agr. Res.* vol. vi. June 1916, No. 10, pp. 339-350; 4 plates).—The author finds that although the conidia range in size from 18 to 64 μ , there is but one species of *Spondylocladium*.

S. atrovirens can withstand a wide range of temperature; its growth is inhibited at 2°C. to 3°C., but it is not killed at - 10°C., while its optimum is from 21°C. to 27°C.

Neutral to slightly acid media are most favourable to the development of the fungus, but 5 per cent. of cane sugar in nutrient agar inhibits sporulation.

The fungus enters the tuber through the lenticels and destroys the epidermis and corky layers, thus accelerating transpiration. Both old and young tubers are liable to infection when stored during winter.—A. B.

Potato-spraying Experiments at Rush, N.Y., 1914. By F. C. Stewart (*U.S.A. Exp. Stn., New York, Bull.* 405, May 1915, pp. 333-339).—The paper details the potato-spraying experiments at Rush, New York, in eighty-two fields, when the following results were obtained:—In fifty-six unsprayed fields the spraying increased the yield by 15.82 bushels an acre, or 8 per cent.; while in twenty-six sprayed fields the yield increased by 13.75 bushels an acre, or 5.5 per cent.

Owing to the favourable weather, potato foliage was remarkably free from diseases and injuries of all kinds, so that large returns from spraying were not to be expected.—A. B.

Potato Stems, The Rhizoctonia Lesions on. By F. L. Drayton (*Phytopathology*, v. pp. 59-63, Feb. 1915; pl.).—The author found the mycelium of the fungus *Corticium vagum* var. *Solani* (*Rhizoctonia*) penetrating the stem and no doubt interfering with the upward and downward flow of the water and food currents.—F. J. C.

Potato, The Verticillium Disease of. By G. H. Pethybridge (*Sci. Pro. Roy. Dublin Soc.* xv. pp. 63-92, March 1916).—The attack of *Verticillium albo-atrum* upon the potato is characterized by diseased plants being rather dwarfier than their fellows, having the lower leaves dead and brown, and the upper ones crowded into a kind of rosette. The leaflets are folded upwards and inwards, thus exposing their lighter lower surfaces. The wood of the vascular bundles is discoloured, but the stems were externally quite sound, and most of the tubers showed a brown discoloured vascular ring at their heel ends. Tubers affected will probably produce diseased crops, and a proper rotation of crops should be maintained.

F. J. C.

Potato Tuber, Effect of Certain Species of Fusarium on the Composition of the. By L. A. Hawkins (*Jour. Agr. Res.* vol. vi. No. 5, May 1916, pp. 183-196).—The effects of *Fusarium oxysporum* Schlecht., and *F. radiculicola* Wollenw., on the sucrose, starch, and fibre content of the potato were studied and the following conclusions arrived at:—

These fungi in the potato tuber reduce the content of sugar, both sucrose and reducing sugar, pentosans, galactans, and dry matter. The starch and methyl pentosans are apparently not appreciably affected, while the crude fibre is not reduced. The two species of fungi secrete sucrase, maltase, xylanase, and diastase, but the last-named enzyme is apparently unable to act upon the ungelatinized potato starch.

A list of short references is given.—A. B.

Potato Tuber Rots Caused by Species of Fusarium. By C. W. Carpenter (*Jour. Agr. Sci.* v. p. 183; Nov. 1915; plates).—Various species of *Fusarium* have been assigned as the cause of tuber rots of the potato. An investigation carried out by the author on these rots adds a new one to the list, and his paper discusses the rôle of *Fusarium Solani* (which he regards as a weak wound parasite under exceptionally favourable conditions), *F. caeruleum* (which occurs as a cause of tuber rot both in Europe and America), *F. Eumartii* n. sp. (the cause of a new wet and dry rot of potatoes in Pennsylvania and New York), *F. radiculicola* (causing jelly-end-rot and dry-rot), *F. oxysporum*, *F. hyperoxysporum* (causing a soft rot in the field), *F. discolor* var. *sulphureum* (occurring in hollows of potato tubers in Germany and U.S.A.), and *F. trichothecioides* (causing a dry-rot of potato tubers in the store, especially in America). *F. radiculicola* caused no rot at 50°F.; a constant storage temperature below 50°F. would prevent the action of *F. radiculicola*, *L. Eumartii*, and *F. oxysporum*. All of these and *F. hyperoxysporum* cause tuber-rot through wound infection.—F. J. C.

Potato Tubers, Biological and Physiological Study of the Rest Period in. By C. O. Appleman (*Bot. Gaz.* lxi. p. 265, 1916).—This article deals with cause and control of the rest period. Thirty-two writers on this subject are referred to. There were two opposing views: Grisebach "considered the yearly

periodicity of plants of temperate regions entirely an hereditary property, induced probably by physiological selection due to alternating conditions through a long series of years"; whereas Sachs believed that the rest period is caused by a deficiency of soluble food, and the cessation of the rest is "due to a gradual production of enzymes." In the "Summary and Conclusions" the author gives his results:

"The carbohydrate transformations during the rest period are entirely dependent upon changing temperatures.

"Active diastase and invertase are present at all stages of the rest period.

"There is no change during the rest period in the relative magnitudes of the forms of nitrogen."

"Metabolism changes begin rather suddenly, and are concurrent with sprouting."

"Drying causes rapid suberization of the skin, and greatly reduces the permeability to water and gases."

"Potatoes may be sprouted at any time during the rest period by simply removing the skin and supplying the tubers with favourable growing conditions, which include in this case the maximum oxygen pressure of the atmosphere. The elimination of the rest period by this means is not due to water-absorption from the exterior.

"Similarly, by cutting tubers into slices with a bud attached, this will sprout sooner.

"It may be safely contended that the elimination of the rest period is correlated with increased oxygen absorption."

This means that the suberized skin prevents oxygen from being absorbed for respiration and metabolism.—G. H.

Potato Tubers, The Value of Immature, as Seed. By H. P. Hutchinson, B.Sc. (*Jour. Bd. Agr.* vol. xxiii. no. 6).—The account of a series of experiments at Garforth, Wye, and Midland Colleges, carried out to test a common and apparently well-founded belief that tubers lifted in an immature or unripe condition give better yields than tubers of the same varieties which have attained their full development. In every case, whether in plot or field experiments, the increased yield from immature tubers, usually lifted in mid or late July according to variety, was very marked. The plants were also more even and better in colour. Suggestions are made to account for this superiority, and it is suggested that it may be due to one or more of the following causes:—Tendency to select small tubers from ripe crop, a large proportion giving plants of medium and low productivity, the selection over a number of years emphasizing this; thinner tuber coat in unripe "seed" rendering absorption of water in growth quicker; amount and condition of reserve food materials, and the greater length of time in storage. G. C. G.

Potatoes, Clean Seed, on New Land in Southern Idaho, Experiments with. By O. A. Pratt (*Jour. Agr. Res.* vol. vi. No. 15, July 1916, pp. 573-575).—It is usually supposed that when disease-free potatoes were planted on new land, the resulting crop would be free from disease. Hence, when the first seed planted in new land in Southern Idaho were far from free of disease, it was naturally assumed that the diseases which appeared were introduced with the seed planted. The diseases most prevalent were wilt (*Fusarium oxysporum* Schlecht.); black-rot (*F. radicicola* Wollenw.); jelly-end-rot (*F. sp.*); powdery dry-rot (*F. trichothecioides* Wollenw.); Rhizoctonia, and common scab.

The results obtained from experiments extending over two years show that:

1. Planting new clean seed potatoes on new land does not guarantee a disease-free product.

2. A smaller percentage of disease may appear in the crop when clean seed is planted on alfalfa (lucerne) or grain land than when similar seed is planted on virgin or raw (uncultivated) desert land.—A. B.

Potatoes, Control of the Powdery Dry-rot. By O. A. Pratt (*Jour. Agr. Res.* vi. pp. 817-831, Aug. 1916; 1 pl.).—The powdery dry-rot of potatoes is produced by the fungus *Fusarium trichothecioides*, which attacks tubers in the store and only through bruises. Badly diseased tubers fail to produce a plant, but slightly diseased ones do not affect the crop. The loss of stored tubers may be kept low by storing in dry, well-ventilated stores, at a temperature of about 35° to 40° F., or by disinfecting the stock before storage with a solution of 4 oz. mercuric chloride in 30 gallons of water, or formalin 1 pint to 30 gallons, provided the steeping is done within 24 hours of digging. The symptoms of the disease are a wrinkled,

sunken appearance on the tubers, which may show the pinkish-white growth of the fungus. The decayed tissue presents various colour shades, from nearly black to light brown.—*F. J. C.*

Potentilla davurica var. **Veitchii** (*Bot. Mag.* t. 8637).—China. Nat. Ord. *Rosaceae*, tribe *Potentilleae*. Shrub, evergreen, 3-5 feet high. Leaves 1 inch long, 3-5 foliolate. Flowers solitary, white, 1 inch across.—*G. H.*

Powdery Mildew in Roses (*Qu. Agr. Jour.* Nov. 1915, p. 298).—Boil 1 lb. of flowers of sulphur and 1 lb. quicklime in 5 pints of water in an earthenware pot for ten minutes. Constantly stir while boiling; then allow to settle, and pour off the clear liquid for use. The plants should be syringed with a mixture of this preparation diluted with a hundred times its bulk in water.
C. H. H.

Primula 'Asthore' (*Irish Gard.* xi, p. 117, Aug. 1916).—This is a hybrid between *Primula Bulleyana* and *P. Beesiana*, and seedlings from it raised in 1914, which have reverted to their ancestors, include orange, orange-red, pink, salmon, and various intermediate shades.—*F. J. C.*

Primula × Edina. By S. Mottet (*Rev. Hort.* Jan. 16, 1916).—Coloured plate showing three varieties, rich orange to red, due to *Cockburnia* blood. Interesting notes in connexion with this and other hybrids.—*C. T. D.*

Primula × kewensis, Genetic Behaviour of the Hybrid. By C. Pellew and F. M. Durham (*Jour. Genetics*, v. pp. 159-182; figs.).—When *Primula verticillata* and *P. floribunda* are crossed either way, plants resembling the seed parent are usually produced; the offspring rarely segregate on being crossed, and generally breed true when selfed. Occasionally hybrids of the form of *P. × kewensis* are obtained as a result of the cross. These hybrids are of two kinds, one partially sterile, the other (with double the number of chromosomes) fertile. *P. × kewensis* selfed generally breeds true, except that it segregates into forms differing in degree of mealiness and in flower colour. Crossed with the parental types maternal hybrids are produced with rare occurrences of segregation. A new type bred from *P. kewensis* × *floribunda*, however, did not breed true, but its seedlings approached *P. floribunda*. One of them on being selfed segregated, giving new forms between *floribunda* and *verticillata*, and varying considerably in shade between the pale *Isabellina* and the full yellow of *floribunda* type and *kewensis*.—*F. J. C.*

Primulas, Notes on Some New. By Murray Hornibrook (*Irish Gard.* xii. Jan. 1917, p. 8; 2 figs.).—The writer confesses that some of the new Primulas do not seem likely to prove "good garden plants," as they require a good deal of care, shade, and plenty of water. *P. Veitchii* is a hardy sort and showy. *P. sinolisteri* is like a small *P. obconica*. The writer then goes on to describe some of the sections of the newer Primulas—the section *Muscarioides* and *Soldanelloides*; the last section comprises some of the loveliest Primulas in existence. Concluding, he gives a few notes on the cultivation.—*E. T. E.*

Productive and Less Productive Sections of a Field. By J. Lyttleton Lyon, J. A. Bizzell, and H. Joel Conn (*U.S.A. Exp. Stn., Cornell, Bull.* 338, Nov. 1913, pp. 49-116; 12 plates).—In a field on Cornell University farm two small tracts of land were noticed in 1905 which were so unproductive, with so little apparent cause for their infertility, that an investigation into this matter was begun by F. R. Reid and J. F. Breazeale. In the course of this work it was shown that soil from the unproductive area, when removed and placed in pots, produced better crops than from the soil of the productive areas in the field, and that this characteristic has remained constant up to the present time.

Experiments by the first two authors of the present bulletin show that this greater productiveness of the poorer soil was largely due to the effect of aeration and caused a great increase in the formation of nitrates. It is therefore concluded that a too compact condition of the soil is the cause of the lessened productiveness of certain sections of this soil for the growth of some crops. This is thought to be due to the adverse effect upon the formation of nitrates; thus the qualities of productiveness, compactness, and rate of formation of nitrates are correlated.

A bacteriological examination by H. Joel Conn showed that, except during the winter, the total number of bacteria was higher in the more compact and less productive sections of the field. The difference in total numbers lies wholly in the group known as 'slow growers.' Rapid liquefiers are often even fewer in the less productive than in the more productive sections.

No type of bacteria found frequently in one soil was lacking in the other. A short bibliography is appended.—*A. B.*

Prunes and Cherries, Brown Rot of. By Chas. Brooks and D. F. Fisher (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 368, March 1916, pp. 1-10; 3 plates).—For several years the growers of lower Columbia and Willamette Valleys have had severe losses of the prune and cherry crops. The blossoms and fruits became blighted, and numerous masses of spores of *Sclerotinia cinerea* (Bon.) Wor. were observed. Later, apothecia were developed, which persisted for many months upon the dried fruit and blossoms, and these caused infection to take place the following spring.

As a result of several years' experience, the authors suggest that for prunes the following schedule of spraying be followed. The solutions recommended are self-boiled lime-sulphur or Bordeaux mixture.

1. The first application just before the blossoms open.
2. The second application just after the petals have fallen.
3. The third application three or four weeks after.
4. The fourth application about four weeks before harvesting.

While the work on cherries has not been carried out as fully as that for prunes, it seems probable that a treatment for cherries similar to that for prunes would give satisfactory control of both the blossom infection and the later brown-rot attacks on the fruit.—A. B.

Pruning. By W. M. Atwood, E. J. Kraus, C. I. Lewis, and V. R. Gardner (*U.S.A. Exp. Stn., Oregon, Bull.* 130, May 1915; figs.)—This gives a clear and well-illustrated account of the pruning of young trees and bearing trees in the orchard, together with the reasons for pruning. The modes of regulating the shape of young trees are particularly well dealt with.—F. J. C.

Prunus Maximowiczii (*Bot. Mag.* t. 8641).—North-Eastern Asia. Nat. Ord. *Rosaceae*, tribe *Pruneae*. Tree, 30 feet high. Leaves ovate, 4 inches long. Racemes corymbose, 1-2 inches wide, 5-8-flowered. Bracts conspicuous, $\frac{3}{8}$ inch long. Flowers $\frac{5}{8}$ inch wide, white. Fruit globose, $\frac{1}{4}$ inch wide, at first red, then black.—G. H.

Pumpkin Seed, Pure Strains of. By C. T. Musson (*Agr. Gaz. N.S.W.* vol. xxvi. pp. 851-861; 2 figs.)—It is a moot point whether two-year-old pumpkin seed gives better results than new seed. To improve the strain of seed, sow iron-bark pumpkin seed. When the female flowers appear, cover the flowers of selected plants with paper bags to keep off bees and other insects. When the flowers open, fertilize them with the pollen from other plants and replace the bags. In fourteen days the bags may be removed. Save this seed and also some from selected naturally-fertilized plants. In the following year sow both kinds of seed. Again fertilize as in the previous year and save both kinds of seed. In the third year sow the two kinds of seed and also seed saved from the first year, and compare the results.—S. E. W.

Pyracanthas, Two New. By A. Bruce Jackson (*Gard. Chron.* Dec. 30, 1916, p. 309; with 3 figs. and Latin diagnoses).—Both are from W. China, one is described as a variety *Rogerstiana* of *P. crenulata*, the other as a distinct species, *P. Gibbsii*. Both are hardier than the older plant, and ornamental in flower and berry.—E. A. B.

Radium Effects on Vegetation. By D. Bois and G. T. Grignan (*Rev. Hort.* Oct. 16, 1915).—Refer to the experiments of Mr. Sutton in this direction, which gave generally unfavourable results.—C. T. D.

Raspberries, Marketing. By H. J. Ramsey (*U.S.A. Exp. Stn., Bull.* 274, 37 pp.; 26 figs.)—Deals with marketing problems, picking, packing, precooling, and refrigerating.—E. A. Bd.

Raspberry, Breeding. By R. D. Anthony and U. P. Hedrick (*U.S.A. Exp. Stn., Geneva*, 14 pp.; 8 plates).—Work undertaken to settle the question of the hybrid origin of the purple Raspberry (Peck's *Rubus neglectus*). The results convince the authors that it is undoubtedly a hybrid of the Black Cap and Red Raspberry. *Rubus odoratus* and the Herbert Raspberry gave fertile seedlings of strong growth. Several curious abnormalities appeared, which are described. A very interesting step in an experiment of much promise.—E. A. Bd.

Rhododendron carneum (*Bot. Mag.* t. 8634).—Upper Burma. Nat. Ord. *Ericaceae*, tribe *Rhodoreae*. Shrub, 3 feet high. Leaves, 4 inches long, $1\frac{1}{2}$ inch wide. Corolla flesh-coloured, lobes spreading, 3 inches across.—G. H.

Rhododendron Charianthum (*Bot. Mag.* t. 8665).—Western China. Nat. Ord. *Ericaceae*, tribe *Rhodoreae*. Shrub. Leaves 2 inches long. Flowers 9–10 in a flat corymb, $3\frac{1}{2}$ inches across. Corolla 2 inches across, rose-coloured, densely blotched with red spots within upper part.—*G. H.*

Rhododendron decorum (*Bot. Mag.* t. 8659).—Western China. Nat. Ord. *Ericaceae*, tribe *Rhodoreae*. Shrub, 16 feet. Leaves 3–5 or 8 inches long. Inflorescence 10-flowered, 8 inches across. Corolla usually white or flushed with rose, $3\frac{1}{2}$ inches across. Lobes 7, nearly orbicular. Stamens 16, anthers pale brown.—*G. H.*

Rhododendron erubescens (*Bot. Mag.* t. 8643).—Western China. Nat. Ord. *Ericaceae*, tribe *Rhodoreae*. Shrub. Leaves 3–4 inches long. Flowers about 8 in a truss. Corolla white within, rose-carmine without, $2\frac{1}{2}$ inches across, 7-lobed.—*G. H.*

Rhododendron Hanceanum (*Bot. Mag.* t. 8669).—Sechwan (China). Nat. Ord. *Ericaceae*, tribe *Rhodoreae*. Shrub, dwarf, 3 feet high. Leaves 3 inches long. Inflorescence 6–9-flowered. Corolla white, 1 inch across.—*G. H.*

Rhododendron hypoglaucom (*Bot. Mag.* t. 8649).—Western China. Nat. Ord. *Ericaceae*, tribe *Rhodoreae*. Shrub or small tree. Leaves 3–4 $\frac{1}{2}$ inches long, green above, glaucous-white beneath by a farinose tomentum. Truss, 4–7-flowered. Corolla 2 inches across, white, flushed with rose, upper petal dotted with crimson within face.—*G. H.*

Rhododendron monosematum (*Bot. Mag.* t. 8675).—Western China. Nat. Ord. *Ericaceae*, tribe *Rhodoreae*. Shrub. Leaves 3–4 $\frac{1}{2}$ inches long. Inflorescence 12-flowered. Corolla wide funnel-shaped, white, suffused with rose-pink, $1\frac{1}{2}$ inch across.—*G. H.*

Ribes divaricatum × **Gooseberry** (*Rep. Bot. Off., Brit. Col.* i. 3, p. 85; 1916).—The raising and fruiting of a hybrid between *Ribes divaricatum* and the Gooseberry 'Red Jacket' (an American variety immune from American Gooseberry mildew and derived from Warrington × Houghton's Seedling) is recorded. The fruits are somewhat small, and generally like those of the pollen parent, but the raiser, Mr. G. Fraser, F.R.H.S., of Ucluelet, B.C., is endeavouring to improve the fruit by further crossing.—*F. J. C.*

Root-rot Fungus (*Thielavia*), **How to Disinfect Tobacco Plant Beds from.** By A. D. Selby, T. Houser, and J. G. Humbert (*U.S. Exp. Stn., Ohio, Circ.* 156, Oct. 1915).—*Thielavia basicola*, which causes root-rot of a large number of different plants (see *Jour. R.H.S.* xxxvii. p. 541), overwinters in the soil, so that successive crops are liable to be attacked. Two methods of soil treatment are recommended: (1) steaming, and (2) formalin drench. The steaming is the more effective, especially on heavy land. The formalin treatment is successful on gravelly land. In both cases the soil is prepared as in making a seed-bed, though the surface need not be rendered so fine. The inverted-pan method of steaming is recommended, and the formalin should be dissolved at the rate of 1 gallon to 100 of water. Very dry soil conditions do not yield the best results, but the drenching is best done in autumn, as in spring the soil is apt to be too wet. Figures of the construction of the inverted pan for steaming are given.—*F. J. C.*

Root-rot of Walnut (*Jour. Dep. Agr. Vict.* Dec. 1915, p. 747).—Where this toadstool disease (*Armillaria mellea*) attacks a tree, the tree should be grubbed up and burnt upon the spot, and, before replanting, the soil for some distance around the affected spot should be thoroughly turned over and watered with 1 lb. of sulphate of iron dissolved in 4 or 5 gallons of water, or 1 lb. of sulphate of copper (blue-stone) dissolved in 8 gallons of water. This fungus is hemisaprophytic, *i.e.* it lives upon dead and decaying wood as a saprophyte and becomes purely parasitic by preying upon living tissue.—*C. H. H.*

Root Systems of Fruit Trees. By A. B. Ballantyne (*U.S.A. Exp. Stn., Utah, Bull.* 143, 15 pp.; 5 figs.).—The root systems of several established trees are examined and plotted. The stocks on which the trees were grafted are not named. The depth of the root approaches in some cases the height of the tree. Watering in early stages will produce a symmetrical system.—*E. A. Bd.*

Root-tubercles and the Influence of Nitrates as Manure. By A. J. Ewart, D.Sc. (*Jour. Dep. Agr. Vict.* Dec. 1915, p. 759).—Broad beans manured with nitrate of soda, others with nitrate of potash compared with no manure, in single and double rows, the total result showed 12.5 tons an acre with 95 lb. sodium nitrate an acre, 13.9 tons with 1 cwt. potassium nitrate an acre and 12.7 tons controls. Root-tubercles were abundant on all the plots; there was no evidence of any suppression of root-tubercle formation by potassium nitrate or by sodium nitrate in the quantities applied. The largest root-tubercle was found on a plant from the control plots, but there was no generally greater abundance or size of the root-tubercles in the plants of the control plots as compared with the others. Hence, although the nitrates used did not diminish appreciably the formation of root-tubercles, their use as manures in the case in question would have been highly unprofitable, the plants being able to gain all the nitrogen they required through their root-tubercles and from supplies already present in the soil.—C. H. H.

Roots, The Orientation of Primary Terrestrial, with Reference to the Medium in which they are Grown. By Richard M. Holman (*Amer. Jour. Bot.* vol. iii. No. 6, June 1916, pp. 274-318; 7 figs.).—The following conclusions were obtained from a series of experiments on the roots of *Vicia-Faba* L. (var. *major* and var. *equina*), *Lupinus albus* L., and *Pisum sativum* L., grown in various media.

1. The difference in the behaviour relative to gravity of roots in air and in earth is not due to differences in the amount of water in the media.

2. The difference in behaviour is not the result of change in the geotonus of the roots due to their stay in air, whether weakening or loss of geotropism as Sachs suggested, or assumption of plagio-geotropism as Nemec reported.

3. That, as was shown by experiments with media, the resistance of which to the root's advance could be widely varied, the failure of the roots in air to reach the vertical is due to the absence of mechanical resistance to the advance of the root tip through that medium.

4. The secondary curvature of roots in earth, sand, sawdust, Sphagnum, or other such media, is complete because the resistance of these media to the advance of the root tip causes passive depression of the root and prevents the complete flattening of the tip curvature.

5. That thigmotropism is not a factor in the difference in the behaviour of roots in air and in earth, or other non-fluid media.

6. The resistance offered by the medium to movements of the root tip influences not only the course of the secondary curvature, but also the course of the primary curvature; that is, the curvature directly following the placing of the root in a position of stimulation.—A. B.

Rose, American Pillar. By S. Mottet (*Rev. Hort.* Oct. 16, 1915).—One illustration of this splendid climber and describing its robust habits.—C. T. D.

Roses, Recent Chinese. By R. A. Rolfe (*Gard. Chron.* July 22, 1916, p. 37).—*Rosa Davidii*, *R. corymbulosa*, *R. setipoda*, *R. Sweginzowii*, *R. sertata*, *R. elegantula*, and *R. Moyesii* described from observations of their habit and flowering at Kew.

E. A. B.

Roses, War (*Le Jard.* vol. xxx. p. 76; 3 figs.).—'Constance' resembles 'Rayon d'Or,' but is much superior. It is hardy and vigorous, with long orange-yellow buds, streaked with crimson. The large flowers are cadmium-yellow when they open, and change to golden-yellow. 'Admiral Ward,' a hybrid tea of vigorous and erect habit, is very floriferous. The buds are dark red, and the velvety flowers are crimson, shaded with bright red and purple.

'Gloire des Belges,' a seedling from 'Mme. Abel Châtenay,' is valuable for cut flowers, as the long stems bear a number of buds which open in water. The buds are crimson in colour. The flowers are large and double.—S. E. W.

Salpiglossis, Gloxinia-flowered. By S. Mottet (*Rev. Hort.* Dec. 16, 1915).—Coloured plate showing six varieties, very handsome.—C. T. D.

Saxegothaea conspicua (*Bot. Mag.* t. 8664).—Chile. Nat. Ord. *Taxaceae*. Tree, 30-40 feet high, or a shrub. Leaves persisting for 4-5 years, linear, $\frac{1}{2}$ inch long. Female cones subglobose. Fruit fleshy.—G. H.

Sclerotinia sp. on Ginseng. By J. Rosenbaum (*Jour. Agr. Res.* v. p. 291, Nov. 1915).—Two rots of the valuable medicinal plant ginseng have been described, a white rot and a black. The former is proved to be due to the *Sclerotinia*

sp. which occurs on lettuce, celery, &c., known as *S. Libertiana*, the latter to *Sclerotinia Panacis*, which cultivation proves to be identical with *S. Smilacina*, which also occurs on *Smilacina racemosa*. The lesions produced on the two hosts are identical.—*F. J. C.*

Seed Sterilizer, Calcium Hypochlorite as a. By James K. Wilson (*Amer. Jour. Bot.* vol. ii. No. 8, Oct. 1915, pp. 420-427).—For many physiological experiments, seeds and seedlings free from bacteria and fungus spores are necessary. Numerous disinfectants have been tried from time to time by many investigators, with but indifferent results. The author has tried mercuric chloride, alcohol, formalin, hydrogen peroxide, and combinations of these substances, but has found them to be unsatisfactory. He now recommends calcium hypochlorite (bleaching powder), used in the following manner: 10 grams of commercial chloride of lime (with 28 per cent. available chlorine) is mixed with 140 cc. of water. The mixture is allowed to settle for ten minutes and the liquid decanted off or filtered. The filtrate, containing about 2 per cent. chlorine, is used as the disinfectant. Dilutions from this strength as well as the full strength may be used in the proportion of five volumes of the solution to one volume of the seed. The time required for sterilizing the seeds varied from four hours to twenty-four hours; if left over this period, injury to seeds was caused. Satisfactory sterilization was secured in every case with the exception of vetch seed, while in the case of seedlings this sterilization was maintained over a period of thirty days or more, and demonstrated the efficiency of this method as a means of securing sterile seedlings. It is also of service in eradicating such plant diseases as may be controlled by treating the seed. It is suggested by Hooker that this effect is probably due to the hypochlorous acid which acts as the toxic agent. There is appended a short bibliography, giving references to previous work in this subject of seed sterilization.—*A. B.*

Seeds, Mechanics of Dormancy in. By Wm. Crocker (*Amer. Jour. Bot.* vol. iii. No. 3, March 1916, pp. 99-120).—Dormancy in plants is common in three organs, seeds, spores, and buds. That in seeds has been studied in detail by the author, who arrives at the following conclusions:—

Dormancy in seeds results generally from the inhibition of one or more of the processes preceding or accompanying germination. The problems are becoming questions of the conditions for growth of the embryo, and the fundamental changes occurring in the embryo at the beginning of germination; as well as of a study of the physical characters (permeability and breaking strength) of the colloids of the seed-coats as affected by age, various conditions, and reagents.

Seed-coats play an important rôle in primary and secondary dormancy. Often they are of such a colloidal nature as to be modified by even very low concentrations of reagents. In the past, such results have been interpreted wrongly as stimulus responses.

Regarding conditions of germination of seeds, the recent trend is towards the need of certain general physical conditions and away from the need of specific chemical stimuli.

After-ripening of seeds may involve growth of a rudimentary embryo, fundamental chemical changes in an otherwise mature embryo, or chemical changes in the seed-coats. In after-ripening there is often a complex interrelation between coat and embryo changes.—*A. B.*

Senile Changes in Leaves of *Vitis vulpina* L., and certain other Plants. By H. M. Benedict (*U.S.A. Exp. Stn., Cornell, Mem.* No. 7, pp. 281-370, 1915). "An attempt to answer the question whether general progressive age-changes occur during the vegetative life of a woody perennial." The author's observations concern primarily the size of the aggregations of photosynthetically active cells, the vein islets in the meshes of the network of veinlets, or in other words the size of the meshes. The results of his observations show that "The size of the vein islets remains constant, if of the same age. The areas and thickness of the leaves show more variation than the minimum and maximum areas of the vein islets in different leaves of the same plant. The size of the vein islets is greatest in the youngest leaves, and undergoes a progressive decrease with advancing age. Other age-changes determined in the leaves of *Vitis* are decrease in rate of CO₂ production, decrease in imbibition of water by powdered leaves, decrease in acidity, increase in number and decrease in size of stomata, and probably a decrease in size of palisade cells and an increase in the proportion of cytoplasm to nucleus."—*G. H.*

Sievekingia Sheppardii (*Bot. Mag.* t. 8635).—Colombia. Nat. Ord. *Orchidaceae*, tribe *Vandaeae*. Herb, epiphytic. Pseudo-bulbs 2-foliolate. Leaves acuminate, 5–8 inches long. Scape erect, 4 inches long, many-flowered, yellow, $\frac{3}{4}$ inch across. G. H.

Sodium Salts in the Soil, The Effect of, upon Plant Growth. By F. B. Headley, E. W. Curtis, and C. S. Scofield (*Jour. Agr. Res.* vol. vi. No. 22, Aug. 1916, pp. 857–870; 8 figs.—Attempts were made to utilize for crop production certain salt lands at Fallon, Nevada, U.S.A., and experiments were devised to determine the limit of tolerance of the crop plants in such soil to the common salts of sodium.

It was found that only a part of the salt added to the soil in pot cultures could later be recovered from it by water digestion; this apparent loss of salt was greater in the case of sodium carbonate and sodium sulphate than with sodium chloride.

When sodium carbonate was added to a soil, the absorption was greater in fine soil rich in organic matter than in sand.

The carbonates and bicarbonates of sodium are mutually interchangeable in the soil, and the toxicity of the soil solution appears to depend upon the quantity of the basic radical held in the soil, regardless of the form of the acid radical.

In the case of the soil from the salt land, the proportion of recoverable salt, which would reduce by one half the growth of wheat seedlings, was, for the carbonates, 0.04 per cent. of the dry weight of the soil; for the chlorides, 0.16 per cent.; and for the sulphates, 0.35 per cent.

The proportion of recoverable salt which prevented germination of wheat was, for the carbonates, 0.13 per cent.; for the chlorides, 0.52 per cent.; and for the sulphates, 0.56 per cent.—A. B.

Soil, Actinomycetes in, A Possible Function of. By H. J. Conn (*U.S.A. Exp. Stn., New York, Tech. Bull.* 52, March 1916, pp. 1–11).—The author considers that *Actinomycetes* are active in the decomposition of grass roots, and finds that in general more colonies of *Actinomycetes* are present in sod soil than in cultivated soil. The results of plate cultures show the proportion of 38 per cent. of the total flora of sod soil, but only 20 per cent. of the total flora of cultivated soil consisted of *Actinomycetes*. It appears that the numbers are even greater in old grass land than in grass land of two or three years' standing.—A. B.

Soil, Bacteriological Studies of, under Different Cropping for Twenty-five Years. By P. L. Gainey and W. M. Gibbs (*Jour. Agr. Res.* vol. vi. No. 24, Sept. 1916, pp. 953–975).—The plots have been under cultivation since 1889, and are located in the land of the Missouri Experimental Station. Each plot consists of one-tenth of an acre and is surrounded by a path 3 feet wide.

The following is a summary of the results:—

1. The agricultural methods practised upon these plots have brought about marked differences in the number of organisms contained in the soil. The soil under continuous corn and wheat contains relatively low numbers of bacteria, in the absence of manure and fertilizers. The presence of manure largely increases the number of bacteria upon continuous wheat and corn lands.

2. The agricultural practices have produced no appreciable effect upon the ability of the soil and its organic life to liberate ammonia from cotton-seed meal.

3. The ability of the soil complex to oxidize ammonia nitrogen to nitrate nitrogen has been materially altered by the methods under study. Continuous corn and wheat with no manures or fertilizers have brought about a relatively low oxidizing power in the soil complex. The addition of manure largely raises the oxidizing power upon such land.—A. B.

Soil Fumigation, A New Method. By J. S. Houser (*Jour. Econ. Entom.* ix. p. 285, April 1916).—Carbon bisulphide poured into the soil is quickly absorbed by it, and the fumes are liberated but slowly. The author proposes to blow the fumes into the soil (for killing ants and other soil insects) by placing the carbon bisulphide in a wide-mouthed bottle through the cork of which two tubes pass, one reaching into the liquid at the bottom, the other only a short distance into the bottle. To the former a pump is attached, and air charged with the carbon-bisulphide fumes is driven out of the other through an attached tube into the soil by working the pump.—F. J. C.

Soil Micro-organisms, Longevity of, Some Factors Influencing the. By W. Giltner and H. V. Langworthy (*Jour. Agr. Res.* vol. v. No. 20, Feb. 1916, pp. 927–942).—Experiments were made to determine whether an organism

may receive protection from the solution in which it is suspended, before being subjected to desiccation in sand. Cultures of *Pseudomonas radicolica* were used and the following solutions were employed :

1.	Physiological salt solution ;		
2.	"	"	+ 0.1 per cent. of agar.
3.	"	"	+ 0.1 " " gelatine.
4.	"	"	+ 0.1 " " albumin.
5.	"	"	+ 0.1 " " gum arabic.
6.	"	"	+ 0.1 " " soluble starch.

Suspension of the bacterial growth from agar slopes was made in 250 cc. of each of the above solutions ; and sterile quartz sand was inoculated with 5 cc. of the solutions. At intervals, the number of organisms in one gram of sand was determined by plate cultures. Other experiments were made using clay, clay loam, sandy loam, in place of sand.

The general conclusions were :—

1. Bacteria, at least those tested, resist desiccation longer in a rich clay loam than in sand under the conditions of these experiments.

2. If bacteria are suspended in a solution extracted from a rich clay loam, before being subjected to desiccation in sand, they live longer than if subjected to desiccation after suspension in physiological salt solution.

3. The survival of non-spore-bearing bacteria in air-dry soil is due, in part, to the retention by the soil of moisture in the hygroscopic form. This, however, is not the only factor, for the longevity of bacteria in a soil is not directly proportional to its grain size and hygroscopic moisture.—A. B.

Soil Protozoa, Separation of. By N. Kopeloff, H. C. Lint, and D. A. Coleman (*Jour. Agr. Res.* v. No. 3, Oct. 1915, pp. 137-140).—Gives a brief account of a method of filtration whereby flagellates, small ciliates (12 to 20 μ), and large ciliates (25 to 60 μ) were readily separated from an eight-day culture on a soil medium.

It is shown that the three types of protozoa can easily pass through the pores of a filter, but can be arrested if various thicknesses of filter paper are used. With one thickness no large ciliates passed through, while with four thicknesses only flagellates were able to pass through. With five thicknesses no protozoa, whether flagellate or ciliate, were found in the filtrate. It is suggested that in this way it becomes possible to use mass cultures of flagellates, small ciliates, or large ciliates, as may be required in experimental work on soil protozoa.

A. B.

Soil, Spore-forming Bacteria in the ; their Significance, if any. By H. Joel Conn (*U.S.A. Exp. Stn., New York, Tech. Bull.* 51, March 1916, pp. 1-9).—As a result of his experiments, the author doubts the common assumption that spore-bearing bacteria (*e.g. B. mycooides, B. cereus, B. megatherium*) are important ammonifiers in the soil. They raise the question as to what possible soil conditions favour their growth and multiplication.

The number of spore-bearing bacteria is relatively constant, and is about the same in all the soils studied. Three of the commoner spore-bearing bacteria were selected for comparison, because their colonies on gelatine plates are easily distinguishable. The total number of these three organisms (*B. mycooides, B. cereus, B. megatherium*) proved to be between 400,000 and 1,500,000 per gram in the soils studied. They always comprised less than 10 per cent., and usually less than 5 per cent., of all the colonies developing on gelatine.

When soil infusion was heated, before plating, at a temperature (75°-85°C.) high enough to kill the vegetative forms of bacteria, nearly if not quite as many colonies of these spore-forming bacteria developed as when it was plated unheated. In about one-third of the cases, indeed, their numbers were actually slightly higher on the plates made after heating. This suggests that these bacteria occur in normal soil as spores rather than in a vegetative state.

No increase in the total number of these organisms, nor increase in the number of their spores, could be detected in a pot of soil to which fresh manure had been added.—A. B.

Soil, Studies of a Scottish Drift. Part I. By James Hendrick and William G. Ogg (*Jour. Agr. Sci.* vol. vii, pt. 4, pp. 458-469).—Part I. of this investigation deals with the composition of the soil and of the mineral particles which compose it. The soil is that of the farm of Craibstone, which is the experimental station of the North of Scotland College, and is situated six miles from Aberdeen. The samples were first mechanically analysed under the six standard

sizes of particles as adopted by the Agricultural Education Association. A chemical analysis of the soil did not throw much light upon the origin of the characteristics which distinguish it from south of England soils of similar (glacial) origin, and it was therefore decided to make separate chemical analyses of the six mechanically separated fractions. A comparison of the chemical composition of corresponding fractions of northern and southern soils shows at once that the fractions agreeing in the size of their constituent particles are chemically very different. The three coarser fractions of English soil contain over 94 per cent. of silica, and consist mainly of powdered silica. The similar Craibstone fractions contain 85 per cent. of silica at the most. On the other hand, they contain up to 13 per cent. of alumina as compared with 3 per cent. in the English fractions, and they also contain much more potash and lime. (For example, in the "coarse sand" fraction the Craibstone soil has 1.79 CaO and 1.78 K₂O, as against .4 and .8 respectively in the English fractions.) It is observed that a similar difference holds between certain Welsh and American drift soils on the one hand and the English drift soils on the other. It is a difference which should be carefully borne in mind in comparisons of the two types of soil. The difference is assigned by the authors to the English soils having undergone a much more profound chemical weathering, while the Scotch soils consist of original granitic minerals, mechanically ground, with only superficial chemical alteration.

It is noteworthy that, as in the case of some Welsh soils, the Craibstone soil, though fertile, contains absolutely no lime as carbonate.—*J. E. W. E. H.*

Soil Temperatures as Influenced by Cultural Methods. By J. Oskamp (*Jour. Agr. Res.* v. pp. 173-184, Oct. 1915).—The data discussed in this paper were obtained from an apple orchard on a clay-silt soil under (1) tillage with cover crop, (2) straw mulch, and (3) grass. The maximum and minimum for each week during which the experiment lasted are given, and the result shows that under a system of clean cultivation with a winter cover crop extreme diurnal and annual fluctuations in soil temperatures are experienced; and that straw mulch reduces these fluctuations to a marked extent, as does grass, though to a less degree.—*F. J. C.*

Soils of Massachusetts and Connecticut, with Special Reference to Apples and Peaches. By Henry J. Wilder (*U.S.A. Dep. Agr., Bull.* 140, 73 pp.; xxi plates).—An extremely interesting study of adaptability of varieties to certain soils, a study as yet in its infancy, but showing great promise for the future.—*E. A. Bd.*

Solanum grandiflorum. By Max Garmer (*Rev. Hort.* June 16, 1916; one illustration).—Description of this, the largest-flowered *Solanum* and a very handsome, robust plant. Flowers blue, fading to light violet.—*C. T. D.*

Sophora macrocarpa (*Bot. Mag.* t. 8647).—Chile. Nat. Ord. *Leguminosae*, tribe *Sophoreae*. Tree of small stature. Leaves pinnate, 6 inches long. Racemes 10-flowered. Corolla 1 inch long beyond calyx, yellow.—*G. H.*

Sophrolaella × 'Psyche' (*Bot. Mag.* t. 8654).—Garden Hybrid. Nat. Ord. *Orchidaceae*, tribe *Epidendreae*. Herb, epiphytic, pseudo-bulbs clustered, 1-foliate. Leaves 3-5 inches long. Flowers orange-yellow, 1½ inch across. Sepals (yellowish below) and petals lanceolate and slightly recurved.—*G. H.*

Spray-fluids, The Fungicidal Properties of Certain. By J. Vargas Eyre and E. S. Salmon (*Jour. Agr. Sci.* vol. vii., part 4, pp. 473-507).—The fungicidal action of alkaline sulphide solutions has been variously attributed by different observers to the free alkali which they contain, to the free sulphur which they deposit in a finely divided state, and to the oxidation of the sulphur. Moreover, the literature of the subject does not afford definite information as to the strength at which the solutions have been found to be fungicidal. As a 0.38 per cent. iron sulphide fluid has been recently adopted, in Oregon, as a standard summer spray for apple and rose mildew, an examination of that fluid was included in the present investigation. The plants used were one- or two-year-old hop seedlings bearing "powdery mildew," and gooseberry bushes infected with American gooseberry mildew. Careful determinations of the exact chemical composition of the spraying materials used—namely soft soap, saponin, liver of sulphur, yellow ammonium sulphide, colourless ammonium sulphide, colourless ammonium hydrosulphide, lime-sulphur, iron sulphide, and caustic soda—were made. The following results were obtained:—(1) Soft soap and saponin have no fungicidal action. (2) A 1 per cent. solution of caustic soda usually kills the mildew, but at the same time severely scorches the leaves. (3) A 4 per cent.

solution of ammonia is necessary to check the mildew, but at this concentration the leaf tissue is seriously injured. (4) A 0.3 per cent. of liver of sulphur (containing 0.13 per cent. of sulphide sulphur), which is the strength usually recommended, is quite ineffective, but a 0.8 solution containing 0.34 per cent. of sulphide sulphur is almost completely fungicidal. Concentrations beyond 0.3 per cent., however, cause serious scorching of gooseberry leaves. (5) Yellow ammonium sulphide containing 0.13 per cent. of sulphide sulphur and 1 per cent. of soft soap was completely fungicidal and caused no injury to the leaf tissue. (6) Colourless ammonium sulphide and ammonium hydrosulphide, each containing sulphide sulphur in excess of the preceding, had little or no fungicidal effect. (7) A lime-sulphur solution having a sp. gr. of 1.01 and containing 0.25 per cent. of saponin (soft soap cannot be used with lime-sulphur) was completely fungicidal. (8) A 0.6 per cent. solution of iron sulphide containing 0.5 per cent. of soft soap was invariably fungicidal and caused no injury to the leaf tissue. The failure of the alkaline fluids, containing sulphur only in the sulphide form, appears to point to the polysulphides as being the active fungicidal agents, and it is probable that their effect is a result of the deposition of finely divided sulphur. Detailed directions are given for the preparation of the solution of yellow ammonium sulphide with soft soap, of lime-sulphur with saponin, and of iron sulphide with soft soap.—*J. E. W. E. H.*

Spray-fluids, their Application to Dormant Trees. By A. H. Lees (*Ann. Rep. Agr. Res. Stn., Long Ashton, 1915, p. 81*).—Experiments were made to ascertain the temperature at which water would need to be applied in winter in order to kill the eggs of insects, and 70°C. (158°F.) was found to kill some; but, owing to the great reduction in temperature when a liquid is applied as a fine spray, that temperature at application time was found impracticable of attainment, and the idea of hot water spraying for the purpose of killing insect eggs was abandoned. Soap and nitrobenzene; soap, nitrobenzene, and paraffin; soap and sodium carbonate, and soap and sodium sulphate were also used, but without success. Bleaching-powder mixed with lime, however, gave promising results, and further experiments are in progress with it.—*F. J. C.*

Statice as Represented at Blakeney Point, The Morphology and Anatomy of Genus. By E. de Fraire (*Ann. Bot. vol. xxx. No. 118, p. 239; April 1916; figs.; Part I.*).—An account of the investigation of the various species of *Statice* at Blakeney Point, Norfolk. The area shares with the neighbouring Burnham-Brancaaster system the distinction of possessing every British species of the genus with the exception of *S. Dodartii* (Gri.). The present paper is confined to *S. binervosa* (G. E. Smith), *S. bellidifolia* (D.C.) and a hybrid, all of them of the shingle banks and lows. The habitat of *S. binervosa* is banks of bare shingle, of which the interspaces are filled with sandy mud, and is only reached by the highest tides. This species is the least maritime of those in the area, and this is in harmony with the fact that it will flourish and flower for years in normal garden soil. On the crests of the banks, and if competition is not too severe, the plants will attain a height of 8.5 inches as compared with 4.18 inches for those from the flanks. *S. bellidifolia* (= *reticulata*) on the other hand occurs in situations reached by all but the lower tides, which may be flooded periodically for a considerable time. Descriptions of the morphology and anatomy are given which show how they are adapted to their different localities, and among the details may be mentioned the mucilage glands whose function is to prevent desiccation of the apex by checking too rapid transpiration; the structure of *S. binervosa* which is formed to withstand the pressure of shingle and scarcity of water; the root of *S. bellidifolia* which, with few xylem fibres and abundant wood parenchyma, is of the marsh type with an aerating cortex. Part II. will deal with the species more particularly characteristic of the salt marsh.—*G. D. L.*

Stone-fruit Diseases. By G. P. Darnell-Smith and E. Mackinnon (*Agr. Gaz. N.S.W. vol. xxvi. pp. 749-753; 4 figs.*) (*cont.*).—Rust is caused by the parasitic fungus *Puccinia Pruni-spinosae*, which attacks the leaf, fruit, and stem of the peach, the leaf and fruit of the almond and apricot, and the leaf of the plum and nectarine. The affected parts should be destroyed, and a thorough spraying with Bordeaux should be given before the buds burst in spring. Later spray with lime-sulphur. Similar treatment is recommended for peach freckle or black-spot, due to *Cladosporium carpophilum*. This disease makes shot-holes in the leaves, brown marks on the stems, and spots on the fruit.—*S. E. W.*

Stone Fruits, A Bacterial Disease of. By F. W. Rolfs (*U.S.A. Exp. Stn. Cornell, Mem. No. 8, July 1915, pp. 372-436; 11 figs.*).—Cultivated varieties of the apricot (*Prunus armeniaca*), the nectarine (*P. persica* var. *nectarina*), the

peach (*P. persica*), and the plum (*P. domestica*, *P. americana*, &c.) are all attacked by a bacterial disease which causes "shot-hole" leaves and "black-spot" fruit, as well as cankers on the branches of these trees. The disease is of American origin and is only known in the United States. It causes extensive damage in the more humid districts of the South.

The common fungus disease of plum and apricot foliage (*Cylindrosporium Padi*) shows similar symptoms to this bacterial leaf-spot disease, but can be readily distinguished from it by forming a white downy growth on the lower surface of the spot.

The bacterium was first described by Smith and named *Pseudomonas Pruni*, but later this name was altered to *Bacterium Pruni*. Conclusive proof of the pathogenic nature of the organism was obtained by Dr. E. F. Smith by inoculating the foliage and fruit of the plum 'Abundance.' The author repeated and confirmed this on the plum, and extended the infection experiments to the apricot, nectarine, and peach. Details are given of the behaviour of the bacterium in various cultural media. Experiments were made to determine the susceptibility of different varieties of the various hosts to the disease.

The chief hope of control lies in the production of resistant varieties of trees by careful selection and crossing.—A. B.

Storage Rots, Temperature Relations of some Fungi causing. By A. Ames (*Phytopathology*, v. pp. 11-21, Feb. 1915).—A series of experiments was undertaken to ascertain the temperature at which germination, growth, and death occurred in the rot-producing fungi mentioned below. All are common on various fruits in store, but the author found that different strains of a species differed somewhat in their temperature relations. At 1-2°C. *Thielaviopsis etheticus*, *Monilia fructigena*, *Rhizopus nigricans*, *Glomerella rufomaculans*, and *Cephalothecium roseum* made no growth, while *Penicillium glaucum* formed a few small colonies in a few cultures, and at about 15°C. most formed fruits within a few days, though *Thielaviopsis etheticus* and *Glomerella rufomaculans* reached their maximum growth at 30°C., and *Rhizopus nigricans* at 36°C. The thermal death-point in the case of *Thielaviopsis etheticus*, *Monilia fructigena*, and *Glomerella rufomaculans* lay between 52° and 54°, of *Cephalothecium roseum* between 47° and 48°, and of *Rhizopus nigricans* between 60° and 60.5°C.

F. J. C.

Storm and Drouth Injury to Foliage of Ornamental Trees. By C. Hartley and T. C. Merrill (*Phytopathology*, v. pp. 20-29, Feb. 1915).—The appearance of foliage of maple and other trees damaged by drought and storm is described. The similarity of the damage produced by these two causes is remarked upon, for in both cases the death of tissue is usually confined to the leaf-margins, although in storm damage the tissues between the nerves may also be affected. Inspection of the whole tree and knowledge of previous weather conditions appear both to be necessary in order to differentiate positively between the two types.—F. J. C.

Strawberries, Diseases of, by Species of Botrytis and Rhizopus. By N. E. Stevens (*Jour. Agr. Res.* vol. vi. No. 10, June 1916, pp. 361-366; 2 plates).—The fungi causing rots in strawberries in transit are chiefly *Botrytis cinerea* (?) and *Rhizopus (nigricans* ?). The berries attacked by the first show a characteristic dry-rot; they retain their shape, shrivel somewhat, and no leaking of juice is evident; whereas the berries attacked by *Rhizopus* quickly decay with the loss of a large volume of juice.

The author finds that this difference is due to the fact that the *Botrytis* penetrates all parts of the berry, growing within the cells as well as between them, and ramifies through the tissues, filling them with a network of mycelium. On the other hand, the *Rhizopus* is found only on the outer portion of the berry. The hyphæ grow between the cells, destroying the middle lamellæ so that the cells separate and quickly decay.—A. B.

Strawberry 'Madame Moutot.' By J. Blanchouin (*Le Jard.* vol. xxx. pp. 29, 30).—Although 'Madame Moutot' is a robust grower, thriving in any ordinary soil and bearing very large fruit, it is not recommended for cultivation, as the flavour is only second-rate and the colour unattractive. In wet seasons it soon decays.—S. E. W.

Strawberry Stock Experiments. By B. T. P. Barker (*Ann. Rep. Agr. Res. Stn., Long Ashton*, 1915, p. 100).—Strawberry plants of the same variety were obtained from twelve different nurseries in various parts of the country.

Each set consisted of 100 plants, and they were grown side by side with extraordinarily different results, varying from a crop of 45 lb. in 1914 and 1915 from the stock obtained from Norfolk to nearly 123 lb. from that obtained from Jersey, the differences in yield being marked in each year. Whether these differences are actually due to the differences in locality from which the stock came cannot be stated with certainty, but a case for further investigation has certainly been established.—*F. J. C.*

Sugar and Acid in Grapes during Ripening, Development of. By W. B. Alwood and others (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 335, April 1916, pp. 1-28).—The study of the fundamental changes which occur during the ripening of grapes is of importance in the determination of the normal composition of grape products. The ripeness of the grape should not be judged merely by the colour; it can only be determined when both chemical composition and physiological condition are considered. In the ripening of grapes the increase of sugar and the elimination of acid are dependent upon many factors, such as climatic and soil conditions, the vigour of the plant, the species and variety characteristics. With certain reservations, sugar should increase and acid diminish as long as the leaves function properly. A series of tables is given showing the analytical results of a number of juice samples from the crops of 1911 and 1912, grown at Sandusky, Ohio, and Charlottesville, Virginia.—*A. B.*

Sugar Beets and Radishes, A New Fungus Parasite of. By H. A. Edson (*Jour. Agr. Sci.* iv. p. 279, July 1915; plates).—This is the fungus referred to in these Abstracts, vol. xli. p. 533. The author now gives a full description of it under the name *Rheosporangium Aphanidermatus*.—*F. J. C.*

Sulphur and Calcium Sulphate, Effects of, on Plants. By Walter Pitz (*Jour. Agr. Res.* vol. v. No. 16, Jan. 1916, pp. 771-780; 1 plate).—A series of experiments was devised to determine the effect of sulphur and sulphates upon soil micro-organisms, and on pure cultures of legume bacteria; and also to determine the effect of sulphur and sulphates upon the growth of red clover (*Trifolium pratense*).

The general conclusions arrived at were:

1. Calcium sulphate, when added to a soil, has apparently no marked effect on the total number of bacteria that grow upon agar plates, nor does it produce any marked increase in ammonification or nitrification.
2. Large amounts of sulphur cause a decrease in total number of bacteria that grow upon agar plates, but produce an increase in ammonification at concentrations of 0.05 per cent. This increase in ammonification is accompanied by a parallel decrease in nitrate formation. This decrease may be due to the acidity or toxicity produced by the oxidation of sulphur.
3. Calcium sulphate stimulates the growth of pure cultures of red clover bacteria in nutrient solutions and in soil extract. The increase is as great with 0.01 per cent. as with 0.1 per cent.
4. The root development of red clover is increased by calcium sulphate, 0.1 per cent. being apparently as efficient in producing this increase as 0.1 per cent.
5. In small amounts calcium sulphate increases the yield of red clover and also the number of nodules.
6. The addition of sulphur increases the ammonification, but decreases nitrification and the total number of soil organisms. It increases the yield of red clover but slightly, and does not affect the root development nor the number of nodules.—*A. B.*

Sulphur Compounds, Relation of, to Plant Nutrition. By E. B. Hart and W. E. Tottingham (*Jour. Agr. Res.* v. p. 233, Nov. 1915; pl.).—Pot experiments with a variety of plants showed that the addition of sulphates to "complete fertilizer" increased the yield to an appreciable extent in Leguminous and Cruciferous crops. Grasses were not so markedly affected. Calcium sulphate was, in general, more effective than sodium sulphate. The addition of sulphates appeared to exert a special influence upon root development, particularly in red clover and rape. In the former especially the roots were much elongated where sulphates were applied, thus materially extending the feeding area. Sulphur by itself was generally harmful, even when considerable quantities of carbonate of lime were present. The experiments are being extended to field trials.—*F. J. C.*

Sunflower, A New. By G. T. Grignan (*Rev. Hort.* Nov. 16, 1915; one illustration).—A fine flower à la Gaillardia, of robust habit.—*C. T. D.*

Syringa Swegenzowl. By D. Bois and G. T. Grignan (*Rev. Hort.* Oct. 16, 1915).—MM. Lemoine et fils speak highly of this novelty as a very charming lilac of Chinese origin.—C. T. D.

Tagasete. By J. H. Maiden (*Agr. Gaz. N.S.W.* vol. xxvi. pp. 883-887; 4 plates).—The author wishes that a trial should be given to the cultivation of Tagasete (*Cytisus palmensis*) in Australia as fodder. The Tagasete is pollarded and the young shoots fed to stock. The horses have to be taught to like it.
S. E. W.

Tepary Bean. By W. M. Carne (*Agr. Gaz. N.S.W.* vol. xxvi. pp. 979-980).—The Tepary bean belongs to the species *Phaseolus acutifolius*. The pods are 3 inches long, thin and tough. The flowers are white or pink to purple. The shelled beans make an excellent green vegetable. The dried beans are smaller than Lima or haricot beans, but are superior in flavour. The beans are sown in rows, 30 inches apart, leaving a space of 3 or 4 inches between the beans in the rows. They are very hardy, require little water, and do best on a light soil.
S. E. W.

Terrapin Scale (*Eulecanium nigrofasciatum* Pergrande) on **Peach Trees.** By F. L. Simanton (*U.S.A. Dep. Agr., Bull.* 351, 96 pp.; 19 figs.).—A detailed account of the insect, life-history, enemies, and remedial measures.—E. A. Bd.

Thalictrum, The Genus. By S. Mottet (*Rev. Hort.* Oct. 16, 1915; one coloured plate).—An interesting article describing some of the more valuable varieties.—C. T. D.

Thrips. By W. W. Froggatt (*Agr. Gaz. N.S.W.* vol. xxvii. pp. 126).—To protect orchards from attacks of thrips, burn all rubbish. Spray with lime-sulphur or red oil emulsion before the buds burst. If the opening leaf or flower-buds show signs of thrips, spray with tobacco and soap wash.—S. E. W.

Thymol, Commercial Production of, from Horse-mint (*Monarda punctata*). By S. C. Hood (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 372, May 1916, pp. 1-12).—It has long been known that thymol is present in considerable quantity in the oil distilled from horse-mint (*Monarda punctata*), but no attempt has been made to cultivate this plant for the commercial production of thymol. In 1907, horse-mint was observed to occur in abundance as a common weed or sandy lands in Central Florida, and preliminary examinations of the oil from these wild plants seemed to indicate that a promising commercial source of thymol could be developed by bringing this plant under cultivation.

It was found that the fresh entire herb yielded from '12 to '2 per cent. of oil. The content of total phenols in these oils ranged from 56 to 62 per cent., and it was found that the phenols consisted almost entirely of thymol.

A large number of variations in the plants were observed, and attempts were made to select and produce a variety containing larger amounts of thymol. These experiments have extended over eight years, and have resulted in the production of a variety which yields '42 per cent. of oil containing 74 per cent. of phenols, chiefly thymol.

Details of the extraction and distillation are given, and the author believes that the production of this plant as a crop might be profitable, since an estimate shows a profit of about \$16 an acre as an average over a five-year period.—A. B.

Timber-killing with Sodium Arsenite. By C. W. Burrows (*Agr. Gaz. N.S.W.* vol. xxvi. pp. 767-769).—A rapid method of destroying trees on a heavily-timbered district is to frill the trees when the sap is falling and apply sodium arsenite. "Frilling" is the application of a series of downward axe cuts round the tree, completely severing the bark as near the ground as is found convenient. Sodium arsenite is then poured into the frilling from an old kettle. To prepare the arsenite, dissolve 2 lb. of caustic soda in water, mix 1 lb. of white arsenic to a paste with a small quantity of water, and pour slowly into the caustic soda solution. When the arsenic is dissolved, add water to make the bulk of liquid up to 4 gallons, and add half a pound of whiting.—S. E. W.

Tobacco, Resistance to the Root-rot Disease. By J. Johnson (*Phytopathology*, vi. pp. 167-181; April 1916; figs.).—The root-rot caused by *Thielavia basicola* is very prevalent on tobacco, but the author found that different strains of cigar-leaf tobacco exist which are practically immune from attacks of this disease. They are, however, unsatisfactory for commercial purposes, but the author considers it possible to obtain resistant stocks of good quality.—F. J. C.

Tomato, Leaf-spot Disease of. By E. Levin (*U.S.A. Exp. Stn., Mich., Tech. Bull.* 25, March 1916, pp. 1-51; 9 plates).—From his experiments the author finds that this disease is caused by the fungus *Septoria Lycopersici* Speg., and a study of its morphology shows that the pycnidia are closed balls with walls similar to those in the genus *Phoma*. The spores are long and needle-shaped, and have several septa. The mycelium is of two kinds. Infection occurs through stomata, and the mycelium is intercellular and possesses haustoria. The author finds that the diseased spots on the leaves transpire more than the healthy portions, and that the transpiration of these healthy portions is repressed below normal.

No variety of tomato was found especially susceptible or immune, although more than fifty were tried. Control measures, chiefly prophylactic, are recommended. A list of references is appended.—*A. B.*

Tomato Manure (*Qu. Agr. Jour.* Nov. 1915, p. 255).—4 to 5 cwt. superphosphate, 1 to 2 cwt. sulphate of potash, 1 to 1½ cwt. nitrolim or sulphate of ammonia or nitrate of soda to the acre, or 3 to 4 oz. of mixture a square yard.
C. H. H.

Tomato Mosaic Disease, On a Case of Recovery from. By W. B. Brierley (*Ann. Econ. Biol.* ii. p. 263, Apr. 1916).—An instance is recorded of the production of healthy shoots on a tomato plant which had been attacked by mosaic disease, the shoots being produced from a part of the stem which had previously produced mottled leaves which had withered and fallen.—*F. J. C.*

Tomato Weevil, Buff-coloured. By W. W. Froggatt (*Agr. Gaz. N.S.W.* vol. xxvi. pp. 1065, 1066).—The buff-coloured tomato weevil (*Desiantha nociva*) is destructive in the larval and adult state. It feeds at night on the bark and foliage of the tomato plant. The weevil is under half an inch in length, dark brown body colour, covered with buff and grey scales and hairs, the colour of dry soil. The larvæ are pale green, slender, and active. The beetles may be trapped by placing grass in holes scooped in the beds. They can be collected and destroyed in the morning.—*S. E. W.*

Tomatos. By Madeleine Maraval (*Rev. Hort.* Nov. 16, 1915).—Two new Tomatos highly recommended, 'Joffre' and 'Tomate des Alliés.'—*C. T. D.*

Tomatos, A Troublesome Disease of Winter. By J. E. Howitt and R. E. Stone (*Phytopathology*, vi. p. 162, April 1916).—Brown and blackened areas occur between the larger veins, involving the secondary veins as well as the soft tissue. Affected leaves remain stunted, droop, and finally wither and die, the younger leaves being attacked first as a rule. Scattered brown spots also appear on the stems, but not, as a rule, extending into the vascular bundles. Diseased fruits have sunken brown spots scattered irregularly over their surface, sometimes extending deeply into the tissues, sometimes superficial. No causal organism has been isolated, and inoculation experiments gave negative results, but the disease, which appears to be in some way connected with the soil, is overcome by soil sterilization.—*F. J. C.*

Transpiration, The Relation of, to the Number and Size of Stomata. By Walter L. C. Muenscher (*Amer. Jour. Bot.* vol. ii. No. 9, Nov. 1915, pp. 487-504).—As a result of numerous experiments with various plants under conditions approximately those of natural field conditions, the author finds the following:

1. There was found no constant relation between the amount of water lost and the amount of linear units of stomatal pore (*i.e.* the number of stomata per unit of leaf surface multiplied by the length of the average pore) in the various species studied.

2. There is no relation between the amount of transpiration and the length of the pore of one stoma. The number of stomata per unit of leaf surface, however, varies at the same time as the length of the pore varies for the different species; so in this case we have two variables.

3. There is no relation between the amount of transpiration and the number of stomata per unit of leaf surface in the different species.

From the above, it would seem that the amount of transpiration is not governed entirely by stomatal regulation, and that the variations in the amount of water loss in different species cannot be accounted for by the size and number of stomata, but must be explained perhaps by a complex of several factors.

A. B.

Transportation, Some Problems of Plant Pathology in Reference to. By F. L. Stevens (*Phytopathology*, v. pp. 108-111, Apr. 1915).—The author gives a list of fungus attacks upon plants in relation to expectations of development during transportation. The matter is of considerable interest in view of legal liability for the condition of consignments of vegetables and fruit when they reach their destination.

The troubles are grouped as follows :—

A. Slowly developing diseases which under no conditions will increase appreciably within a few days.—Wheat smut, apple, pear, and peach scab, apple blotch, Ascochyta of pea, potato scab, Fusarium, and Phytophthora, tomato blossom-end rot, water-melon anthracnose.

B. More or less rapidly developing diseases which can normally originate only at point of production.

a. Rapid.—*Monilia* of peach, various bacterial soft rots (?), plum and cherry *Monilia*, *Sclerotium Rolfsii*, canteloupe rots, *Sclerotinia Libertiana* on lettuce, *Botrytis* on lettuce.

b. Less rapid.—Apple bitter-rot, black-rot and pink-rot, grape black-rot, bean anthracnose, celery *Septoria*, egg-plant ascochytose.

C. Rapidly developing diseases which can occur only on wounded plant parts.—*Rhizopus* on strawberry and sweet potato, *Penicillium* on grapes, apples, and oranges. Various bacterial rots, e.g. celery, asparagus, onion.

D. Rapidly developing diseases which occur only on wilting or old products or under unsuitable conditions of temperature and humidity.—Bacterial or mould infections of many kinds, *Rhizopus*, *Penicillium*, bacteria, &c.—*F. J. C.*

Tree-killing by Ringing and Arsenic (*Qu. Agr. Jour.* June 1916, pp. 303-4).—Ring the tree when dormant, low and somewhat into the wood, then pour on to the wound a mixture compounded of 1 lb. arsenious oxide, 3 lb. washing soda (or 2 lb. caustic soda), 4 gallons water, $\frac{1}{2}$ lb. whiting (the latter to mark the trees which have been treated). In mixing the arsenic with soda solution mix slowly to a paste, stirring all the time; stand away from the fumes, as they are poisonous. If washing soda is used, the solution should be boiled; if caustic soda, it is self-boiling.—*C. H. H.*

Ursinea cakilefolia (*Bot. Mag.* t. 8676).—South-West Africa. Nat. Ord. *Compositae*, tribe *Arctotideae*. Herb, 1 foot high. Leaves, 2-pinnatifid, $2\frac{1}{2}$ inches long, glaucous-green. Heads solitary, very long-stalked, about $2\frac{3}{4}$ inches across. Ray-florets 20-25, orange above. Disk-florets blackish-purple.—*G. H.*

Viburnum betulifolium (*Bot. Mag.* t. 8672).—Central China. Nat. Ord. *Caprifoliaceae*. Shrub, bushy, 4-6 feet high. Leaves ovate, 5 inches long. Corymbs 7-rayed. Flowers white, crowded, $\frac{1}{2}$ inch across, in clusters $\frac{3}{8}$ inch across. Fruit, scarlet berries, $\frac{1}{4}$ inch across.—*G. H.*

Vine Phylloxera and Tomato Plants (*Qu. Agr. Jour.* March 1916, p. 130).—In Spain and Italy it is found that tomatos planted among vines help the vine to combat the Phylloxera on its roots, and render the vines stronger. Thousands of dead insects were found on the roots of the tomatos. It is thought the poisonous alkaloid solanine in the tomato roots destroys the insects which prey on the vine.—*C. H. H.*

Violet Rove Beetle, The. By F. H. Chittenden, Sc.D. (*U.S.A. Dep. Agr., Bull.* 204, June 1915; 1 fig.).—In 1901 a small dark-coloured rove beetle, known to science as *Apocellus sphaericollis* Say, was reported as an enemy to violets and other succulent plants in the district of Columbia and from St. Louis, Mo. This insect is a common one in the United States and is generally considered a scavenger, feeding on humus and decaying vegetable matter.

As a remedy, decaying leaves deposited in heaps about infested plants attract the beetles, after which the leaves are quickly dipped into hot water.—*V. G. J.*

***Vitis vulpina* L., Senile Changes in Leaves of.** By H. M. Benedict (*U.S.A. Exp. Stn., Cornell, Mem.* No. 7, June 1915, pp. 272-370; 7 figs.).—The importance of determining whether there is any real senile change in plants lies not only in the scientific need of such knowledge, but also in its direct bearing on the question regarding the effect of continuous vegetative propagation of seed-producing plants. The processes of division and growth require considerable expenditure of energy; therefore, if the plant-cell is not entirely immune to senile

deterioration, the meristematic as well as the specialized tissues should undergo such change.

It would seem that the logical method of attacking the problem is by a careful comparison of the same organ in young and old plants of the same genus for evidences of senile deterioration in structure or function. The wild grape (*Vitis vulpina* L.) was chosen because it puts forth new growth each year, in order to minimize, as far as possible, the chance of the presence of unfavourable conditions other than age. Investigations upon young and old leaves on veining, photosynthetic activity, respiration, and imbibition were made, and the following results were obtained:—

The vein islets in the leaves of *Vitis vulpina* become smaller as the vine becomes older. This decrease in size is due to the encroachment of vascular tissue; and this decrease means reduction in size of "photosynthesizing" cells, and therefore a decrease in rate of photosynthesis.

There is also a decrease in the rate of respiration in picked leaves.

Leaves of young vines have a greater capacity for imbibing water than have leaves of old vines, which may be due to less vascular tissue in the former.

There is an increase with age in the number of stomata per sq. mm. There is probably a decrease in the size of the palisade cells, and in the size of the nuclei in the parenchymatous cells, as the leaves increase in age.

A short bibliography is appended.—A. B.

Walnuts, Crossing of. By Max Garmer (*Rev. Hort.* July 16, 1916).—Illustration showing three varieties. Note on various French hybrids.—C. T. D.

Water Melon Stem-end Rot. By F. C. Meier (*Jour. Agr. Res.* vol. vi. No. 4, April 1916, pp. 149-152; 2 plates).—For some years in certain parts of the Southern States of America, a decay and rot, which attacks water-melons (*Citrullus vulgaris*) in transit, and sometimes destroys them completely, has been noticed.

The author has isolated a fungus which bears pycnidia and possesses many of the characteristics of the genus *Diplodia*. It is well known that *Diplodia* spp. attack numerous tropical crops, including sweet potato (*Ipomoea Batatas*), cotton (*Gossypium*), rubber (*Hevea* spp.), cocoa (*Theobroma Cacao*), tea (*Thea* spp.), as well as the various species of Citrus.—A. B.

Weeds. By J. H. Maiden (*Agr. Gaz. N.S.W.* vol. xxvii. pp. 29-39 and 235-246).—Blue Couch Grass (*Cynodon incompletus*) is poisonous at some seasons; Corn-cockle (*Agrostemma Githago*), some of the Sundews (*Drosera*), Oleander, *Stipa robusta*, *Nicotiana suaveolens* are dangerous to stock. *Datura Stramonium*, *Nicandra physaloides*, Hemlock (*Conium maculatum*) are poisonous, and *Euphorbia Drummondii*, *Stachys arvensis*, *Anagallis arvensis*, *Crotalaria*, and *Echium vulgare* are suspect:

Weeds are spread in manure even if it is well rotted. Always use screened seed of good quality. Prevent weeds from seeding. Burn, do not bury weeds. Eradicate if possible. Weeds are harboured on waste land, such as neglected cemeteries and the strips of land adjacent to the railway tracks in Australia.

S. E. W.

White Pine Blister Rust. By Perley Spaulding (*U.S.A. Dep. Agr., Bur. Pl. Ind., Farm. Bull.* 742, June 1916, pp. 1-15; 5 figs., 1 plate).—This disease is caused by a fungus, *Cronartium ribicola* Fischer (*Peridermium Strobi* Klebahn); it attacks the white pine, and has an intermediate host in various species of *Ribes*. It causes much damage to pines in the North-Eastern States of America, and is said to have been introduced from Europe on imported seedlings of pines. *Pinus Strobus*, *P. monticola*, *P. Lambertiana*, *P. excelsa*, and other species of the 5-needle-leaved pines, may be attacked by this disease.

A brief account of the life-history of the fungus is given, and an account of the measures of control adopted in Europe and America detailed. A most drastic measure for each federal State is advocated, in order that the pest may be completely controlled, and finally eradicated.—A. B.

Wistarias of China and Japan. By E. H. Wilson (*Gard. Chron.* Aug. 5, 1916, p. 61).—Enumerates four species and many varieties. *W. multijuga* of gardens is shown to be *W. floribunda*, and *W. brachybotrys* is *W. venusta*, but *W. venusta* stands for the well-known and first introduced plant. *W. japonica* has pale yellow flowers.—E. A. B.

Wood-using Industries of Ohio. By Carroll W. Dunning (*U.S.A. Exp. Stn., Ohio*, 1912).—With her many rail and water transportation facilities, and with her vast resources of soil, forests, coal, oil, gas, iron, stone, and clay, Ohio

stands high as a manufacturing State. Manufacturing, therefore, is pre-eminently Ohio's leading industry. The present report deals with a single class of factories, those manufacturing commodities from wood. They form one of the most important divisions of Ohio's enterprises, and nearly every State in the Union, as well as many foreign countries, send some portion of their forest material to Ohio for utilization in manufacture.

For many years there was no demand for timber products. The first market, it has been stated, was found at New Orleans, and a few rafts were floated down. With the influx of new settlers came the towns. This necessitated the sawmills, and from 1820 until the present time Ohio has held an important place among the States in the production of rough lumber. There were more than 1,900 sawmills operating in Ohio in 1860. This number was steadily maintained for several decades, when the failing timber supply began to be felt and the larger mills were compelled to move to other regions. In 1910, 1,532 mills were still operating in Ohio. These were mostly portable mills of small capacity. Their combined cut in 1910 was 542,000,000 feet as against 990,000,000 feet sawn in 1900, a decrease of more than 45 per cent.

Artificial limb manufacturers used only one wood, willow, and the entire supply was cut outside the State. Umbrella racks, made mostly of metal, have wooden frames; ash and white oak supplied the material. Hard maple answered for looms of silk and textile mills, the sapwood of red gum for curtain poles, and black walnut for gun-stocks. The making of coffee-mills required yellow poplar and red gum, and money-drawers yellow poplar and white oak, the former for the inside compartments, and the latter for the exterior. In the breweries, to clarify and filter beer, chips cut from beech are frequently employed and are called brewers' shavings. The manufacture of these in Ohio is not a large industry, but is worthy of mention. On the other hand, the making of cigar-moulds, cigar-makers' boards and presses, is quite an extensive line of manufacturing in the quantity of wood reported. The moulds are of yellow poplar, basswood, maple and beech, while for presses and cigar-boards high-grade hard maple alone supplied the demand. A large amount of wood in Ohio is converted annually into shoe lasts, tires, and forms.—A. D. W.

Woolly Aphis and Immune Varieties of Apple. In "Insect Pests of Fruit," by C. French (*Jour. Dep. Agr. Vict.* Apr. 1916, pp. 214).—Certain varieties of apples are immune to the attack of woolly aphis, viz., 'Winter Majetin,' 'Northern Spy,' 'Perfection,' 'Paradise,' and a few others. The supposed reason of this is that they contain more carbonate of lime than those attacked by the aphis. Growers are therefore advised to have their trees worked on blight-proof stocks to avoid aphis at the root.—C. H. H.

Woolly Aphis, Cold-water Cure for (*Qu. Agr. Jour.* Dec. 1915, p. 331).—A grower (Coleman Phillips) hoses with cold water his 1,000 apple trees. Water with a good pressure, he finds, has a marvellous effect in washing woolly aphis and other insects from the trees; he hoses whenever the pest shows itself at all badly, even once a week, usually four times during the summer. After the hosing, the soil under the tree is churned up a little to bury any aphides that have been washed off.—C. H. H.

Woolly Aphis, Identity of *Eriosoma pyri*. By A. C. Baker (*Jour. Agr. Res.* v. pp. 1115-1119; March 1916; figs.).—Fitch described a woolly aphis from the roots of apple and pear as *Eriosoma pyri*, but since his time it has been grouped with *E. lanigerum*. The author considers it distinct and as belonging to another genus, *Prociophilus*. He also gives descriptions of other species of the same genus.—F. J. C.

Woolly Aphis, Insecticide for. By M. Lièvre (*Jour. Soc. Nat. Hort. Fr.* July-Dec. 1914, p. 516).—A new insecticide invented by M. Duval, of Boulogne, is said to have remarkable effects against woolly aphis. It can be used on leaf, twig, or old wood with the same good results.

FORMULA I.

Rain-water	1 litre
Carbonate of Potash	4 grammes
Sulphorcinatate of soda	40 "
Spirits of wine	20 "
Strong tobacco juice (100 grs. nicotine per litre)	10 "

During the weeks just before the leaves fall, when all fear of injuring them is over, if the trees are still infected the following mixture may be used :—

FORMULA II.

Rain-water	1 litre
American potash	10 or 12 grammes
Sulphuricinate of soda	40 "
Tobacco juice	20 "
Spirits of wine	20 "

At this period the eggs of the aphid are laid in the cracks of the tree, and to destroy these M. Duval advises the application of the following mixture at about the end of October:—

FORMULA III.

Rain-water	1 litre
Soft soap	350 grammes
Sulphuricinate of soda	50 "

Finally, open a hole all round the tree so as to uncover the roots, and water these with Formula I. or, if necessary, Formula II.—M. L. H.

Worms, Enchytraeid, The Action of. By Rev. H. Friend (*Ann. Appl. Biol.* iii. p. 49; June 1916).—Experiments made by the author with white worms, and also with some species of the same group with red blood, all common in soil containing much decaying vegetable or animal matter, convince him that they are scavengers doing no damage to cultivated plants.—F. J. C.

Xerofotic Movements in Leaves. By Frank C. Gates (*Bot. Gaz.* lxi. p. 399; 8 figs.).—The author begins by defining *xerofotic*, but why it is not spelled *xerophotic* we do not know; there is no f in Greek. It signifies "dryness caused by light." The movements "are manifested by an upward bend in the leaflets, or a curling or rolling upward of the blade."

With regard to the mechanism: "The side of a structure facing the sun becomes warmer than the opposite side . . . hence there is a greater loss of water from the exposed side . . . the greater turgidity on the lower side causes the leaf-blade to bend in the direction of the exposure.

"Two kinds of xerofotic response were observed: the *localized* response, in which the differential turgidity is largely confined to a small region, as the pulvini; and the *generalized* response, in which it is spread over the leaf, causing the blade to curl upward."

The article deals with the localized, specially observed in leguminous plants. The xerofotic position is between 45° and 70° from the horizontal. The movement is not peculiar to any season.

"The obvious result of the xerofotic position is to decrease the amount of direct radiant energy received per unit area of leaf. When screens were placed before plants in the sun, the leaflets fell back to the horizontal position.

"In successive experiments, both absolute alcohol and xylol were carefully applied to the upper side of the pulvinus with a small pointed brush. As the drying agent withdrew water locally from the upper cells of the pulvinus, the xerofotic position of the leaflet was gradually assumed."

The generalized type was noted particularly on monocotyledons, which have no pulvinus.—G. H.

Yellow Pine Needle Disease. By J. R. Weir (*Jour. Agr. Res.* vol. vi. No. 8, May 1916, pp. 277-288; 1 plate, 4 figs.).—A very conspicuous disease on the needles of the Western Yellow Pine (*Pinus ponderosa* Laws.) has been observed in parts of the States of Montana, Oregon, Washington, and Idaho. The causal organism is a new species and has been named *Hypoderma deformans*. The first sign of infection is a slight browning of the tips of the leaves, which soon becomes a yellow, deepening into a brown colour when the apothecia appear.

Owing to the attacks of this fungus, the terminal shoots become distorted and stunted, eventually forming "witches' brooms."

Attempts to grow the fungus upon culture media were without success.—A. B.

Zygopetalum Prainianum (*Bot. Mag.* tab. 8610).—Peru. Nat. Ord. *Orchidaceae*. Tribe *Vandeeae*. Herb, terrestrial. Leaves elongato-lanceolate, 10-14 in. long. Scapes 2 ft. long, 4-5-flowered. Flowers 2 in. across, sepals brownish-green, petals white; column incurved, yellow.—G. H.

ERRATA.

- Page 36, line 10 from bottom, for *Pilostegia*, read *Pileostegia*.
,, 84, ,, 7 from bottom, for *quintuplinerva*, read *quintu-
plinerva*.
,, 107, ,, 13, for *Betula Bhojpatra*, read *Betula Bhojpatra*.
,, 189, ,, 25, for *C. Simmondsii*, read *C. Simonsii*.
,, ,, ,, 30 from bottom, for *B. Corryi*, read *B. Coryi*.
,, ,, ,, 5 from bottom, for peas, read pears.
,, 202, ,, 2 from bottom, for *C. virginis*, read *P. virginis*.
,, 205, ,, 12 from bottom, for garieties, read varieties.

EXTRACTS FROM THE PROCEEDINGS
OF THE
ROYAL HORTICULTURAL SOCIETY.

GENERAL MEETING.

JANUARY 11, 1916.

Col. Right Hon. MARK LOCKWOOD, C.V.O., in the Chair.

Fellows elected (49).—C. E. Adams, Mrs. Baird-Carter, Mrs. Bartholomew, A. E. Blackett, H. Cadbury Brown, Mrs. Campbell, C. R. Canney, Mrs. Champness, Lady Church, R. S. Coble, W. A. Conway, E. H. Crawshay, G. H. Creasey, Miss L. Cumberlege, C. G. Davis, Lady Dilke, Miss A. M. Edgeworth, E. T. Ellis, F. A. Fisher, Arthur J. Gaskell, Mrs. C. Glen-Walker, R. Hammer, Lady Harcourt-Smith, E. J. Hicks, Arthur T. Johnson, Mrs. Langford-James, Mrs. A. M. Luckock, W. W. McKay, H. Middlehurst, Lieut.-Commander J. G. Millais, R.N.V.R., Mrs. Muller, C. S. Orwin, M.A., Lieut. Geoffrey M. Owen, S. C. Russ, S. Ryder, Mrs. T. Schneider, Charles L. Schofield, Miss F. Spencer, H. G. Stocker, Mrs. H. G. Stocker, Percy W. Straker, Montagu Summers, Mrs. G. G. Vertue, Mrs. C. Waterhouse, R. Webb, Mrs. A. E. Holt White, A. J. Williams, G. Thorp Wilson, Miss A. C. Wilson.

Fellows resident abroad (5).—A. E. Edge (Rhodesia), G. de Lechevalier (Nigeria), Hiranand B. Rajdev, B.Ag. (India), David A. Hay (New Zealand), G. H. McIndoe (New Zealand).

Associates (4).—Miss A. M. Cooper, F. Cresswell, Miss W. L. Hake, Miss M. J. Norris.

Societies affiliated (2).—Ruislip Garden Society, Streatham and District Rose and Sweet Pea Society.

GENERAL MEETING.

JANUARY 25, 1916.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair.

Fellows elected (22).—Mrs. A. C. Bamford, Miss W. E. Barker, F. W. Barnes, T. D. Berner, Mrs. M. C. Brackenbury, Mrs. Carroll, L. J. M. Coates, W. J. J. Draper, G. O. Duggua, D. Gray, C. Harding,

W. Hemmant, Mrs. Stanley Leighton, A. McNicol, Miss E. B. Pitman, Mrs. J. Rivington, Mrs. R. B. Roberts, Mrs. Scott, Mrs. Scott Tullis, Mrs. T. West, A. E. Wilson, Miss A. Wilson.

Associate (1).—F. Dunn.

A lecture on "Wild Birds and their feeding habits" was given by Mr. W. E. Collinge, M.Sc. (see p. 1).

ANNUAL GENERAL MEETING.

FEBRUARY 8, 1916.

Field-Marshal the Right Hon. Lord GRENFELL of Kilvey, G.C.B., G.C.M.G., in the Chair.

The Minutes of the Annual Meeting of February 9, 1915, were read and signed.

Fellows elected (78).—Mrs. W. A. Addinsell, Mrs. A. Arnhold, Mrs. A. O. Barnes, A. Bayley, Miss V. Blair, Mrs. Boyd, R. Bravington, Mrs. Burbidge-Hambly, C. Butcher, Mrs. H. E. Buxton, T. W. Calverley-Rudston, Rev. E. H. P. Carter, A. Chester, Mrs. Chute, Miss F. H. Clarke, R. M. Cocks, Mrs. H. H. Coles, Mrs. Conyers, Mrs. J. Crawley, R. H. Crockford, F. N. Davidson, Mrs. C. Daws, F. Debacker, Lady Donkin, Mrs. G. Drage, Mrs. Duforest, Miss A. J. M. Elliot, A. Freshwater, Mrs. T. B. Fry, Sir Alfred Pearce Gould, K.C.V.O., Dr. Lilius Hamilton, Mrs. W. de B. Herbert, Miss A. Holmes, E. E. Holt-Evans, F. Jowett, Mrs. Lawder, Mrs. F. T. Leeming, Mrs. E. O. Lloyd, Miss M. Macbeth, Mrs. McCarthy, Miss I. D. Mackintosh, H. Martineau, Mrs. W. Maudsley, F. W. Monks, J.P., A. F. Nix, Mrs. O'Kinealy, Miss M. F. I. Orrell, Mrs. T. R. Pace, Mrs. Peake, Miss F. Rains, Dr. A. S. Ransome, H. R. Read, Miss E. Rooke, Miss Rossiter, Capt. S. Saunderson, Mrs. H. Sapte, Mrs. J. H. Savory, Miss J. Sawyer, G. Scott, Mrs. Shaw, Miss P. E. Smith, Rev. H. G. Southcomb, Mrs. S. Spiers, Maj.-Gen. J. C. Stewart, C.B., The Countess of Stradbroke, G. H. T. Swinton, Mrs. Sworder, H. F. Sykes, Miss M. Thomas, R. Thompson, Mrs. A. H. Venables-Williams, Mrs. G. A. Warburton, Maj.-Gen. Ward, C.B., Mrs. W. H. Watts, Mrs. B. Weekes, Mrs. T. Weller-Poley, Miss E. B. White, Mrs. Trevor-Wingfield.

Fellows resident abroad (2).—G. Baldwin (Toronto), Lieut. A. R. Blannin Ferguson (Mornington, Aus.).

Associate (1).—Miss J. Whittington.

The CHAIRMAN moved the adoption of the Annual Report. This was seconded by the Treasurer and carried.

The following names of President, Vice-President, Members of the Council, and Officers having been duly proposed and seconded, and the list sent round in accordance with Bye-law 74, and no alternative

names having been proposed, they were declared by the Chairman to be elected :

As President.—Field-Marshal the Right Hon. Lord Grenfell, G.C.B., G.C.M.G.

As Vice-Presidents.—The Duke of Bedford, K.G., F.R.S., the Rt. Hon. The Earl of Ducie, F.R.S., Leopold de Rothschild, Esq., C.V.O., Sir John T. Dillwyn-Llewelyn, Bart., D.L., J.P., V.M.H., the Duke of Portland, K.G., P.C., G.C.V.O., the Right. Hon. James W. Lowther, P.C.

As Members of Council.—Lieut.-Col. Sir George Holford, K.C.V.O., C.I.E., Mr. E. A. Bowles, M.A., Mr. Henry B. May, V.M.H.

As Treasurer.—Mr. J. Gurney Fowler.

As Secretary.—The Rev. W. Wilks, M.A., V.M.H.

As Auditor.—Mr. Alfred C. Harper.

Mr. ELWES proposed that a sale of plants should be held at the Chelsea or Holland House Shows in aid of the "Red Cross Fund."

Mr. WALLACE suggested that it would be better to hold a two days' sale in the Hall, earlier in the year, as the date of the Chelsea Show would be a bad time for lifting plants.

Mr. WALLACE also suggested that Awards of the four grades of Cups should be given as heretofore at the Chelsea and Holland House Shows; the award to be in name only, the Cups themselves not being given.

Sir ALBERT ROLLIT said the Annual Report recorded a new and important development—the foundation of a Degree in Horticulture (B.Sc. and D.Sc. (Hort.)) at the University of London. His colleagues on the Council had been good enough to acknowledge and thank him for his services as Chairman of the Horticultural Degree Committee of the Senate of the University and the mover in the Senate of the resolution for the new degree. The work had been both long and hard, but the thanks must be shared with the Council and its Secretary, and with some he saw present, especially Dr. Keeble, Mr. Chittenden, and Mr. Wright; while the University Senate had received most favourably his proposition to establish the degree and to admit the Society's Wisley garden as a School of the University, though as to the power to do the latter he had found it necessary to reinforce his own opinion by that of Counsel, and the desired result was being secured. The Senate had also sanctioned a most important provision—that the Society's National Diploma in Horticulture shall be the condition and basis of the Degree Course, its possession by the student being necessary preliminary to his entrance for the Degree Examinations—and this also ensured the practical horticultural qualifications of all candidates. So now it would be open to any gardener to qualify himself—or herself—and enter as a candidate for a degree, and, he hoped, a University Scholarship and Medal, in horticulture, and this would have two effects of the greatest industrial and national value: It would encourage gardeners to be honourably ambitious of such practical, technical, and scientific knowledge as the degree involved, and stimulate the acquire-

ment of this training by the individual ; and it would advance public education and national development by enlarging its area, and increase the probability of the production of one or more of those scientific or industrial geniuses who moved the world, such as Newton, Watt, Wedgwood, or Bessemer. The creation of one of such would repay a million-fold the cost of national education, as the result of substituting the rule of science for the rule of thumb, which was no longer implicitly reliable, though of course it was based on the experience of ages, which, however, might not only lead, but mislead.

Now, however, the Society could fairly congratulate itself that whatever industries, and they were many, had been nationally neglected, and even surrendered to our enemies, like some dye trades, no reproach rested upon the Society, for it had organized and co-ordinated the British horticultural trade, and by its bi-weekly exhibitions in its own building in Vincent Square, and its great shows at the Temple, Chelsea Hospital, and Holland House, had so educated the trade and its customers and the public that it had become the most productive and important in the world, a matter on which his experience as a judge not only at the Society's shows, but also at the similar exhibitions in France and Belgium, justified him in forming the opinion he had expressed. And even in this war-time horticultural things were not so bad as might have been expected, while the Council had also found time and means to help by a fund of many thousands of pounds to relieve and restore horticulture in Serbia and Northern France, for which it had received the thanks of both countries, and especially of gallant Serbia, personally, through the wife of its Prime Minister, M. Passitch. But the greatest service of the Society was that while many industries had languished owing to the neglect of education and the consequent non-application of science to industries, the Society had taken all the steps in its power to identify itself with scientific training, investigation, and inventions, and with the many branches of science at the base of horticulture, by its work in London and at its gardens, laboratories, and means of experimental research at Wisley, and had thus placed itself and the great horticultural trade it represented abreast of the times and of modern thought and development, and so rendered the best service to trade and industry, to labour, and to the commerce and culture of the country.

A question relating to the membership of the Library Committee was introduced, and it was urged that the meetings of the Committee should be resumed.

Mr. GEORGE PAUL proposed a vote of thanks to the President, Chairman, and Council, which was seconded by Mr. GERALD LODER, who at the same time expressed the hope that the annual contribution to the revision of Pritzel's Index would be reinstated as soon as the Council saw their way clear to do so.

REPORT OF THE COUNCIL FOR THE YEAR 1915.

1. **Effect of the War.**—It is satisfactory to be able to report that, notwithstanding the War, the work of the Society has been maintained to a remarkably successful degree. The full programme, arranged for both Vincent Square and Wisley, has thus far been carried through. Difficulties have been encountered, but it has been found possible to meet them successfully. The development work at Wisley has also gone forward, and as the year closes the new Laboratory buildings are nearing their completion.

Nevertheless, the Council view the coming twelve months with distinct anxiety, and it is for the Fellows to relieve that anxiety, by seeing that there is now no set-back in the important work to which the Society stood committed at the time the War broke out. One way of doing this is obviously by none of us allowing his Fellowship to lapse. The Annual Subscription is so comparatively small that withholding it can be really necessary to but few; whilst, on the other hand, each subscription is helping to maintain the invaluable work of the great Society which the Fellows have been engaged upon, during the last 110 years, for the improvement of fruits, vegetables, flowers, and garden plants, both in quantity and quality; in scientifically investigating plant foods, plant enemies, and plant diseases; and benefiting their own Gardens and the Gardens of Great Britain and her Colonies.

The Council do not intend for one moment to lose sight of the practical side of gardening work, but they know that in order to do this it is absolutely necessary to keep abreast with the upward scientific development which is now entering into, and perfecting, all industries and arts; and because scientific investigation and research work slowly, quietly, and unobtrusively, they fear lest many of the Fellows should fail to grasp their vital importance in every department of modern life; and in this particular the Council cannot but recognize that foreign Governments have been more far-seeing than our own. Fellows are asked to remember that the Society is not in receipt of any assistance whatever from the Government, financial or otherwise. It holds an entirely independent position, and is free to conduct its work upon lines which are known to be sound, as directed by thoroughly practical as well as able scientific men. At all costs, and come what may, the Society must be supported by the Fellows. After the efforts of the past century, and particularly the past quarter of a century, its work must not be allowed to lapse, nor must it be allowed to suffer financial difficulties with their consequent restrictions,

for the sake of what, after all, will prove to be a passing difficulty. If our enemies are at present endeavouring to prove their scientific pre-eminence in certain regrettable directions, it is even more urgent for this country to prove its pre-eminence in the things which build up, rather than in those things which destroy. And horticulture, from whatever point it is viewed, is constructive. It is a very reasonable anticipation, and one that all events foreshadow, that when the War is ended there will be a better co-ordination of scientific effort in this country, in order that our whole national life may be given a further upward development; and there could be no better time than the present, provided the means are forthcoming, for preparing for that greater effort which lies before us. In every department of the Society's work arrangements are now being made with this end in view, and Fellows have a responsibility in the matter, which it is hoped they will not lightly ignore, when so little from each individual can collectively accomplish so much.

2. **Staff Enlisted.**—There has been a remarkable response on the part of the staff of the Society to the call for men. No fewer than 32 from the Wisley Gardens (21 staff and 11 students), and of the small staff at Vincent Square four, have enlisted since War was declared. Adding a further 34 past Wisley students and gardeners, a total of 70 is reached, three of whom have already laid down their lives for their country.

3. **Economy.**—In response to Government exhortations to economy the positions held by those who have joined the Army have not been filled up, save in those cases in which it would have materially affected efficiency; and all departments are being carefully considered with a view to possible retrenchment:—for example, the Council, having been informed that most Nurserymen and Seedsmen value the award of the Society's Medals as much as, if not more than, the Silver Cups usually awarded at the Chelsea, Holland House, and a few other Meetings, have resolved to adopt the suggestion, and will accordingly confine the presentation of Cups in 1916 to Amateurs only, unless any specific schedule indicate otherwise. Gold and Silver Medals will be awarded to Nurserymen and Seedsmen as heretofore. In other directions also a special effort is being made for promoting economy without loss of efficiency.

4. **Bulbs for Hospitals.**—The President, Field-Marshal Lord Grenfell, G.C.B., G.C.M.G., made an appeal through the Society in the late autumn for bulbs for the Soldiers' Gardens at the Convalescent Hospitals and Camps near Étaples. There was a generous response, over one ton weight being received. They were despatched free of cost by the British Red Cross Agency, and a very grateful letter of appreciation and thanks has been received from the Chief Officer in Command. The contributors were:—The Edinburgh Botanic

Gardens, The Rev. J. Jacob, Messrs. Walter T. Ware, Dickson & Robinson, A. M. Wilson, Sutton & Sons, Carter Page & Co., Dicksons, Brown & Tait, Robert Veitch & Son, T. G. Brown, J. R. Pearson & Son, W. H. Divers, W. Poupart, and Barr & Sons. Messrs. Hobbies, and Isaac House, offered Roses and miscellaneous Plants, but these it was not found possible to send, so that their kind offer had for the present to be declined.

5. Care of Food Committee.—The Care of Food Committee has done good work during the past year in increasing the Vegetable and Fruit food-supply of the country. Attention is particularly drawn to a series of nine pamphlets which have been prepared, on (1) Small Fruits for Cottage and Allotment Gardens, (2) The Training of Fruit Trees, (3) Vegetables and How to Grow Them in Small Gardens and Allotments, (4) Flowers for Small Gardens, Window Boxes, and Wall Decoration, (5) Hardy and Half-Hardy Annuals in the Open Air, (6) Bottling Fruits and Vegetables, (7) Vegetable Cookery, (8) Salads and Salad Making. They have been issued at the nominal price of 3*d.*, just sufficient to cover the cost of production, printing, and postage, and have already had a wide sale. The latest to be issued (9) is on Autumn Vegetables Grown from Seed sown in July and August.

It is impossible to estimate the value to the country of this additional supply of food-stuffs, which was initiated by the Society by means of a letter to *The Times* on the very day it became known that an *ultimatum* had been despatched to Berlin. The possibility of excellent catch-crops from July-and-August-sown vegetables has been established beyond doubt, as was shown by the excellent exhibits of vegetables so produced at our Meetings in October 1914, and again in October 1915; and as the facts and methods become more widely known, they are certain to become more widely adopted.

6. Wisley Development.—In spite of unavoidable delays caused by the War, the new Laboratories are approaching completion.

Improvements in the gardens include the formation of a garden for British ferns to contain the magnificent collection presented to the Society by Mr. W. B. Cranfield, of Enfield Chase; the establishment of an "American Garden"; and the making of a large pond in the seven-acre field, to receive the outflow from the general system of ditches. The best thanks of the Society are due to Mr. Cranfield.

During the whole of the past year Mr. Harold Page, Chemist to the Society, has been on active commissioned service in Flanders. The Trials Officer, Mr. Titchmarsh, has received a commission, and his deputy Mr. Barker has recently joined H.M. Forces. Only the loyalty and devotion of the staff have enabled the work of the Gardens to be carried on with success. The number of visitors to the Gardens (upwards of 15,000) during the year has been greater than in any previous year—a striking evidence of the fact that Fellows seek, and

find therein, solace from the anxieties of the present time, as well as information and instruction for practical use.

The Scientific Staff has been engaged during the past year in the following researches :—

- | | |
|--------------------|--|
| Dr. Keeble . . . | The Raising of self-fertile Races of <i>Primula obconica</i> . |
| Prof. Lefroy . . . | The Prevention of White Fly and Scale. |
| Mr. Chittenden . . | Sterility of Fruit Trees. |
| Dr. Horne . . . | American Gooseberry Mildew.
Black Spot and Mildew on Roses. |

Mr. Eric Hoghton has been appointed honorary Research Student in Electro-biology and is making active preparation to begin his investigations as soon as the Laboratory is ready for use.

7. **Wisley Trials.**—The following trials have been conducted :— Winter-flowering Sweet Peas, Bearded Irises, Pyrethrums, Annual Sunflowers, Early and mid-season Potatos, Early Peas, Autumn Cabbages, Parsnips, Winter Washes for Fruit Trees, and Spray Nozzles ; and the following for the determination of Nomenclature :— Tulips, Pentstemons, Scented Pelargoniums, and Sedums.

8. **New Cottages.**—The block of six new cottages for the Staff at Wisley is now completed and occupied. It will be found at the far northern end of the Gardens, where it forms an attractive group on three sides of a square, facing the road from Byfleet.

9. **Entomologist.**—In the spring of the year the Society's Entomologist, Professor Maxwell Lefroy, M.A., was temporarily released from his duties at Wisley to enable him to undertake, on behalf of the War Office, an investigation into the means of destroying the eggs and larvæ of Flies, with the object of preventing outbreaks of disease. His investigations proved to be of much value, and a summary of them will be published in the *Journal*. Later in the year he was urgently requested by the Secretary of State to proceed to India, in order to undertake another entomological investigation for the Government. The Council felt that the acceptance by Professor Lefroy of this appointment, entailing absence from England till January 1917 at least, rendered the holding of his Wisley appointment impossible, and his resignation was accordingly accepted, though with the greatest regret.

10. **Imperial College.**—With the appointment of Professor Lefroy as Entomologist to the Society, relations were established between the Society and the Imperial College of Science. Although Professor Lefroy was compelled to relinquish his appointment in November these relations remain, and the prime object which they were designed to fulfil, namely, the establishment of a National Station for Research in Entomology at Wisley, will be pursued.

11. Diploma Examination.—The first Final Examination for the National Diploma in Horticulture was held in June, and notwithstanding absentees through the War, there were 17 successful recipients on this first occasion. It is thus evidenced that the National Diploma has already won the confidence of the gardening world, which is thoroughly convinced as to its practical, as well as its professional, utility.

12. Degree in Horticulture.—The establishment of a Degree in the Faculty of Science (B.Sc.) in Horticulture by the Senate of the University of London, foreshadowed in the last Annual Report, is now accomplished. Final negotiations are proceeding whereby the Society's Research Station and School of Horticulture at Wisley are to be recognized as a school of the University for the purpose of this Degree. Moreover, the National Diploma has been linked with the Degree by the University requiring that the Diploma Preliminary Examination should have been passed by all candidates for the Degree. The special thanks of the Society are due to Sir Albert Rollit, D.C.L., for introducing the matter, and patiently pursuing it over a series of years.

13. Tulip Nomenclature.—The Trial of Tulips for the purpose of determining their synonymy and correct nomenclature has been brought to a close, after two years of very long and careful investigation both in this country and in Holland. A full, illustrated report has been prepared, which will be issued as a separate publication at a charge of 2s. 6d. (3s. post free), from the Society's Agents, Messrs. Wesley, 28 Essex Street, London, W.C. This illustrated report will constitute the standard work on Tulips for many years to come. The Council record their grateful thanks to the gentlemen from Holland who have so kindly assisted in this work.

14. Daffodil Year Book.—The Daffodil Year Book was published in August, for the third year in succession. These Year Books are commended to the notice of Fellows for their practical information on all subjects connected with the Daffodil.

15. Rome Convention.—The text of the rules for the Importation and Exportation of Plants, introduced at the Pathological Conference at Rome in 1914, has received considerable attention. In connexion with this subject, a Return of British Imports and Exports of Plants, Seeds, Bulbs, &c., and a Schedule of Pests affecting the question, are being prepared, at the suggestion of the Society's Parliamentary Committee.

16. Pritzel.—The revision of Pritzel's "Iconum Botanicarum Index" has not been forgotten, but, under the strained conditions prevalent both in this country and abroad, it is felt that the present

is not an opportune time for commencing the work of revision ; it has therefore been decided that, during the continuance of the War, further steps should be deferred, save the collecting of funds from every available source.

17. "**The Preliminary Recognition.**"—The use of a card bearing these words has been established for the purpose of recognizing "Young plants" and "Seedlings of promise," and having them systematically recorded to the credit of their original raisers, introducers, or owners, before they arrive at a stage when a definite Certificate or Award of Merit could properly be bestowed.

18. **List of Fruits.**—Early in February the Fruit Committee suggested that the Council should give Awards to "Old Varieties of Fruits of sterling merit, which had received no award in the past." The Council replied by asking for a list of the varieties which the Committee had in mind. The Committee then drew up, and submitted in August, a list, which, they asked, should first be sent round to about 100 prominent growers, all over the kingdom, for their comments upon it. Immediately after the long vacation the Council approved a suggestion that advantage should be taken of the sending out of this list in order to obtain certain further information applicable to particular districts ; and the Secretary was directed to draw up a Form of Inquiry for the purpose. Copies of this Form were sent out, together with the Committee's original list, to 107 growers suggested by the Committee, and 84 returns have been received. The returns, tabulated according to Districts, will be published at an early date.

19. **Chelsea Show.**—The Spring Show will be held at Chelsea in 1916 on May 23, 24, and 25. Owing to the scarcity of labour, and other difficulties, the Council may have to forgo the Great Tent used in 1914 and 1915, and be content for next year with a series of large marquees, but they do not think that the Show would in any way suffer if this change should be unavoidable—it might even serve to break a threatened monotony of repetition.

20. **Holland House Show.**—The Summer Show will be held as usual at Holland House, Kensington, on July 4, 5, and 6, but it must be borne in mind that this, *like all other Meetings of the Society*, may possibly be overruled by the exigencies of the times. In case of any alterations being necessary, as long a notice as possible will be given in the Press, but it is impossible to send separate notice to every individual Fellow.

21. **Vincent Square.**—Owing to the Police Regulations controlling the lighting of London, it is necessary for the Meetings at Vincent Square to close at 5 P.M. from October to March inclusive.

22. **Lawrence Medal.**—The Lawrence Medal for 1915 has been awarded to Mr. J. Gurney Fowler, of Brackenhurst, Pembury, Kent, for his magnificent exhibit of Orchids at the last Chelsea Show.

23. **Maintaining British Gardens.**—In the latter part of the summer, the Horticultural Trade was threatened with disaster, through certain letters appearing in the Press urging the cessation of all gardening expenditure. The Society at once took up the matter, and by private correspondence with the authorities, and by appealing to the gardening public, and privately to the Fellows, it is understood that that danger has been fairly successfully combated.

24. **Dried Bulb Show.**—To encourage the planting of British-grown bulbs and to make their excellent quality known, the Council have arranged to hold a Show of dry British-grown bulbs, in connexion with the Meeting on August 1, 1916. The Schedule will be found in the Book of Arrangements.

25. **War Relief Fund.**—A Fund has been established for helping to restore Horticulturists and Market Gardeners in the Countries of our Allies whose gardens and horticultural businesses have suffered such wholesale and ruthless destruction. His Majesty The King contributed £100, and up to the close of the year the Fund has reached over £6,000, including £1,000 given by the Society.

The Council are particularly indebted to The Lady Northcote, C.I., President, and a Committee of influential ladies, viz. :—

VICE-PRESIDENTS.

The Viscountess Allendale.	The Duchess of Norfolk.
Miss Balfour.	Mrs. Leopold de Rothschild.
The Marchioness of Crewe.	The Countess of Selborne.
Mrs. Lewis Harcourt.	The Lady Wantage.
Mrs. Lowther.	The Marchioness of Zetland.

EXECUTIVE COMMITTEE.

Miss Balfour.	Mrs. Lowther.
The Lady Balfour of Burleigh.	The Lady Mayoress of London.
Mrs. Robert Benson.	The Duchess of Norfolk.
The Lady Margaret Boscawen.	The Lady Northcliffe.
The Hon. Mrs. Evelyn Cecil.	Mrs. Leopold de Rothschild.
The Countess of Jersey.	The Countess of Selborne.
Elizabeth, Lady Lawrence.	The Countess of Selkirk.
Mrs. Mark Lockwood.	Madame Vandervelde.

These Ladies are all taking the greatest trouble in organizing the work of collecting throughout Great Britain and Ireland, and Lady Presidents have been appointed on their invitation for nearly all the counties and divisions of the British Isles. A full list of the

Ladies' Committee, County Presidents, County Vice-Presidents, Treasurers, Secretaries, &c., will be issued with the March number of the *Journal*, together with a list of subscribers up to the end of the year. Besides His Most Gracious Majesty The King, the Fund has the patronage of Her Majesty The Queen, Her Majesty Queen Alexandra, His Imperial Majesty The Emperor of Russia, Her Imperial Majesty The Empress of Russia, His Majesty The King of the Belgians, Her Majesty The Queen of the Belgians, The President of the French Republic, and The Prince Regent of Serbia.

26. **Obituary.**—It is with great regret that the Council have to record the death of the following Fellows amongst others:—Lord Addington; Viscount Alverstone; Mr. Atlee Burpee, one of the leading Horticulturists of the United States; Sir Arthur Church, F.R.S., K.C.V.O.; Mr. A. D. Darbishire, a great authority on Genetics; The Earl of Jersey, G.C.B., G.C.M.G.; Dr. Hugo Müller, F.R.S., Ph.D., LL.D.; Sir George Nares, K.C.B.; Capt. Savile Reid, R.E., an expert in Lilies; Mr. T. A. H. Rivers; and the Rt. Hon. Lord Rothschild, for many years a Vice-President of, and great benefactor to, the Society. The Council also deeply regret to record the sudden death, in the last month of the year, of the Hon. John Boscawen, for many years himself a member of the Council, and at all times a most active and willing helper in matters Horticultural.

27. **Numerical Position.**—The following table shows the Society's position with regard to numerical strength during the past year:—

LOSS BY DEATH IN 1915.				FELLOWS ELECTED IN 1915.			
		£	s. d.			£	s. d.
Life Fellows	. 8	0	0 0	4 Guineas	. 3	12	12 0
4 Guineas	. 3	12	12 0	2 „	. 307	644	14 0
2 „	. 70	147	0 0	1 „	. 363	381	3 0
1 „	. 84	88	4 0	Associates	. 52	27	6 0
				Affiliated Societies	9	9	9 0
				Commutations.	6		
	165	£247	16 0	= £172	4s. od.		
				Loss	. 74 ⁰	£1,075	4 0
						1,726	4 0
LOSS BY RESIGNATION &c.				NET DECREASE IN INCOME			
		£	s. d.			£	s. d.
4 Guineas	. 2	8	8 0			£651	0 0
2 „	. 384	806	8 0				
1 „	. 574	602	14 0	Deaths and Resignations	. 1,207		
Associates	. 48	25	4 0	New Fellows &c.	. 74 ⁰		
Affiliated Societies	34	35	14 0				
				NUMERICAL LOSS	. . .	467	
	1,042	£1,478	8 0	Total on December 31, 1914	14,404		
TOTAL LOSS	1,207	£1,726	4 0	Total on December 31, 1915	13,937		

The Council deeply regret having to record that, for the first time since the year 1887, there has been a decrease, on the previous year, in the total number of Fellows. 1915 is the only year, in the long series of twenty-eight years, in which the number of New Fellows

elected has not exceeded that of the Deaths and Resignations combined, or in which the income from Fellows' Subscriptions has failed to increase; and sad to say, 1915 shows a falling off in income of £651, which, compared with the last three years' average increase of £1,163, shows a total loss from this source alone of £1,814.

In view of these facts the Council venture very earnestly to urge on the Fellows the necessity of enlisting the sympathy of all their friends, so that 1916 may to some extent restore the balance in both income and numbers, and this could so easily be done if every Fellow would endeavour to obtain at least one new recruit to the ranks of the Old Society.

28. **Committees &c.**—The Society owes a constantly recurring debt to the Members of the Standing and Special Committees, Chairmen, Judges, Writers of Papers for the *Journal*, Compilers of Extracts, Reviewers, Lecturers, and the several Examiners, who, during the past twelve months, have done so much to contribute to the Society's usefulness, and to help to maintain its high standing among the practical and scientific institutions of the world.

The Council, whilst thanking, as they do most cordially, all the members of the Committees for their kind assistance, think it not out of place to remind them that all Committees are appointed to advise those who appoint them, whose duty it then is to consider very carefully the advice so kindly tendered, and to give effect to it or not as in their judgment they consider best for the general welfare of the Society. The Council are glad to acknowledge that it is very rarely indeed that they are unable to accept the advice tendered by any of their Committees; at the same time, as the governing body of the Society, responsible to the Fellows, exceptional cases must in the course of years occasionally occur, and it is the duty of the Council in such rare instances to exercise the power of decision with which the Royal Charter and the Fellows of the Society have endowed them.

The Council greatly regret that they must at length abandon the long-cherished hope of Mr. George Bunyard, V.M.H., being again able to resume his place at the head of the Fruit Committee, on which he has served so zealously for a period of thirty-five years. The Council wish to record the thanks of the Society due to Mr. Bunyard, and express the hope that he may enjoy a quiet, restful period in the evening of his days.

The Council desire to cordially acknowledge their obligations to their staff, and also to the Press for their invaluable assistance in reporting upon, and calling attention to, the work of the Society.

By Order of the Council,

W. WILKS,
Secretary.

ROYAL HORTICULTURAL SOCIETY,
VINCENT SQUARE, WESTMINSTER, S.W.

January 1, 1916.

Dr.

ANNUAL REVENUE & EXPENDITURE ACCOUNT

	£	s.	d.	£	s.	d.
To ESTABLISHMENT EXPENSES—						
Ground Rent	690	0	0			
Rates and Taxes	579	15	9			
Water Rate	66	4	4			
Electric Light	122	7	11			
Gas	29	19	5			
						1,488 7 5
Salaries and Wages	2,279	8	10			
Printing and Stationery	1,464	0	3			
Postages	509	19	9			
Fuel	66	14	0			
Professional Fees	142	13	0			
Gratuities	58	2	0			
Repairs and Renewals (including £150 for Hall Painting)	312	18	9			
Miscellaneous Expenses	188	9	5			
						5,022 6 0
" INSURANCES						106 0 0
„ JOURNAL, PRINTING AND POSTAGE						2,618 12 1
„ STAFF PENSION	329	3	0			
<i>Less</i> contributed by the Staff, as per scheme	151	13	2			
						177 9 10
„ SHOWS and MEETINGS—						
Chelsea Show	3,096	7	11			
Holland Park Show	1,644	1	9			
Autumn Vegetable Show	412	12	7			
Labour Floral Meetings and Conferences	235	15	4			
Expenses, do. do.	32	6	7			
Council, Committee and Deputation Expenses	288	13	0			
Painting Orchid Certificates	29	12	6			
						5,739 9 8
„ INSPECTION OF GARDENS						88 15 11
„ PRIZES and MEDALS—						
Awarded at Society's Shows						524 19 11
„ [EXAMINATIONS in HORTICULTURE—						
Amount expended	315	19	8			
<i>Less</i> received in Fees	270	2	7			
						45 17 1
„ CONTRIBUTION to LINDLEY LIBRARY—						
Purchase of Books	75	18	8			
Expenses	54	1	4			
						130 0 0
„ SPECIAL EXPENDITURE—						
Publication of Douglas' Journal	251	8	6			
Share in Collector's Expedition in China	100	0	0			
Rome Convention	35	7	3			
						386 15 9
„ DEPRECIATION—						
Hall Glass Roof, Furniture, Appliances for Shows						265 9 4
						16,594 3 0
„ BALANCE, carried to BALANCE SHEET						10,536 11 7
						<u>£27,130 14 7</u>

FOR YEAR ENDING 31st DECEMBER, 1915.

Cr.

	£	s.	d.	£	s.	d.
By ANNUAL SUBSCRIPTIONS				19,646	1	6
„ ENTRANCE FEES					171	3 0
„ DIVIDENDS AND INTEREST	2,053	12	0			
„ do. do. DAVIS TRUST	47	14	8			
				2,101	6	8
„ SHOWS AND MEETINGS—						
Chelsea Show	2,042	3	6			
Holland Park Show	792	16	0			
Takings at Hall Shows	133	19	5			
				2,968	18	11
„ JOURNALS AND OTHER PUBLICATIONS—						
Advertisements	626	12	8			
Sale of Publications	221	17	9			
				848	10	5
„ HALL LETTINGS	1,337	16	3			
Less Labour Expenses	133	14	7			
				1,204	1	8
„ PRIZES AND MEDALS					89	16 5
„ LIFE COMPOSITIONS—						
Being amount paid by Fellows now deceased					84	0 0
„ RENT OF COTTAGES, WISLEY					16	16 0

£27,130 14 7

Dr.

BALANCE SHEET,

		LIABILITIES.								
To CAPITAL FUNDS ACCOUNT—		£	s.	d.	£	s.	d.			
	As at 31st December, 1914.	£44,307	11	6						
	Less Fees paid by Fellows now deceased		84	0	0					
					44,223	11	6			
	Transferred from Revenue for Capital purposes				1,778	11	6			
						46,002	3	0		
„	LIFE COMPOSITIONS, 1915					172	4	0		
„	SUNDRY CREDITORS					1,496	14	7		
„	SUBSCRIPTIONS, &c., paid in advance					318	14	9		
„	WISLEY SCHOLARSHIPS—									
	Balance 31st December, 1914.				19	15	10			
	Less paid to Scholars				14	11	8			
							5	4	2	
„	RESERVE ACCOUNT—HALL PAINTING—									
	Balance 31st December, 1914.				523	13	4			
	Added 1915				150	0	0			
							673	13	4	
„	DEPRECIATION AND RENEWALS RESERVE ACCOUNT—									
	Balance 31st December, 1914				2,211	12	10			
	Added 1915.				265	9	4			
							2,477	2	2	
„	LABORATORY PRIZE FUND—									
	Balance 31st December, 1914	£3	14	2						
	Dividend (Nicholson Memorial Fund)		6	1	3					
						9	15	5		
	Less expended					5	12	6		
								4	2	11
„	WILLIAMS MEMORIAL FUND						23	13	0	
„	MASTERS MEMORIAL FUND						11	6	0	
„	SCHRÖDER PENSION						9	8	4	
„	LINDLEY LIBRARY TRUST						8	12	6	
„	PRITZEL REVISION FUND						56	17	6	
„	GENERAL REVENUE ACCOUNT—									
	Balance, 31st December, 1914				53,923	6	0			
	Deduct—									
	Transfer to Capital Fund Account	£1,778	11	6						
	Capital Expenditure Wisley Gardens	9,550	11	0						
	Depreciation in Market Value of Securities sold or trans- ferred to Wisley Endowment Fund	2,439	11	5						
	Bad Debts		10	10	4					
					13,779	4	3			
„	REVENUE FOR THE YEAR, as per annexed Account	£10,536	11	7	40,144	1	9			
	Less WISLEY GARDENS, Excess of Expenditure over Revenue	4,610	13	7						
					5,925	18	0			
						46,069	19	9		
						£97,329	16	0		

NOTE.—The Royal Horticultural Society have agreed to contribute £1,000 to the R.H.S. War Relief Fund.

ASSETS.		£ s. d.	£ s. d.
By CAPITAL EXPENDITURE—			
„ NEW HALL AND OFFICES—			
As at 31st December, 1914 . . . . .	.41,277	13 4	
„ FURNISHING HALL AND OFFICES—			
As at 31st December, 1914 . . . . .	. 2,464	9 8	
„ FREEHOLD LAND AND COTTAGES AT WISLEY . . . . .	. 2,260	0 0	
			46,002 3 0
„ APPLIANCES FOR SHOWS			296 11 0
„ SUNDRY DEBTORS AND PAYMENTS MADE IN ADVANCE			2,047 18 2
„ WOKING WATER CO.—			
Deposit in respect of laying water-main from Ripley to Wisley Gardens			1,260 0 0
„ INVESTMENT OF DEPRECIATION and RENEWAL and RESERVE ACCOUNT—			
3½% India Stock £2,367 18 9 cost			2,211 12 10
(The approximate value of this Investment on the 31st December, 1915, was £1,912 2s. 2d.)			
„ INVESTMENTS, as per Schedule at cost			42,852 10 6
(The approximate value of these Investments on the 31st December, 1915, was £36,291 3s. 6d.)			
„ CASH—			
At Bank . . . . .	. 2,639	8 2	
In Hand . . . . .	. 19	12 4	
			2,659 0 6
			£97,329 16 0

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., 1915.

ALFRED C. HARPER, *Auditor*
(HARPER BROTHERS & FEATHER, *Chartered Accountants*),
35 GREAT TOWER STREET, LONDON, E.C.

14th January, 1916.

Dr. WISLEY GARDENS—ANNUAL REVENUE & EXPENDITURE

	£	s.	d.	£	s.	d.	£	s.	d.		
To SALARIES—											
Garden	544	7	4								
Laboratory	1,462	17	0								
				2,007	4	4					
„ RATES AND TAXES					145	7		7			
„ INSURANCES					18	2		8			
„ LABOUR					1,496	4		4			
„ GARDEN IMPLEMENTS					57	19		9			
„ LOAM AND MANURE					284	15		11			
„ REPAIRS					130	18		1			
„ FUEL					270	9		7			
„ MISCELLANEOUS EXPENSES—											
Garden	195	13	6								
Laboratory	103	15	1								
				299	8	7					
„ GRATUITIES					3	3		0			
„ CARTAGE					168	18		2			
„ TREES AND SHRUBS, AND ROCK GARDEN					35	17		3			
							4,918	9	3		
„ COST of GROWING, PACKING and DISTRIBUTION of PLANTS to FELLOWS								223	1	1	
„ STAFF PENSION				237	18	6					
Less contributed by the Staff, as per scheme				97	6	8					
							140	11	10		
„ DEPRECIATION—											
Glass Houses, Plant and Materials								448	14	3	
„ SPECIAL EXPENDITURE—											
Professional Fees re agreement with Woking Water Company				49	15	6					
Royal Zoological Society, Fly Research				62	10	0					
							112	5	6		
							£5,843	1	11		

ACCOUNT FOR YEAR ENDING 31st DECEMBER, 1915.

Cr.

	£	s.	d.	£	s.	d.
By DIVIDENDS AND INTEREST				1,117	19	9
„ PRODUCE SOLD				72	8	7
„ STUDENTS' FEES				42	0	0
„ BALANCE, being excess of Expenditure over Revenue				4,610	13	7

£5,843 11

Dr.

WISLEY GARDENS—BALANCE

LIABILITIES.

	£	s.	d.	£	s.	d.
To CAPITAL FUNDS ACCOUNT—						
As at 31st December, 1914	13,764	8	6			
Amount transferred from R. H. Society, 31st December, 1915	9,550	11	0			
				23,314	19	6
„ ENDOWMENT FUND				25,000	0	0
„ DEPRECIATION AND RENEWALS—						
As at 31st December, 1914	2,772	7	0			
Added, 1915	398	14	3			
				3,171	1	3

£51,486 0 9

ASSETS.

	£	s.	d.	£	s.	d.
By DWELLING HOUSES—						
As at 31st December, 1914 .	£5,579	11	10			
Expenditure since						
Installation of Water	72	5	6			
				5,651	17	4
„ GLASS HOUSES, RANGES, POTTING SHED, &c.—						
As at 31st December, 1914	5,202	6	0			
„ LABORATORY—						
As at 31st December, 1914	£2,052	5	5			
Expenditure since	9,292	10	9			
				11,344	16	2
						22,198 19 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.						
„ INVENTORY OF PLANT AND LOOSE EFFECTS—						
As taken by Mr. G. P. Allen and Mr. Chittenden					966	0 0
„ MOTOR CAR	200	0	0			
Less Depreciation	50	0	0			
					150	0 0
						23,314 19 6
„ INVESTMENT OF DEPRECIATION and RENEWALS RESERVE ACCOUNT, 31st December, 1914—						
£2,981 11s. 10d. 3½% India Stock at cost	2,772	7	0			
(The approximate value of this Investment on the 31st December, 1915, was £2,407 12s. 8d.)						
Add Cash at Bank for Investment, 31st December, 1915	398	14	3			
					3,171	1 3
„ INVESTMENTS—						
Great Eastern Railway Company 4 % Debenture Stock £3,500	3,535	0	0			
Leopoldina Railway Company, Ltd. 5 % Terminable Debentures £2,000	2,000	0	0			
City of Moscow Loan 1912. 4½% Bonds £6,000	5,730	0	0			
Buenos Ayres Great Southern Railway Company 5 % Non-Cumulative Preference Stock £2,500	2,825	0	0			
War Stock 4½% 1925-45, £5,000	5,000	0	0			
Canadian Pacific Railway Company 4 % Perpetual Consolidated Debenture Stock, £4,632	3,890	17	6			
Consols 2½% £3,229 5s. 6d.	1,889	2	6			
London County Consolidated 3½% Stock £135 8s. 4d.	130	0	0			
					25,000	0 0
(The approximate value of these Investments on the 31st December, 1915, was £22,429 5s. 5d.)						
						£51,486 0 9

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., 1915.

ALFRED C. HARPER, Auditor

(HARPER BROTHERS & FEATHER, Chartered Accountants),

35 Great Tower Street, London, E.C.

14th January, 1916.

Dr.

ALFRED DAVIS

Bequeathed to the Society in 1870 for Annual Prizes,

	£	s.	d.	£	s.	d.
To Amount of Fund, 31st December, 1914	1,797	8	9			
„ Dividends received 1915				47	14	8
				<u> </u>		

WILLIAMS

Raised by Donations in 1891 in Memory of

	£	s.	d.	£	s.	d.
To Amount of Fund, 31st December, 1914	204	2	5			
„ Balance 31st December, 1914				16	0	8
„ Dividends received 1915				7	12	4
				<u> </u>		
				<u>23 13 0</u>		

MASTERS

Raised by Donations in 1908 in Memory of Dr. Masters

	£	s.	d.	£	s.	d.
To Amount of Fund, 31st December, 1914	542	17	0			
„ Balance 31st December, 1914				11	6	0
„ Dividends received 1915				20	0	0
				<u> </u>		
				<u>£31 6 0</u>		

NICHOLSON

Raised by Donations in 1908 in Memory of

	£	s.	d.	£	s.	d.
To Amount of Fund 31st December, 1914	160	12	11			
„ Dividends received 1915				6	1	6

SCHRÖDER

Provided by Royal Horticultural Society in Memory of the late Baron

	£	s.	d.	£	s.	d.
To Amount of Fund 31st December, 1914	557	14	6			
„ Balance 31st December, 1914				9	8	4
„ Dividends received 1915				20	0	0
				<u> </u>		
				<u>29 8 4</u>		

TRUST FUND.

Cr.

or in any other way the Council may determine.

	£	s.	d.	£	s.	d.
By Consols, £2,022 8s. 9d.	cost	1,797	8	9		
„ Revenue and Expenditure Account					47	14 8

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 3s. 1d.	36	2	5			
	<u>204</u>	<u>2</u>	<u>5</u>			
„ Balance in hands of R. H. Society				23	13	0
				<u>23</u>	<u>13</u>	<u>0</u>

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			
	<u>542</u>	<u>17</u>	<u>0</u>			
„ Dr. Russell for Lectures, 1915				20	0	0
„ Balance in hands of R. H. Society				11	6	0
				<u>£31</u>	<u>6</u>	<u>0</u>

MEMORIAL FUND.

George Nicholson for Prizes to Wisley Students.

	£	s.	d.	£	s.	d.
By Tasmanian Government 4 per cent. Inscribed Stock (1940-50), £162 4s. 5d.	160	12	11			
„ Transfer to Wisley Prize Fund				6	1	6

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				9	8	4
				<u>29</u>	<u>8</u>	<u>4</u>

Dr.

LINDLEY LIBRARY

	<i>£</i>	<i>s.</i>	<i>d.</i>	<i>£</i>	<i>s.</i>	<i>d.</i>
To Amount of Fund 31st December, 1914.	5,987	4	10			
„ Contribution from R. H. Society, 31st December, 1915		75	18	8		
	<hr/>			6,063	3	6
To Balance 31st December, 1914					8	0
„ Dividends and Donations received 1915					46	10
„ Contribution from R. H. Society, 31st December, 1915					54	1
	<hr/>				108	12
	<hr/>				6	6

PRITZEL REVISION

Fund to be raised for the Revision of Pritzel's Iconum

	<i>£</i>	<i>s.</i>	<i>d.</i>	<i>£</i>	<i>s.</i>	<i>d.</i>
To Amount of Fund, 31st December, 1914.	859	2	2			
„ Balance, 31st December, 1914					22	13
„ Dividends received 1915					34	3
	<hr/>				56	17
	<hr/>				6	6

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, 1914				4,528	9	3
„ Purchase of Books, 1913 (<i>See</i> Report)				75	18	8
				<hr style="width: 100%;"/>		
				6,063	3	6
By Librarian's Salary					100	0 0
„ Balance in hands of R. H. Society					8	12 6
				<hr style="width: 100%;"/>		
				108	12	6
				<hr style="width: 100%;"/>		

FUND.

Botanicarum Index. Estimated cost, £3,000.

	£	s.	d.	£	s.	d.
By India 2½ per cent. Stock, £1,367 13 6				859	2	2
„ Balance in hands of R. H. Society					56	17 6
				<hr style="width: 100%;"/>		
				56	17	6
				<hr style="width: 100%;"/>		

SCHEDULE OF INVESTMENTS.

31st December, 1915.

	<i>cost</i>	<i>£</i>	<i>s.</i>	<i>d.</i>
2½ % Consols, £5,324 19s. 8d.	<i>cost</i>	5,081	6	0
3 % Local Loans, £5,800	,,	6,006	16	6
3½ % Indian Rupee Paper, 37,000 Rupees	,,	2,462	14	4
3½ % Dominion of Canada Registered Stock (1930-1950), £2,000	,,	2,000	0	0
3½ % London County Consolidated Stock, £2,864 11s. 8d.	,,	2,884	6	10
3½ % India Stock £2,063 4s. 6d.	,,	2,024	10	4
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
5 % State of San Paulo Treasury Bonds (1913) £5,000	,,	4,897	13	0
4 % Central Argentine Railway, Limited, Debenture Stock, £600	,,	537	15	10
2½ % India Stock, £186 9s. 9d.	,,	109	2	2
4 % Mortgage on Freehold £1,000	,,	1,000	0	0
4½ % War Stock (1925-1945), £2,000	,,	1,995	2	0
5 % Exchequer Bonds, £2,000	,,	2,000	0	0
		<u>£42,852</u>	<u>10</u>	<u>6</u>

GENERAL MEETING.

FEBRUARY 22, 1916.

Dr. F. KEEBLE, F.R.S., in the Chair.

Fellows elected (52).—Mrs. P. Adams, Mrs. H. Baldwin, Mrs. M. E. Barber, Mrs. Bergne, Miss J. E. Biggs, Mrs. Bolitho, Mrs. A. Bowe, J. B. Cudlip, R. Daniels, A. H. Dix, G. H. Dunsmure, Major H. E. Fiennes, J. Firth, Miss M. D. Fort, Miss V. F. H. Fraser, Miss G. E. Galbraith, Mrs. Hawkesley, C. Hawkins, R. S. Hunter, Mrs. Lawson, Capt. F. Baring Leman, Mrs. Gwyn Lewis, Mrs. Lias, Mrs. R. Lockwood, Mrs. L. S. Long, Mrs. H. C. Minchin, Mrs. E. Morton, Mrs. E. Mylne, H. Ocle, Rev. G. T. C. Pearce, Mrs. J. Pearson, A. W. Pepper, Mrs. J. E. Ponder, Mrs. C. I. Rawle, J. Rooke Rawlence, Mrs. E. Roney, Mrs. H. L. Rooke, Earl Russell, C. A. Samuells, Miss E. Smith, Mrs. Mackintosh Smith, A. T. Stephens, F. Stokes, Mrs. Arnold Sutton, Mrs. Telfordsmith, C. R. Thorn, Mrs. Chicheley Thornton, Mrs. A. V. Treacher, Mrs. E. Tudway, Miss M. F. Vincent-Wing, C. J. Warren, T. J. Whiffen.

Associates (25).—Miss M. D. Barbour, Miss M. Baur, Miss M. Bayley, H. Coombe, Miss E. A. Davis, Miss D. George, T. D. Henstock, Miss M. Howard, Miss C. Hughes, Miss E. Johnston, Miss D. Leeper, Miss E. M. McCowen, Miss O. F. Marshall, Miss E. Moberly, Miss M. Nest Owen, Miss M. O. Slaney, G. Smith, Miss L. Spicer, Miss A. H. Stein, Miss K. M. Sutherland, Miss V. M. Taylor, Miss R. Waite, Miss M. Wall, Miss E. S. Williamson, Miss M. Williamson.

Society Affiliated (1).—Longfords Valley Hort. Soc.

A lecture on "Essential Points of Orchid Cultivation" was given by Mr. Gurney Wilson, F.L.S. (see p. 7).

GENERAL MEETING.

MARCH 7, 1916.

Sir JOHN T. D. LLEWELYN, D.L., V.M.H., in the Chair.

Fellows elected (23).—J. Key Allen, Mrs. I. H. B. de la Poer Beresford, Mrs. J. F. Bullar, L. A. Church, C. M. Cooling, Gen. H. S. FitzGerald, C.B., B. A. Glover, Mrs. Hethrington, Miss G. Hunter, Mrs. C. Carkeet James, Mrs. F. Joynson, Miss G. Miller, Mrs. T. H. Morgan, Mrs. Oppenheimer, F. H. Purchas, J. F. Rayner, Miss S. Seruya, F. Siddons, Mrs. W. Lloyd Thomas, W. Upton, Mrs. R. Wedgwood, G. J. White, Robert Williams.

Fellows resident abroad (2).—W. Head (India), Mrs. F. Smyly (Canada).

Associates (2).—Miss M. H. Harral, Miss K. Lloyd Jones.

A lecture on "The Control of Fungal Plant Disease in Great Britain" was given by Dr. A. S. Horne (see p. 13).

GENERAL MEETING.

MARCH 14, 1916.

The Rev. JOSEPH JACOB in the Chair.

Fellows elected (14).—G. C. Carley, J. Hudson Davies, Miss Deare, E. Denson, Miss M. French, Miss M. Goring, Mrs. H. Le M. Guille, Hon. Mrs. Geoffrey Howard, Mrs. E. T. Hudson, Miss P. Lebus, J. Northcott, Walter Rush, Owen H. Smith.

Fellow resident abroad.—Mrs. Lionel Hood (Australia).

A lecture on "Crocuses and their Species" was given by Mr. E. A. Bowles, M.A.

SPRING SHOW OF FORCED BULBS.

TUESDAY AND WEDNESDAY, MARCH 14 AND 15, 1916.

Class 2.—Twenty-four Hyacinths, eighteen distinct varieties.

First Prize, £5 5s. ; Second, £3 3s. ; Third, £1 11s. 6d.

1. Duke of Portland, Welbeck Abbey, Worksop (gr. J. Gibson).
2. R. G. Morrison, Esq., The Hollies, Victoria Park, Wavertree (gr. E. Raper).
3. Marquis of Ripon, Coombe Court, Kingston Hill (gr. T. Smith).

Class 3.—Twelve Hyacinths, distinct.

First Prize, £3 3s. ; Second, £2 2s. ; Third, £1 1s.

1. William Joyce, Esq., 53 Prince Alfred Road, Wavertree, Liverpool (gr. A. Hitchman).
- No other awards.

Class 4.—Six Hyacinths, distinct.

First Prize, £1 11s. 6d. ; Second, £1 1s. ; Third, 10s. 6d.

1. J. Haslam, Esq., 12 Newcastle Avenue, Worksop.
2. T. Crompton, Esq., Halfway House, Woolton Road, Wavertree, Liverpool (gr. J. Gilston).
3. Not awarded.

Class 5.—Six pans of Hyacinths, ten roots of one variety in each pan. The blooms of each pan to be of distinctly different colour from those of the other five pans ; the bulbs need not have been actually grown in the pans.

First Prize, £5 5s. ; Second, £3 3s. ; Third, £1 11s. 6d.

1. Duke of Portland.
 2. Marquis of Ripon.
- No third.

Class 6.—The finest decorative display of Hyacinths to be staged on the floor.

First Prize, £5 5s. ; Second, £3 3s. ; Third, £1 11s. 6d.

1. Duke of Portland, Welbeck Abbey, Worksop (gr. J. Gibson).
2. Marquis of Ripon, Coombe Court, Kingston Hill (gr. T. Smith).
- No third.

NOTE.—For Classes 2, 3, and 4 each bulb must be in a separate pot (size optional). Classes 2, 3, 4, and 5 must all be single spikes ; no spikes must be tied together. Exhibitors may only compete in one of the Classes 2, 3, or 4. All bulbs must have been forced entirely in Great Britain or Ireland. All varieties should be correctly named. Points will be deducted for all incorrect names.

GENERAL MEETING.

MARCH 28, 1916.

Sir JOHN T. D. LLEWELYN, D.L., V.M.H., in the Chair.

Fellows elected (29).—Chas. Henry Bacon, The Lady Edward Spencer Churchill, Mrs. V. A. Corbett, Mrs. S. A. Courtauld, M. H. Dear, Mrs. H. W. Ellis, Mrs. G. M. Fowler, Miss D. Giffard, J. Hazel, W. J. Heney, Mrs. P. G. Hutchison, Mrs. W. B. Incedon, F. W. Lang, Mrs. Percy Leaf, W. H. Martindale, Mrs. J. F. B. Matthews, S. M. Mellor, R. L. Mond, M.A., W. Muir, Mrs. J. H. Newton, Lady Reynolds, Mrs. F. H. Schwann, Philip Smith, Miss Mary C. Sprague, Mrs. A. S. Sutherland-Harris, G. H. Ward, A. K. Watson, Mrs. R. Wilson, Mrs. F. W. Young.

Fellows resident abroad (4).—B. M. Gupta, B.A., M. R. Siddaramaiya, Rev. B. Upward, Edwin A. White (Ithaca).

GENERAL MEETING.

APRIL 11, 1916.

HENRY CUST, Esq., in the Chair.

Fellows elected (29).—The Countess of Ancaster, Col. R. R. Charteris, C. du P. Chiappini, F. W. Costin, Miss H. Cowen, H. Dicks, C. R. Greenfield, E. W. Greening, E. Hatton, Mrs. W. D. Hoare, R. W. Hunt, Miss F. Ind, Mrs. E. Joannides, Mrs. C. Johnston, Miss E. Kendall, Col. H. S. Lockhart-Ross, Fredk. Mills, W. H. Moore, Wm. Hy. Neal, F. M. Newton, Dr. C. A. P. Osburne, E. J. Parsons, A. Rampton, Sir E. Rosling, W. Smyth, A. L. Stocks, C. S. Walsh, A. P. Wilkin, F.Z.S., W. H. Woodward.

Fellow resident abroad.—H. A. Govindaran.

Society Affiliated.—Lincolnshire Gardeners' Society.

Associates (2).—Miss Laura Epps, Miss Rowan.

A lecture on "Medicinal Herbs" was given by Mr. E. M. Holmes.

GENERAL MEETING.

APRIL 18, 1916.

H. J. ELWES, Esq., F.R.S., V.M.H., in the Chair.

Fellows elected (17).—Lieut. Eric C. Cheshire, Miss Flower, Mrs. Goodchild, W. H. Grant, C. Oscar Gridley, Loftus R. G. Hare, John McEwan, J.P., Robt. Miller, Miss Otway, Miss M. Pettus-Batcheler, Mrs. C. F. Rawson, Miss E. K. Salter, R. M. Spiller, Viscountess Templetown, Harold Wells, Miss Florence Witherington, Mrs. R. C. Wroughton.

Associate.—Miss E. M. Casey.

A lecture on "Hybrids, Sports, and Varieties of Trees" was given by Professor Henry, M.A., V.M.H.

DAFFODIL SHOW.

TUESDAY AND WEDNESDAY, APRIL 18 AND 19, 1916.

SECTION I.

Open Classes.

(Exhibitors in Section I. could not enter or compete in Sections II. or III.)

Class 1.—Daffodils, 48 varieties, fairly representing the different Divisions. Three stems of each.

First Prize, Silver-gilt Cup and £1; Second, Standard Cup and £1; Third, Silver-gilt Flora Medal and £1.

1. A. M. Wilson, Esq., Shovell, Bridgwater.
2. C. Bourne, Esq., Simpson, Bletchley.
3. Messrs. F. H. Chapman, Ltd., Rotherside Gardens, Rye.

Class 2.—Twelve varieties (Division I.). Three stems of each.

First Prize, Silver-gilt Banksian Medal and £1; Second, £1; Third, 10s.

1. Messrs. Barr, King Street, Covent Garden, W.C.
2. A. M. Wilson, Esq.
3. C. Bourne, Esq.

Class 3.—Twelve varieties. (Division II.) Three stems of each.

First Prize, Silver-gilt Banksian Medal and £1; Second, £1; Third, 10s.

1. A. M. Wilson, Esq.
 2. C. Bourne, Esq.
- No third.

Class 4.—Twelve varieties. (Division III.) Three stems of each.

First Prize, Silver-gilt Banksian Medal and £1 ; Second, £1 ; Third, 10s.

1. A. M. Wilson, Esq.
2. C. Bourne, Esq.
3. Messrs. Chapman.

Class 5.—Nine varieties. (Division IVa.) Three stems of each.

First Prize, Silver-gilt Banksian Medal and £1 ; Second, £1 ; Third, 10s.

1. Rev. J. Jacob, Whitewell Rectory, Whitchurch, Salop.
 2. A. M. Wilson, Esq.
- No third.

Class 5A.—Nine varieties. (Division IVb.) Three stems of each.

First Prize, Silver-gilt Banksian Medal and £1 ; Second, £1 ; Third, 10s.

No awards.

Class 6.—Nine varieties, selected from Divisions V., VI., and VII.
Three stems of each.

First Prize, Silver-gilt Banksian Medal and £1 ; Second, 15s. ; Third, 10s.

1. A. M. Wilson, Esq.
- No second.

Class 7.—Six varieties. (Division VIII.) Three stems of each.

First Prize, Silver-gilt Banksian Medal and £1 ; Second, 15s. ; Third, 10s.

1. W. F. M. Copeland, Esq., West View, Shirley, Southampton.
2. A. M. Wilson, Esq.

Class 8.—Nine varieties. (Division IX.) Three stems of each.

First Prize, Silver-gilt Banksian Medal and £1 ; Second, 15s. ; Third, 10s.

1. Messrs. F. H. Chapman.
- No second.

Class 9.—Six varieties. (Division X.) Three stems of each.

First Prize, Silver-gilt Banksian Medal and £1 ; Second, 15s. ; Third, 10s.

1. W. F. M. Copeland, Esq.
- No other awards.

Class 9A.—Six varieties. Three stems of each. To be selected from any or all of the Divisions I., II., III., IV., and IX. None of the flowers must exceed three inches in diameter.

First Prize, Silver Banksian Medal ; Second, 15s. ; Third, 10s.

This class was intended to encourage the exhibition of the smaller-flowered varieties. The Judges were particularly instructed not to give points for under-sized blooms of large-flowered varieties.

No entries.

SECTION II.

Amateurs only.

All flowers shown in this Section must be in commerce.
(Exhibitors in Section II. could not enter or compete in Sections I.
or III.)

Class 10.—Collection of Daffodils, 24 varieties, fairly representing the different Divisions. Three stems of each.

First Prize, Standard Cup and £1; Second, Silver-gilt Banksian Medal and 15s.;
Third, Silver Flora Medal and 10s.

No other awards.

3. A. Johnson, Esq., Greensted, West Hill, East Grinstead.

Class 11.—Six varieties. (Division I.) Three stems of each.

First Prize, 15s.; Second, 10s.; Third, 7s. 6d.

1. Rev. T. Buncombe, The Rectory, Black Torrington, Devon.

2. R. Morton, Esq., Grange Dene, Woodside Park, N.

3. H. R. Darlington, Esq., Park House, Potter's Bar.

Class 12.—Six varieties. (Division II.) Three stems of each.

First Prize, 15s.; Second, 10s.; Third, 7s. 6d.

1. R. Morton, Esq.

2. H. R. Darlington, Esq.

3. A. Johnson, Esq.

Class 13.—Six varieties. (Division III.) Three stems of each.

First Prize, 15s.; Second, 10s.; Third, 7s. 6d.

1. H. R. Darlington, Esq.

2. R. Morton, Esq.

No third.

Class 14.—Six varieties. (Division IV*a*.) Three stems of each.

First Prize, 15s.; Second, 10s.; Third, 7s. 6d.

No awards.

Class 14*A*.—Six varieties. (Division IV*b*.) Three stems of each.

First Prize, 15s.; Second, 10s.; Third, 7s. 6d.

1. Rev. T. Buncombe.

2. H. R. Darlington, Esq.

No third.

Class 15.—Six varieties. (Division IX.) Three stems of each.

First Prize, 15s.; Second, 10s.; Third, 7s. 6d.

1. R. Morton, Esq.

2. H. R. Darlington, Esq.

No third.

Class 16.—Six varieties. (Division V.) One stem of each.

First Prize, 15s.; Second, 10s.; Third, 7s. 6d.

1. Mrs. Ridley, Maperton, Wincanton, Somerset.

2. H. R. Darlington, Esq.

No third.

Class 17.—Six varieties. (Division VIII.) Three stems of each.

First Prize, 15s. ; Second, 10s. ; Third, 7s. 6d.

1. H. R. Darlington, Esq.
- No other awards.

Class 18.—Three varieties. (Division X.) Three stems of each.

First Prize, 7s. 6d. ; Second, 5s. ; Third, 3s.

1. R. Morton, Esq.
 2. H. R. Darlington, Esq.
- No third.

Class 18A.—Six varieties. Three stems of each. To be selected from any or all of the Divisions I., II., III., IV., or IX. None of the flowers must exceed three inches in diameter.

First Prize, 15s. ; Second, 10s. ; Third, 7s. 6d.

This class is intended to encourage the exhibition of the smaller-flowered varieties. The Judges were particularly instructed not to give points for under-sized blooms of large-flowered varieties.

1. R. Morton, Esq.
 2. H. R. Darlington, Esq.
- No third.

SECTION III.

Amateurs only.

All flowers in this Section must be in Commerce.

(Exhibitors in Section III. could not enter or compete in Sections I. or II.)

Class 19.—Twelve varieties, fairly representing the different Divisions. Three stems of each.

First Prize, Silver-gilt Banksian Medal and 10s. 6d. ; Second, Silver Flora Medal and 7s. 6d. ; Third, Silver Banksian Medal and 5s.

1. Miss V. Warren, The Oaks, Westbere, Canterbury.
2. W. B. Cranfield, Esq., East Lodge, Enfield Chase, Enfield.
3. G. Stocks, Esq., 44 Bentley Road, Doncaster.

Class 20.—Three varieties. (Division Ia.) Three stems of each.

First Prize, 7s. 6d. ; Second, 5s. ; Third, 3s.

1. W. B. Cranfield, Esq.
2. Mrs. Butler, Twynning Park, Tewkesbury.
3. Geo. Churcher, Esq., Woodcote, Alverstoake, Hants.

Class 21.—Three varieties. (Division Ib.) Three stems of each.

First Prize, 7s. 6d. ; Second, 5s. ; Third, 3s.

1. W. B. Cranfield, Esq.
2. Miss V. Warren.
3. Mrs. Butler.

- Class 22.—Three varieties. (Division Ic.) Three stems of each.
 First Prize, 7s. 6d.; Second, 5s.; Third, 3s.
1. W. B. Cranfield, Esq.
 2. Mrs. Butler.
 3. Geo. Churcher, Esq.
- Class 23.—Three varieties. (Division IIa.) Three stems of each.
 First Prize, 7s. 6d.; Second, 5s.; Third, 3s.
1. W. B. Cranfield, Esq.
 2. Miss V. Warren.
 3. Mrs. Butler.
- Class 24.—Three varieties. (Division IIb.) Three stems of each.
 First Prize, 7s. 6d.; Second, 5s.; Third, 3s.
1. Mrs. Butler.
 2. Miss V. Warren.
 3. W. B. Cranfield, Esq.
- Class 25.—Three varieties. (Division IIIa.) Three stems of each.
 First Prize, 7s. 6d.; Second, 5s.; Third, 3s.
1. Miss V. Warren.
 2. Geo. Churcher, Esq.
 3. Mrs. Butler.
- Class 26.—Three varieties. (Division IIIb.) Three stems of each.
 First Prize, 7s. 6d.; Second, 5s.; Third, 3s.
1. Geo. Churcher, Esq.
 2. Miss V. Warren.
 3. W. B. Cranfield, Esq.
- Class 27.—Three varieties. (Division IVa.) Three stems of each.
 First Prize, 7s. 6d.; Second, 5s.; Third, 3s.
1. W. B. Cranfield, Esq.
- No other awards.
- Class 27A.—Three varieties. (Division IVb.) Three stems of each.
 First Prize, 7s. 6d.; Second, 5s.; Third, 3s.
1. Geo. Stocks, Esq.
 2. Geo. Churcher, Esq.
- No third.
- Class 28.—Three varieties. (Division V.) One stem of each.
 First Prize, 7s. 6d.; Second, 5s.; Third, 3s.
1. W. B. Cranfield, Esq.
- No other awards.
- Class 29.—Three varieties. (Division VIII.) Three stems of each.
 First Prize, 7s. 6d.; Second, 5s.; Third, 3s.
1. Geo. Churcher, Esq.
 2. Geo. Stocks, Esq.
- No third.

Class 30.—Three varieties. (Division IX.) Three stems of each.
First Prize, 7s. 6d. ; Second, 5s. ; Third, 3s.

1. Mrs. Butler.
2. Miss V. Warren.
- No third.

Class 31.—Three varieties. (Division X.) Three stems of each.
First Prize, 7s. 6d. ; Second, 5s. ; Third, 3s.

1. Miss V. Warren.
2. W. B. Cranfield, Esq.
- No third.

Class 31A.—Three varieties. Three stems of each. To be selected from any or all of the Divisions I., II., III., IV., and IX. None of the flowers must exceed three inches in diameter.

First Prize, 7s. 6d. ; Second, 5s. ; Third, 3s.

This class is intended to encourage the exhibition of the smaller-flowered varieties. The Judges are particularly instructed not to give points for under-sized blooms of large-flowered varieties.

1. Geo. Stocks, Esq.
2.

{	equal	Geo. Churcher, Esq.
		W. B. Cranfield, Esq.

SECTION IV.

Seedling and new Daffodils—Open Classes.

Class 32.—Twelve varieties, introduced into commerce since 1912. One stem of each.

First Prize, Standard Cup and £1 ; Second, Silver-gilt Flora Medal and 15s. ;
Third, Silver-gilt Banksian Medal and 10s.

No awards.

Class 33.—Twelve varieties, not in commerce. One stem of each.
First Prize, Engleheart Cup and £1 ; Second, Silver-gilt Flora Medal and £1 ;
Third, Silver-gilt Banksian Medal and 15s.

1. P. D. Williams, Esq., Lanarth, St. Keverne.
2. Messrs. Barr.
- No third.

Class 34.—Six varieties, not in commerce. One stem of each.
First Prize, Silver-gilt Banksian Medal and £1 ; Second, Silver Flora Medal and 15s. ; Third, Silver Banksian Medal and 10s.

1. Capt. H. G. Hawker, Higher Barracks, Exeter.
2. Rev. J. Jacob.
3. Messrs. F. H. Chapman.

Class 35.—Three varieties, not in commerce. One stem of each.
First Prize, Silver Flora Medal and 10s. ; Second, Silver Banksian Medal and 7s. 6d. ; Third, 7s. 6d.

1. C. Bourne, Esq.
2. C. Lemesle Adams, Esq., Pendeford Hall, Wolverhampton.
3. Rev. T. Buncombe.

Class 36.—Three varieties, not in commerce. Nine blooms of each. First Prize, Silver-gilt Banksian Medal and £1; Second, Silver Flora Medal and 15s.; Third, Silver Banksian Medal and 10s.

2. Messrs. F. H. Chapman.

No other awards.

Class 36A.—One variety, not in commerce. Nine blooms. First Prize, Silver Flora Medal and 7s. 6d.; Second, Silver Banksian Medal and 5s.; Third, Bronze Flora Medal and 2s. 6d.

1. Capt. H. G. Hawker.

No other awards.

Class 37.—Nine varieties of Triandrus Hybrids, not in commerce. One stem of each.

First Prize, Silver-gilt Flora Medal and £1; Second, Silver-gilt Banksian Medal and 15s.; Third, Silver Flora Medal and 10s.

1. Messrs. Barr.

2. W. F. M. Copeland, Esq.

3. Messrs. Chapman.

Class 38.—Twelve varieties, raised by the exhibitor. One stem of each.

First Prize, Silver-gilt Cup; Second, Standard Cup; Third, Silver-gilt Flora Medal.

1. A. M. Wilson, Esq.

2. Messrs. Barr.

No third.

Class 39.—Six varieties, raised by the exhibitor. One stem of each.

First Prize, Standard Cup; Second, Silver-gilt Flora Medal; Third, Silver-gilt Banksian Medal.

1. Messrs. F. H. Chapman.

2. Rev. J. Jacob.

3. W. F. M. Copeland, Esq.

Class 40.—Three varieties, raised by the exhibitor. One stem of each.

First Prize, Silver-gilt Flora Medal; Second, Silver Flora Medal; Third, Silver Banksian Medal.

1. C. Lemesle Adams, Esq.

2. Rev. T. Buncombe.

3. Geo. Stocks, Esq.

Class 40A.—Three varieties, not in commerce. Three stems of each. To represent any of the Divisions I., II., III., IV., or IX. None of the flowers must exceed three inches in diameter.

First Prize, Silver Flora Medal and 10s.; Second, Silver Banksian Medal and 7s. 6d.; Third, 7s. 6d.

1. P. D. Williams, Esq.

2. T. Batson, Esq., Beaworthy, S. Devon.

3. W. F. M. Copeland, Esq.

SECTION V.

Single Blooms—Open Classes.

Class 41.—One bloom. (Division Ia.)

First Prize, 7s. 6d. ; Second, 5s. ; Third, 2s. 6d.

1. P. D. Williams, Esq.
2. A. M. Wilson, Esq.
3. Capt. H. G. Hawker.

Class 42.—One bloom. (Division Ib.)

First Prize, 7s. 6d. ; Second, 5s. ; Third, 2s. 6d.

1. W. F. M. Copeland, Esq.
2. P. D. Williams, Esq.
3. C. Bourne, Esq.

Class 43.—One bloom. (Division Ic.)

First Prize, 7s. 6d. ; Second, 5s. ; Third, 2s. 6d.

1. P. D. Williams, Esq.
2. C. Lemesle Adams, Esq.
3. Messrs. F. H. Chapman.

Class 44.—One bloom. (Division IIa.)

First Prize, 7s. 6d. ; Second, 5s. ; Third, 2s. 6d.

1. P. D. Williams, Esq.
2. A. M. Wilson, Esq.
3. W. F. M. Copeland, Esq.

Class 45.—One bloom. (Division IIb.)

First Prize, 7s. 6d. ; Second, 5s. ; Third, 2s. 6d.

1. P. D. Williams, Esq.
2. Mrs. Gage Hodge, Huxham Rectory, Exeter.
3. $\left\{ \begin{array}{l} \text{equal} \\ \text{C. Lemesle Adams, Esq.} \\ \text{W. F. M. Copeland, Esq.} \end{array} \right.$

Class 46.—One bloom. (Division IIIa.)

First Prize, 7s. 6d. ; Second, 5s. ; Third, 2s. 6d.

1. P. D. Williams, Esq.
2. A. M. Wilson, Esq.
3. Messrs. F. H. Chapman.

Class 47.—One bloom. (Division IIIb.)

First Prize, 7s. 6d. ; Second, 5s. ; Third, 2s. 6d.

1. A. M. Wilson, Esq.
2. P. D. Williams, Esq.
3. Messrs. F. H. Chapman.

Class 48.—One bloom. (Division IVa.)

First Prize, 7s. 6d. ; Second, 5s. ; Third, 2s. 6d.

1. P. D. Williams, Esq.
2. Rev. J. Jacob.
3. C. Bourne, Esq.

Class 48A.—One bloom. (Division IVb.)

First Prize, 7s. 6d.; Second, 5s.; Third, 2s. 6d.

1. P. D. Williams, Esq.
2. Capt. H. G. Hawker.
3. C. Bourne, Esq.

Class 49.—One stem. (Division V.) Trumpet-shaped.

First Prize, 7s. 6d.; Second, 5s.; Third, 2s. 6d.

1. P. D. Williams, Esq.
2. T. Batson, Esq.
3. Messrs. F. H. Chapman.

Class 50.—One stem. (Division V.) Cup-shaped.

First Prize, 7s. 6d.; Second, 5s.; Third, 2s. 6d.

1. W. B. Cranfield, Esq.
2. W. F. M. Copeland, Esq.
3. Messrs. F. H. Chapman.

Class 51.—One stem. (Division VII.)

First Prize, 7s. 6d.; Second, 5s.; Third, 2s. 6d.

1. A. M. Wilson, Esq.
2. P. D. Williams, Esq.
3. T. Batson, Esq.

Class 52.—One stem. (Division VIII.)

First Prize, 7s. 6d.; Second, 5s.; Third, 2s. 6d.

1. P. D. Williams, Esq.
2. A. M. Wilson, Esq.
3. W. F. M. Copeland, Esq.

Class 53.—One bloom. (Division IX.)

First Prize, 7s. 6d.; Second, 5s.; Third, 2s. 6d.

1. Messrs. F. H. Chapman.
2. P. D. Williams, Esq.
3. Capt. H. G. Hawker.

Class 54.—One bloom. (Division X.)

First Prize, 7s. 6d.; Second, 5s.; Third, 2s. 6d.

1. W. F. M. Copeland, Esq.
2. A. M. Wilson, Esq.
3. Capt. H. G. Hawker.

SECTION VI.

Open to all Amateurs.

Class 55.—A Collection of thirty-six varieties, three stems of each, fairly representing Divisions I., II., III., IV., V., IX., and X. Divisions VI. and VII. optional, Divisions VIII. and XI. excluded.

The Council have accepted the prizes offered in this class by Messrs. Barr and Sons, for award at the Daffodil Show.

First Prize, the Barr Silver Daffodil Vase; Second, £3; Third, £2.

1. W. B. Cranfield, Esq.
2. Mrs. Ridley.
3. W. Poupert, Esq., Marsh Farm, Twickenham.

SCIENTIFIC COMMITTEE.

JANUARY 11, 1916.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and nine members present.

Hybrid Mint.—Mr. J. Fraser, F.L.S., showed a specimen of a Mint which he had collected near Aberdeen, and which he regarded as a possible hybrid between *Mentha aquatica* and *M. piperita*. It was the only specimen growing in a quantity of the latter plant, and had much of the habit of that species, but was very hairy. He thought it had probably inherited its hairiness from *M. aquatica*. It was different from *M. pubescens* (*M. nepetioides*, as it is called on the Continent).

Brodiaea Sellowiana.—Mr. A. Worsley showed a flower of this pretty little species of *Brodiaea* which he had had growing in a house for many years, but which died out of doors. It does not appear to be hardy.

Massonia pustulata.—Mr. Bowles showed a specimen of this interesting plant from Mr. Elwes. A Botanical Certificate was awarded to it when last shown in 1906. He also showed a remarkable flower of *Galanthus cilicicus*, much larger and finer than usual, from the same source. It had appeared among imported bulbs.

"Sporting" of *Bouvardia*.—Mr. W. Bateson, F.R.S., showed a sport from the pale pinkish form of *Bouvardia*, known as 'Bridesmaid,' like 'Hogarth' in every way, *i.e.* of a red colour. It had occurred among plants raised from cuttings of the former. He suggested that the probable explanation of the sporting was that 'Bridesmaid' was a chimæra, and that, as the buds on the root-cuttings were produced from the central tissues of the root only, the outer covering present in 'Bridesmaid' was lacking in the plants propagated from it. Such sporting in root-cuttings has been recorded several times, especially some years ago, and the Committee would be glad to learn of other similar cases.

Fasciated Daphne Laureola.—Mr. C. H. Curtis sent very remarkable shoots of *Daphne Laureola* which had occurred in the garden at Scratby Hall, Yarmouth. The stem was flattened and spread out in a fan-like manner, so that many hundreds of small shoots were produced in a cockscomb-like termination to the branches.

Fasciated Primula malacoides.—Mr. Curtis also sent from his own garden an inflorescence of *Primula malacoides* with very numerous flowers in the whorls, from the first of which several branches bearing many-flowered whorls had arisen.

Gall on Salix babylonica.—Mr. W. B. Gingell sent a gall similar to those which occurred on Willows in Essex in 1906, and then shown before the Scientific Committee, cut from *Salix babylonica* in Dulwich Park. The gall consists of innumerable short shoots arising close together so as to form a dense mass of thin growths, which in winter look almost like derelict birds'-nests hanging in the trees. It is probably caused by a mite, and has spread rapidly all over the London district.

SCIENTIFIC COMMITTEE, JANUARY 25, 1916.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and eleven members present.

Apple Fruit Spot.—Dr. Horne showed cultures on Apple agar of various fungi, which he had isolated from minute brown spots on Apple fruits. One of them had fruited, proving to be a species of *Stemphylium*, producing conidia, sclerotia, and pycnidia similar to those found on the Apple. The fungi associated with the spot appeared to vary from year to year.

Gall on Rhododendron.—Mr. J. Fraser, F.L.S., showed a further specimen of the fungus gall on the Indian Azalea, which has been before the Committee on several occasions, due to the fungus *Exobasidium japonicum*, and which has appeared with increasing frequency since its introduction about 1906. Picking off the galls and burning them is sufficient to keep it in check.

Germination of Vallota purpurea.—Mr. H. J. Elwes, F.R.S., drew attention to the curious germination of the seeds of *Vallota purpurea*. The seeds, which were sown on the surface and fully exposed to the light, sent out the usual germination process, from the apex of which roots were developed. All the reserve food passed from the seed to the apex of the process, which became green and swelled before any leaves were developed (fig. 31). In all probability food was made during this stage of germination. In several cases in allied plants the formation of chlorophyll is normal in seeds.

Osage Orange Fruiting.—Mr. C. H. Curtis showed a fruit of the Osage Orange, which had ripened in a Suffolk garden. *Maclura aurantiaca* rarely fruits in this country, although the plant is hardy. The present fruit was rather small, and not quite yellow. In the United States *Maclura aurantiaca* is an excellent hedge plant, and the large, yellow fruits, inedible but conspicuous, are freely produced.

Fasciated Rose.—Mr. Allgrove, of Langley, Slough, sent a remarkable fasciated shoot of Rose 'Coronation' with a flattened stem several inches broad.

SCIENTIFIC COMMITTEE, FEBRUARY 8, 1916.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, with fourteen members present, and Rev. J. Jacob and Mr. W. Barr (visitors).

Death of Canon Ellacombe.—Mr. Bowles referred in sympathetic terms to the death of the oldest member of the Scientific Committee, Rev. Canon Ellacombe, of Bitton. The Committee unanimously desired that a message of sympathy should be sent to his family.

Yellow-flowered Poinciana.—Mr. W. Fawcett, F.L.S., showed a specimen of a yellow-flowered form of *Poinciana regia* from near Bull Bay, Jamaica. As members of the Committee remarked, some forms are also more orange than others.

Forms of Galanthus and Helleborus.—Mr. H. J. Elwes, F.R.S., exhibited several forms of *Galanthus* from his garden and elsewhere, remarking that, in his opinion, too many species of these plants had been made by botanists. The species of *Galanthus* are particularly variable, and Mr. Bowles undertook to examine and report upon those brought by Mr. Elwes.

His report is as follows, grouping the forms under the species to which they belong:—

I.—*G. nivalis. Melvillei*—a major form of *nivalis* (*Gard. Chron.* 1879, i. 237).

Imperati represents the South European form. It seems the form Backhouse sent out, not that of Atkins, by the misshapen segments.

Imperati var. *Boydii*. A seedling (? normally two-flowered). (See Burbidge, *R.H.S. Journal*, 1891, p. 200.)

cilicicus is an early-flowering Eastern form, with very narrow glaucous leaves. (See Baker, *Gard. Chron.* 1897, i. 214.)

caucasicus is a late-flowering Eastern form, which, when robust, produces two flowers from each pair of leaves. (See Baker, *Gard. Chron.* 1887, i. 313.)

The Straffan Snowdrop is a fine form of *caucasicus*. (See *caucasicus grandis*, Burbidge, *R.H.S. Journal*, 1891, p. 203.)

Nivalis hybrids:—

'William Thompson' is *nivalis* × *plicatus*. (*Gard. Chron.* Jan. 1911, fig. 20.)

maximus, Baker = *grandiflorus*, Baker. (See *Gard. Chron.* 1893, xiii. p. 656.)

'Neil Fraser,' probably *nivalis* × *caucasicus*.

II.—*G. latifolius*, true. Leaves light green, with bright gloss, small flowers.

G. latifolius var. *Allenii*. Leaves duller, darker green. (See *Gard. Chron.* 1891, ix. p. 298, and *Garden*, March 1902, p. 157.)

G. latifolius var. *Ikariae*. Leaves revolute, deep green, with large green spots on inner segments, late flowering. (See *Gard. Chron.* 1893, xiii. p. 506.)

III.—*G. plicatus* Bieb.

‘Dragoon.’ A seedling of Allen’s.
chapelensis. A major form. (See Allen, *R.H.S. Journal*, 1891, p. 175.)

byzantinus Baker? A hybrid *plicatus* × *Elwesii*, but breeds true. Leaves of *plicatus*, flowers of *Elwesii*. (See *Gard. Chron.* 1893, xiii. p. 226.)

IV.—*G. Elwesii*.

Var. *Cassaba* has inner segments, almost entirely green. (See *Gard. Chron.* 1899, p. 165.) There is a robust form, called by S. Arnott *Elwesii Cassaba Boydii*.

Var. *robustus* = *Elwesii*. (See *Gard. Chron.* 1893, iii, p. 226.)

Elwesii hybrids:—

Colesborne var. (? *Elwesii* × *caucasicus*.)

Similar, but with wider leaves and more green in inner segments.

V.—*G. Fosteri* Baker.

(?) A hybrid between *Elwesii* and *latifolius*, but more probably a true species. (See *Gard. Chron.* 1889, v. p. 458.)

Plantago Roots.—Dr. J. A. Voelcker drew attention to the change in colour of roots of *Plantago*, which become quite red on exposure to the air owing to the production of anthocyanin.

Double Primula sinensis.—Mr. E. J. Allard showed the result of crossing a double form of *P. sinensis* with a single. Two double forms are known, one in which several petals are produced within one another, the other in which two rows occur, the inner being reversed in colouring. Mr. Allard had searched over a number of plants of *P. sinensis alba plena*, in which the flowers are of the former type, shown by Messrs. Veitch, and had found one flower with a normal stigma, none with pollen. He pollinated this flower with pollen from a single magenta-flowered plant, and obtained three seeds, which gave two plants bearing normal single flowers tinged white. These were self-pollinated, and gave seventy-four plants, seventy-two of which were single, two double, both white, and with the older form of doubling similar to the double parent of F₁.

Origin of Peloria &c.—Colonel H. E. Rawson showed a number of dried specimens to illustrate the various correlations which accompany the growth of supernumerary spurs in *Tropaeolum*. Although a flower with three spurs and no other variation was the first to appear, and out of the first ten flowers only two varied in the number and

shape of the petals, as well as having two-spur peloria, there seems to be a series of changes which follow. They are:—

1. A change in the distribution of the vascular bundles, which affects the form and size of one of the anterior petals.

2. This change in the anterior petal takes place in other flowers than those with extra spurs, and is passed on by the seed sown in an open garden.

3. The subtending leaf of the peloric flowers is suppressed altogether, or is pushed a few millimetres up the pedicel and dwarfed, perhaps 90 per cent.

4. The suppression in (3) is accompanied by a shortening of the internodes, and as many as seven flowers will arise from less than 1 inch of a lateral branch, and of these perhaps four will show two-spur peloria and the rest will be normal. Subtending leaves may, or may not, be suppressed or dwarfed.

5. Each additional spur is accompanied by the change of at least one anterior petal into one with the sessile character and obovate shape of the posterior petals. A three-spur flower will sometimes have all five petals sessile, with the vascular bundles coloured and well defined in each.

6. The normal spur is no longer connected with a posterior sepal, but is in line with and directly extends a posterior petal.

All these modifications, with the exception of the last, which appeared only last summer, have been transmitted by the seed in the open garden. The formation of a spurred petal appears to be the first occurrence of the kind in *Tropaeolum* on record.

Geaster sp.—Mr. Clarence Elliott sent one of the curious fungi, called earth-stars, belonging to the genus *Geaster*, in which the outer part of the fruit splits in a stellate fashion, turns back, and carries the inner spore-bearing portion above the surrounding ground.

SCIENTIFIC COMMITTEE, FEBRUARY 22, 1916.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and thirteen members present.

Cardamine amara form.—Mr. J. Fraser, F.L.S., showed a specimen from Weybridge of the form of *C. amara* called *lilacina* or *erubescens*. In the type only the stamens are coloured; in the variety the petals also are tipped with reddish colour.

Plants from Gallipoli.—Mr. E. M. Holmes, F.L.S., showed a number of dried plants, including species of *Mentha*, *Thymus*, *Marrubium*, &c., which Lieut. G. M. Owen had sent to Mr. Chittenden from Gallipoli. One thistle was a particularly handsome plant.

Effect of Screening on Plants.—Col. H. E. Rawson showed a further series of examples of *Tropaeolums* showing deviations from the normal, such as suppression of bracts, congestion of flowers, hairiness and the

like, which he attributed to the effect of screening. Members remarked that similar occurrences were to be seen in *Tropaeolums* grown in pots when kept on the dry side, and the general criticism of the results obtained was that while these aberrations may be the direct result of the treatment the plants had been subjected to, the possibility of an inclination to vary in these directions, irrespective of external conditions such as lighting, being innate in the strain experimented with, had not been excluded.

Kiitchingia uniflora.—Mr. W. E. Ledger showed a well-flowered plant of this rare Crassulaceous species from (in all probability) Madagascar. It differed in appearance in several minute characters from the figure in the *Bot. Mag.* (t. 8286), which had been drawn from the Kew plant, of which the present was a piece, owing, probably, to flowering at a different season, to differences in temperature and light, &c. It has roundish, fleshy leaves about $\frac{1}{4}$ inch in diameter, and urceolate pink flowers, $\frac{1}{2}$ – $\frac{3}{4}$ inch long, borne on slender pedicels. A Botanical Certificate was unanimously recommended to this plant.

Rhododendron irroratum.—A Botanical Certificate was also recommended to *Rhododendron irroratum*, a new Chinese species with white flowers, freely spotted inside the corolla with purplish-pink spots, sent by Mr. E. J. P. Magor, of Lamellan, St. Tudy, Cornwall.

Jasminum primulinum.—Mr. W. B. Fletcher sent specimens of single and double flowers of this species, with the following history:—*Jasminum primulinum* rarely fruits; indeed, Wilson, who collected it in China for Messrs. Veitch, searched in vain for seeds, and was obliged to send plants over to England in order to introduce it. The form introduced had hose-in-hose flowers, and Mr. Fletcher had pollinated the flowers with pollen from *J. nudiflorum* and its own pollen, with the result that a few seeds were secured, and these gave one single-flowered plant, one of the original form, two double-flowered (triplex) forms, and one with such poor flowers that it was promptly destroyed. Mr. Fletcher also crossed *J. nudiflorum* ♀ with *J. primulinum* ♂ and secured one plant, which, after flowering once or twice, died. He drew attention to the fact that in seedlings of *J. primulinum* the first leaves formed above the cotyledons are trifoliate, while in *J. nudiflorum* they are simple. The hybrid, with *nudiflorum* as its seed-parent, had its first leaves trifoliate.

Hyacinth many-spiked.—Examples of Hyacinth bulbs throwing several instead of one spike of flowers are frequently before the Committee, fourteen spikes being the most observed so far. They are derived from the same stock as the single-spiked bulbs, and are picked out at the time the bulbs are lifted by the growers, and sold as miniature Hyacinths. They represent a stage at which the bulb is beginning to produce a number of small ones.

SCIENTIFIC COMMITTEE, MARCH 7, 1916.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and ten members present.

Fasciation &c. reproduced by seed.—Mr. J. Fraser, F.L.S., showed some fasciated stems of *Cineraria* to illustrate the condition of about 50 per cent. of a batch of seedlings of the *stellata* type of *Cineraria*. He also remarked upon a number of *Violas* with from two to five spurs having occurred in a batch of seedlings.

Fasciated Plants.—Fasciated specimens of *Polemonium caeruleum*, *Euonymus japonicus*, *Cotoneaster microphylla*, *Prunus Mahaleb*, and *Spiraea Douglasii* were shown from various sources. The latter, which came from Camberwell Park, was one of a number of specimens which had occurred there.

A Paint-destroying Fungus.—Mr. J. Ramsbottom, F.L.S., exhibited some pieces of wood which had been painted white and placed in a greenhouse at the Chelsea Physic Garden, on which a pink fungus, *Phoma pigmentifera*, had appeared in full fructification within five weeks. The fungus has been recently described by Mr. Masee.

SCIENTIFIC COMMITTEE, MARCH 28, 1916.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, with thirteen members present, and Rev. J. Jacob, visitor.

Curious Larvæ.—Mr. W. C. Worsdell, F.L.S., showed preserved larvæ of a species of *Aspidomorpha* from the shores of Delagoa Bay. The larvæ, which feed on *Ipomoea*, cover themselves with excreta as do the larvæ of *Cassidas* in Britain.

Meconopsis × decora.—Mr. T. Hay, of Greenwich Park, sent a plant of *Meconopsis × decora* with white flowers. Several plants had been raised, some having white, some blue flowers, and after being cut back they freely produced flowers again. No seed was produced. The plants were raised from seeds obtained from India and from the Botanic Gardens, Edinburgh, under the name of *M. Wallichii*, but those raised proved to be something different. Sir D. Prain named it *M. decora* (see *Kew Bull.* No. 4, 1915), but subsequently came to the conclusion that it was a hybrid. It has appeared in several gardens, but whether the seed in these cases came from India or from Edinburgh cannot be stated.

Narcissus cyclamineus ♀ × *N. Tazetta* 'Soleil d'Or.'—A plant raised by Baron de Soutellino, of Oporto, of this interesting cross was exhibited. The hybrid had a deep orange cup and a clear yellow spreading perianth. 'Soleil d'Or' apparently rarely proves a good pollen parent. A Botanical Certificate was unanimously recommended for this plant.

Narcissus triandrus albus.—Mr. H. Clinton Baker, of Hertingfordbury, sent some plants of a *Narcissus* which he had collected in Spain. The flowers showed a certain amount of variation in size, but did not agree with the figure (*Bot. Mag.*, 6473) and description of the plant under whose name they were exhibited, *N. pallidulus*, the original description of which states it to be “pallidi sulphureus.” They were apparently good forms of *N. triandrus*.

Freesias breaking.—Rev. J. Jacob said that in his experience *Freesias* (except the yellow forms) were apt to “break” in the same way as Tulips, the colour becoming patchy.

SCIENTIFIC COMMITTEE, APRIL 11, 1916.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and ten members present.

Seeds of Pyracantha Lelandii germinating in fruit.—Mr. J. Fraser, F.L.S., showed fruits of *Pyracantha Lelandii* containing germinating seeds. The fruit had but recently been picked.

Partial virescence in Chrysanthemum Parthenium.—Mr. A. Worsley brought capitula of *Chrysanthemum Parthenium* in which the bracts had become foliose. In many cases the pale flowers were to be seen among the bracts.

Narcissus canariensis.—Mr. H. J. Elwes, F.R.S., said that in his garden this form of *Narcissus* usually flowered in autumn, but some had been lifted, and flowered early in the spring after drying off, while Miss Willmott found it to flower normally in spring at Warley (whether after lifting or not was not stated).

A Light Wood.—Dr. J. A. Voelcker showed a specimen of wood under the name of Balsa wood, from Brazil. It is exceedingly light, a cubic foot weighing only about 7 lb., whilst a cubic foot of cork weighs 13 lb. Mr. Elwes suggested that as it was so soft it might be useful for making setting boards and so on for insects, and even for making pith helmets. Sir Everard im Thurn stated that in British Guiana it was used to float the heavy logs of greenheart from the forest down the river.

Action of Caustic Soda on Soil &c.—Dr. Voelcker also reported that he had examined a vine sent him recently which had been killed by caustic soda being poured upon its roots. The action upon the soil was very peculiar, the general effect being to produce a sticky mass.

Narcissus with divided corona.—Messrs. Carter Page & Co. sent a *Narcissus* which for the second time was producing flowers with the corona deeply divided into six segments almost equal in size to the perianth segments, opposite to them, and lying upon them.

Heredity in Campanula.—Mr. T. B. Grove, Wyndley Nurseries, Sutton Coldfield, sent an account of his observations upon the characters of a hybrid *Campanula*. The F₁ generation was raised by crossing *C. carpatica* ‘White Star’ ♀ with *C. Tommassiniana* ♂. The

seed of a selfed hybrid was sown in September 1914, and fifty-nine seedlings were raised. They showed segregation along the following lines (where the total does not correspond with 59 the discrepancy is due to two plants having failed so far to flower):—Plants tall like ♀, 29 (10 in.-20 in.), dwarf like ♂, 30 (4 in.-9 in.); white (♀), 39, blue 18 (♂); flower large ($1\frac{1}{2}$ in. upwards), 30, small ($\frac{1}{2}$ in.-1 in.), 27; flower broad or flat (♀), 44, narrow or tubular (approaching ♂), 13; foliage broadly ovate (♀), 49, inclined to lanceolate (approaching ♂), 10; inflorescence much branched, 32, little branched, 25 (a point difficult to distinguish); with few long branches, 21, with many short ones, 36; free-flowering, 43, not free-flowering, 14. The numbers in the last two pairs of characters are subject to revision. The figures seem to indicate that the pairs of characters are in many cases not simple ones, but probably combinations of more than one.

SCIENTIFIC COMMITTEE, APRIL 18, 1916.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and four members present.

Daffodil with double spathe.—Mr. Bowles showed a Daffodil with a stalk about 6 inches in length bearing a node from which sprang a linear brown spathe about 4 inches long. In the axil of this was the ordinary scape, about 10 inches in length, bearing the usual spathe and flower.

Varieties of Anemone nemorosa.—Mr. E. A. Bowles showed a series of wild forms of *Anemone nemorosa* illustrating the wide variation this species exhibits. The series included the form known as *Robinsoniana*, which was probably introduced from Norway; a beautiful blue form with prettier buds than has *Robinsoniana*, called *purpurea*, found at Pau by Grant Allen; a bluish early form, earlier than *Allenii*, and a form from the Lismore woods collected by Miss Currey; Lady Doneraile's form, which appears to be common in Ireland, with pinkish flowers of large size and good substance; a pink form from the Cotswolds with pink buds; a fine white form with pink back and purplish leaves; an early pink form and a late one, and a pure white form with round flowers. He also showed *A. ranunculoides*, and a pale form of it called *pallida*.

Fritillarias.—Mr. H. J. Elwes, F.R.S., showed a series of *Fritillarias*, including a fine form of *F. imperialis* with very large orange flowers called *grandiflora* (or *maxima*), but distinct from the *maxima* of many nurseries, and of slow increase; the inodorous form, and several fine variegated varieties. *F. latifolia* was represented by a long series of colour forms and, unlike *F. Meleagris*, apparently always one-flowered. The latter often, under cultivation in good soil, bears several flowers. *Fritillaria obliqua*, with very dark purple flowers, was also exhibited. It is remarkable among flowers of its colour for its sweet scent.

FRUIT AND VEGETABLE COMMITTEE.

JANUARY II, 1916.

Mr. J. CHEAL, V.M.H., in the Chair, and sixteen members present.

No awards were recommended on this occasion.

Exhibits.

Mr. E. Beckett, V.M.H., Elstree : Apple 'Gascoyne's Scarlet' and Grape 'Cooper's Black.'

Mr. F. Bowler, Chorley Wood : Apples.

Messrs. Bunyard, Maidstone : Pear 'Santa Claus.'

Mr. W. Camm, Taplow : Tomato 'Winter Coral.'

Messrs. Cheal, Crawley : Pear 'Beurré de Naghan.'

Mr. G. E. Dyke, Milborne Port : seedling Apple.

Mr. C. Howlett, Reading : seedling Pear.

Rev. J. Jacob, Whitchurch : Cydonia Jelly.

Colonel Lockwood, M.P., Romford : Apples.

Mrs. Miller, Marlow : 'Moyleen' Confections.

Mr. P. Sale, Wokingham : Apple 'Wheeler's Russet.'

Messrs. R. Veitch, Exeter : Apples.

Messrs. Westmacott, London : South African preserves.

FRUIT AND VEGETABLE COMMITTEE, JANUARY 25, 1916.

Mr. J. CHEAL, V.M.H., in the Chair, and fourteen members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Mr. J. A. Baker, Harlesden, for Canadian Apples.

Silver Banksian Medal.

To Sir Albert Rollit, LL.D., Chertsey, for West Indian Grape Fruits.

Other Exhibits.

Mr. Allgrove, Slough : Pear 'Mrs. Seden.'

Marchioness of Breadalbane, Aberfeldy : Potatos.

Mr. R. Doe, Henley-on-Thames : seedling Apple.

Mrs. Miller, Marlow : confections.

Messrs. Westmacott, London : South African preserves.

The Grape Fruits (*Citrus decumana* var. 'Triumph'), exhibited by Sir Albert Rollit were produced in his conservatory at Chertsey. The trees were obtained from the island of Dominica. This, which is the

best variety of Grape Fruit, is specially grown for the United States market and fetches very good prices. It is a most refreshing and healthy fruit, highly recommended by the medical faculty, and is always on the breakfast table of the leading people in New York, Boston, and Washington. It possesses valuable tonic properties, but seems to be very little known in this country. The fruit originated in the West Indies, and the name 'Grape Fruit' is given to it because it grows in clusters of four, six, or eight in a bunch like grapes.

FRUIT AND VEGETABLE COMMITTEE, FEBRUARY 8, 1916.

Mr. J. CHEAL, V.M.H., in the Chair, and eleven members present.

Award Recommended :—

Bronze Knightian Medal.

To The Marquis of Ripon (gr. Mr. Smith), Kingston Hill, for Apples.

Other Exhibits.

Mr. J. A. Baker, Harlesden: Canadian Apples, of which the Committee considered an unnamed Russet and 'Northern Spy' to be the best, being full of juice and of excellent flavour.

Mr. G. H. Quint, Princes Risboro': seedling Apple.

Messrs. Sutton, Reading: Broccoli.

Mr. W. Wallace, Dunstable: Apple 'Pitstone Pearmain.'

The letter given below was received from Mr. Trier, and the reply which follows it was sent at the direction of the Committee :—

" UPLANDS, CHAMPION HILL, S.E.
Jan. 25, 1916.

" DEAR MR. WRIGHT,—Referring to our chat to-night *re* prices of Canadian apples shown at the R.H.S. Hall to-day, and the prices for apples superior in flavour and of at least equal appearance which my son is able to obtain at Covent Garden, I should be very glad if you would bring up the matter at one of your meetings. I was told that a case of the apples shown fetched 14s., *i.e.* for 40 lb. They are no doubt well packed and sorted, but for carefully sorted apples packed in layers, in wood wool, a method of packing amply sufficient for the apples to remain perfectly good after the short journey from Roberts-bridge, it is considered favourable to receive 6s. 6d. or 7s. for 40 lb.

" If, as you suggested, it is the guarantee of the Canadian Government as to the character of the fruit exported which is responsible for the enormous difference in price as compared with English fruit, then surely it is high time that English growers should be able to obtain some official recognition or mark which should stamp their wares according to their merits. A grower who should fail to pack in accordance with a certain definite standard, entitling

him to the use of an official mark, should forfeit his right to the use of such mark. I do not think the control would be at all difficult.

“Believe me, yours faithfully,
“FRANK TRIER.”

REPLY.

“Feb. 9, 1916.

“DEAR MR. TRIER,—I laid your letter before the Fruit and Vegetable Committee yesterday, and they considered the higher price obtained for apples from Canada was due to the careful grading and packing of the same, and also to the possibility of obtaining continuous supplies of the same variety. They suggest that British growers should make their own brand, exercise the same care in grading and packing, and send continuous supplies of the same variety for as long a period as possible.

“Yours faithfully,
“S. T. WRIGHT, *Secretary to the Committee.*”

FRUIT AND VEGETABLE COMMITTEE, FEBRUARY 22, 1916.

Mr. A. H. PEARSON, J.P., V.M.H., in the Chair, and eleven members present.

Award Recommended :—

Silver Knightian Medal.

To Messrs. Cannell, Eynsford, for Apples.

Other Exhibits.

Mr. E. Beckett, Elstree : Onion ‘Autumn Triumph’ and Apple ‘Scarlet Nonpareil.’

Messrs. Brown, Stamford : Apple ‘Oakham Seedling.’

Messrs. Bunyard, Maidstone : Apple ‘Lodgemore Nonpareil.’

Mr. G. W. Miller, Wisbech : Rhubarb ‘The Sutton.’

FRUIT AND VEGETABLE COMMITTEE, MARCH 7, 1916.

Mr. OWEN THOMAS in the Chair, and six members present.

No awards were recommended on this occasion.

Exhibit.

Mr. B. Shadwell, Wallingford : Apples.

FRUIT AND VEGETABLE COMMITTEE, MARCH 14, 1916.

The Committee did not meet on this occasion.

The following award was made by the Council :—

Silver Knightian Medal.

To Messrs. Sutton, Reading, for vegetables and salads.

Other Exhibits.

Mr. W. G. Miller, Wisbech : Rhubarb.

Messrs. Westmacott, London : Cape fruits.

FRUIT AND VEGETABLE COMMITTEE, MARCH 28, 1916.

Mr. J. CHEAL, V.M.H., in the Chair, and ten members present.

No awards were recommended on this occasion.

Exhibits.

Mr. E. Beckett, V.M.H., sent three varieties of cabbage all sown on the same date in August 1915. The exhibit was of special interest, showing the great improvement in earliness of 'Harbinger' and 'April' as compared with the well-known variety 'Ellam's Early Dwarf.' 'Harbinger' was quite ready for use, and as it is a small compact-growing one, it can be planted a foot apart each way. 'April' was almost ready, only wanting a few more days to make it quite ready for use, while 'Ellam's Early Dwarf' would not be fit for use for another month or six weeks.

Mr. W. H. Bey, Seend : seedling Apple.

Messrs. Cheal, Crawley : Apples.

Messrs. Merryweather, Southwell : Apple 'George Ruffles.'

Mr. G. W. Miller, Wisbech : Rhubarb 'The Sutton.'

Mr. G. Taylor, Ferry Bridge : Onion 'The Urn.'

On January 11, 1916, Mr. E. Beckett, V.M.H., Aldenham House Gardens, Elstree, exhibited Grape 'Cooper's Black' in splendid condition, and considerable discussion arose as to its distinctness from one or two other varieties, and also as to its origin. Mr. Owen Thomas brought the following letter before the Committee on March 28:—

"Boconnoc Gardens, Lostwithiel, Cornwall:

"DEAR SIR,—In 1888 I went to Hillsborough Gardens as foreman under Mr. Bradshaw and there had the original vine of Cooper's Late Black Grape under my care for some time. At that time a very keen interest was aroused among the old garden men on the subject of seedling Grapes. As there was at that time so much criticism among a certain set of exhibitors in Ireland about 'Cooper's Black Grape,' I made all the inquiries I could on the spot from the men who had assisted in the vineries under Mr. Cooper. Undoubtedly it was a seedling of Mr. Cooper's and fruited about 1866, but I could not ascertain the seed parent. In the autumn of 1867 Lord Downshire erected a large vinery from plans drawn by Mr. Cooper, and the work was done by the estate carpenters. In the spring of 1868 the vines were planted, nearly all being late varieties, and 'Cooper's Black' was given a place in the house. Lord Downshire died shortly afterwards: to be exact, in August 1868. The fifth Marquis died in 1874,

and about that time Mr. Cooper left and started as a market grower in Scotland. A Mr. Lee succeeded Cooper, and he also exhibited the Grape at the local shows, but owing to so much adverse criticism the Grape has to be shown in the 'any other black grape' class. The worst thing that I have heard said of it was that it too closely resembled 'Gros Maroc.'

"On taking charge of Seaford Gardens, co. Down, in 1897, I found several rods of 'Cooper's Black Grape' in one of the late vineries. The vine always carried a heavy crop and did better than 'Gros Maroc.' I was able to keep them in perfect condition for December use. My employer, Colonel Forde, complimented me on keeping them so late, several seasons. I may say there are several gardeners who served their apprenticeship in the Downshire Gardens who also know most of the facts mentioned in my letter.

"Yours sincerely,
"J. LEICESTER."

FRUIT AND VEGETABLE COMMITTEE, APRIL 11, 1916.

Mr. J. CHEAL, V.M.H., in the Chair, and ten members present.

Award Recommended :—

Cultural Commendation.

To Mrs. Farnham, Witley, for Loquats.

Other Exhibits.

Messrs. Bunyard, Maidstone : Apple 'Ontario.

Mr. Peters, Leatherhead : Apple 'Harry Pring.'

Messrs. Westmacott, London : South African fruit.

FRUIT AND VEGETABLE COMMITTEE, APRIL 18, 1916.

Mr. P. C. M. VEITCH, J.P., in the Chair, and two members present.

Award Recommended :—

Silver Knightian Medal.

To Messrs. Sutton, Reading, for vegetables.

FLORAL COMMITTEE.

JANUARY 11, 1916.

Mr. H. B. MAY, V.M.H., in the Chair, and thirty members present.

Awards Recommended :—*Silver-gilt Flora Medal.*

To Messrs. Sutton, Reading, for Cyclamen.

Silver Flora Medal.

To Messrs. May, Upper Edmonton, for ferns and flowering plants.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Mr. J. J. Kettle, Corfe Mullen, for Violets.

To Mr. L. R. Russell, Richmond, for shrubs.

To Messrs. Wells, Merstham, for Chrysanthemums.

Bronze Flora Medal.

To Messrs. Low, Bush Hill Park, for Carnations.

Bronze Banksian Medal.

To Messrs. Barr, Taplow, for flowering shrubs.

To Messrs. Cheal, Crawley, for shrubs.

First-class Certificate.

To *Abies bracteata* (votes, unanimous), from Lieut.-Colonel Barclay (gr. Mr. W. Graysmark), Bury Hill, Dorking. A beautifully coned branch of *Abies bracteata* was exhibited from a fine tree growing at Bury Hill, Dorking, which has attained the height of 60 feet 8 inches and has a spread of branches measuring 35 feet 6 inches. The cones are the remarkable feature of this species. They have leaf-like bracts about 2 inches long, which, together with the scales, are covered with globules of thin transparent resin. The foliage is deep green. The tree is a native of California, where Douglas discovered it in 1832, and whence it was introduced into England in 1853.

Award of Merit.

To Begonia 'Norbury White' (votes, 6 for), from Mr. G. Kent, Dorking. A useful winter-flowering Begonia of exceptionally free-flowering habit. The flowers are white, very faintly tinged with pink, and are of the 'Lorraine' type.

To *Cotoneaster horizontalis perpusilla* (votes, 15 for, 4 against), from Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), Elstree. A deciduous shrub of low, compact habit, bearing numerous bright red globose berries. It is a native of China, and was introduced by Mr. E. H. Wilson, V.M.H.

Other Exhibits.

- Miss C. Batten, Taunton : Christmas Roses.
- Messrs. Chapman, Rye : early bulbs in flower.
- Mr. A. Edmonds, Stroud : Chrysanthemum 'Nancy Heston.'
- Mr. C. Elliott, Stevenage : alpines.
- Messrs. Fletcher, Ottershaw : Aucubas.
- Misses Hopkins, Shepperton : hardy plants.
- Messrs. Jefferies, Cirencester : double form of *Primula malacoides*.
- Mr. G. Reuthe, Keston : hardy plants.
- Messrs. Whitelegg & Page, Chislehurst : alpines.

FLORAL COMMITTEE, JANUARY 25, 1916.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-five members present.

Awards Recommended : —

Silver Flora Medal.

To Messrs. May, Upper Edmonton, for ferns and flowering plants.

Silver Banksian Medal.

- To Messrs. Allwood, Haywards Heath, for Carnations.
- To Messrs. Cutbush, Highgate, for Carnations and hardy plants.
- To Mr. J. J. Kettle, Corfe Mullen, for Violets.
- To Messrs. Low, Bush Hill Park, for Carnations and Cyclamen.
- To Messrs. Piper, Bayswater, for hardy plants.
- To Mr. L. R. Russell, Richmond, for shrubs.

Bronze Banksian Medal.

- To Messrs. Cheal, Crawley, for shrubs.
- To Mr. C. Elliott, Stevenage, for alpines.
- To Mr. M. Prichard, Christchurch, for hardy plants.
- To Messrs. Waterer, Sons, & Crisp, Bagshot, for alpines.

Award of Merit.

To *Columnnea gloriosa discolor* (votes, 17 for), from Elizabeth, Lady Lawrence (gr. Mr. Bain), Burford, Dorking. A very handsome stove plant, suitable for growing in baskets. The flowers are large, tubular, and of a fiery-red colour, with some yellow in the interior. The growths are pendulous and fleshy, while the neat ovate leaves are pubescent.

To *Eucharis* × *Lawrenceae* (votes, unanimous), from Elizabeth, Lady Lawrence, Burford, Dorking. A very beautiful hybrid raised by

crossing *E. Richardiana* and *E. burfordiensis*. The flowers are pure white and are borne with great freedom on stout scapes. The perianth segments are longer and narrower and more reflexed than those of the well-known *E. amazonica*, while the large Funkia-like foliage is very distinct.

To *Iris* 'Little Bride' (votes, 20 for), from Messrs. Chapman, Rye. A striking seedling of unrecorded parentage, raised from a batch of mixed seeds from *I. reticulata*, *I. Krelagei*, *I. Danfordiae*, and other allied Irises. The flowers are of the *reticulata* type, with whitish falls streaked with orange and very pale bluish standards. (Fig. 32.)

Other Exhibits.

Messrs. Carter, Raynes Park: Primulas.

Misses Hopkins, Shepperton: hardy plants.

Mr. G. W. Miller, Wisbech: hardy plants.

Mr. G. Reuthe, Keston: hardy plants.

C. C. Rogers, Esq., Stanage Park, Herefordshire: an unnamed variety of *Thuya orientalis* and an apparently new Cupressus with glaucous foliage, unidentifiable until it cones.

Mr. H. Rogers, Woodbridge: Violets.

Messrs. Wells, Merstham: Carnations and Chrysanthemums.

Messrs. Whitelegg & Page, Chislehurst: hardy plants.

FLORAL COMMITTEE, FEBRUARY 8, 1916.

Mr. H. B. MAY, V.M.H., in the Chair, and thirty-one members present.

Awards Recommended:—

Gold Medal.

To Messrs. Cuthbert, Southgate, for forced shrubs.

Silver-gilt Banksian Medal.

To Messrs. Cutbush, Highgate, for forced shrubs, hardy plants, and Carnations.

Silver Flora Medal.

To Mr. J. J. Kettle, Corfe Mullen, for Violets.

To Mr. A. Perry, Enfield, for hardy ferns.

To Mr. L. R. Russell, Richmond, for Azaleas.

To Messrs. Waterer, Sons, & Crisp, London, for hardy plants.

Silver Banksian Medal.

To Messrs. Barr, Covent Garden, for alpiners, bulbous plants, and Japanese trees.

To Messrs. Blackmore & Langdon, Bath, for Begonias and Cyclamen.

To Messrs. Carter, Raynes Park, for Primulas.

To Messrs. Low, Enfield, for Carnations and Cyclamen.

To Mr. Malby, Woodford, for photographs.

To Messrs. May, Upper Edmonton, for flowering plants.

To R. L. Mond, Esq., Sevenoaks, for Freesias.

To Messrs. Piper, Bayswater, for alpiners.

To Mr. M. Prichard, Christchurch, for hardy plants.

To the Marquis of Ripon (gr. Mr. Smith), Kingston Hill, for spring flowers.

To Messrs. Ware, Feltham, for alpiners.

To Messrs. Wells, Merstham, for Carnations.

Bronze Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Mr. J. Box, Haywards Heath, for *Primula malacoides robusta*.

To Messrs. Cheal, Crawley, for shrubs and alpiners.

To Mr. G. W. Miller, Wisbech, for hardy plants.

To Messrs. Whitelegg & Page, Chislehurst, for alpiners.

Award of Merit.

To *Berberis Bealei* (votes, 14 for, 7 against), from Elizabeth, Lady Lawrence (gr. Mr. Bain), Burford, Dorking. This most useful early-flowering *Berberis* was introduced by Fortune from China in 1845. Its lemon-yellow, delightfully fragrant flowers are borne in terminal clusters of numerous erect racemes. The fragrance of the flowers resembles that of the Lily of the Valley. The handsome leaves are composed of four or five pairs of large, stiff, dark green, sparsely spined leaflets, the bases of each pair often overlapping, and a very large terminal leaflet often measuring as much as 6 inches long.

To *Berberis japonica hyemalis* (votes, 18 for), from Mr. G. Reuthe, Keston. This very old garden plant is a fine early-flowering form of *Berberis japonica*, and has generally been accepted as *B. Bealei*. It is quite distinct from the latter in its leaves, which have from eleven to seventeen leaflets, the lowest pair of which are close to the base of the leaf-stalk. The leaflets are not so large and broad as those of *B. Bealei*, neither do the bases overlap. The flowers are yellow, very sweetly scented, and are borne in numerous racemes about 8 inches long. The flowering season extends from October to early spring.

To *Lachenalia* 'Rosemary' (votes, 18 for), from Rev. J. Jacob, Whitchurch. The flowers of this beautiful variety have yellow calyces heavily tinged with red, while the petals are greenish, bordered with claret purple. The red colouring of the calyx is very pronounced in the bud state, and gives all along a bright appearance to the flowers. The stout scape is spotted and about 9 inches high, while the handsome leaves measure about 1½ inch across.

Other Exhibits.

Messrs. Bath, Wisbech : Daffodils and Tulips.

Messrs. Cannell, Eynsford : Pelargoniums.

Messrs. Chapman, Rye : bulbous plants.

Mr. C. Elliott, Stevenage : alpiners.

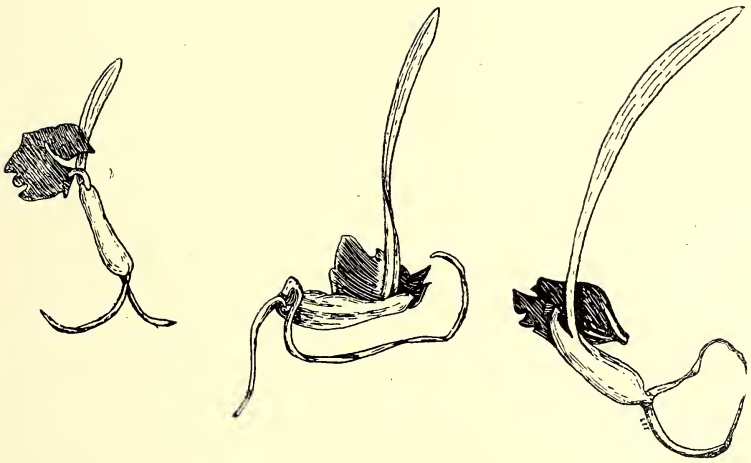


FIG. 31.—GERMINATING SEEDS OF VALLOTA PURPUREA.
(See p. xl.)

[To face p. lvi.]



FIG. 32.—IRIS 'LITTLE BRIDE.' (*Gard. Mag.*)
(p. lv.)



FIG. 33.—SAXIFRAGA × SUNDERMANNII. (*Gard. Chron.*)
(p. 1x.)



FIG. 34.—PRIMULA × 'ZULEIKA DOBSON.' (*Gard. Chron.*)
(p. lxii.)

[To face p. lvii.]

Misses Hopkins, Shepperton : hardy plants.
 Mr. A. Osborne, Guildford : Violet 'Osborne's alba.'
 Messrs. Sutton, Reading : Cyclamen.
 Messrs. Tucker, Oxford : alpines.
 Mr. G. West, Datchet : Carnation 'Nora West.'
 Mr. W. West, Alton : Mimosa.

FLORAL COMMITTEE, FEBRUARY 22, 1916.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-eight members present.

Awards Recommended : —

Silver-gilt Flora Medal.

To Messrs. Cuthbert, Southgate, for Tulips and forced shrubs.

To Lady Tate (gr. Mr. Howe), Streatham Common, for forced bulbs.

Silver Flora Medal.

To Messrs. Bath, Wisbech, for Daffodils and Tulips.

To Messrs. Cutbush, Highgate, for Carnations and forced shrubs.

To Messrs. Felton, London, for collection of Eucalyptus and spring flowers.

To Messrs. Sutton, Reading, for Primulas.

Silver Banksian Medal.

To Messrs. Barr, Covent Garden, for hardy plants and forced Daffodils.

To Messrs. Cheal, Crawley, for Conifers.

To Messrs. Gill, Falmouth, for Rhododendrons.

To Messrs. Low, Bush Hill Park, for greenhouse plants.

To Messrs. May, Upper Edmonton, for ferns.

To Mr. M. Prichard, Christchurch, for hardy plants.

To Mr. G. Prince, Longworth, for Roses.

To Mr. G. Reuthe, Keston, for hardy plants.

To Messrs. Waterer, Sons, & Crisp, Bagshot, for rock plants.

To Messrs. Wells, Merstham, for Carnations.

Bronze Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Carter, Raynes Park, for Primulas.

To Messrs. Jackman, Woking, for hardy plants.

To Mr. G. W. Miller, Wisbech, for hardy plants.

To Messrs. Piper, Bayswater, for rock plants.

To Mr. L. R. Russell, Richmond, for Azaleas.

To Messrs. Tucker, Oxford, for alpines.

To Messrs. Ware, Feltham, for alpines.

To Messrs. Whitelegg & Page, Chislehurst, for hardy plants.

Award of Merit.

To *Cineraria* 'Matador' (votes, 19 for, 3 against), from Messrs. R. Veitch, Exeter. The plants of this variety of greenhouse *Cineraria* are of compact habit and bear good trusses of large chestnut-red flowers, the colour of which very nearly approaches that of shade 4 of Ox-blood red ("Répertoire de Couleurs").

To *Crocus aeriuss* (votes, unanimous), from Mr. G. Reuthe, Keston. A pretty species from Greece. The flowers are dark blue in colour and globose in shape.

To *Kennedyia rosea* (votes, 14 for), from the Countess of Cranbrook, Saxmundham. A greenhouse climbing plant bearing numerous axillary racemes of small, rosy-lilac, pea-shaped flowers. The leaves are ovate-lanceolate and about 3 inches long.

To *Primula malacoides* 'King Albert' (votes, unanimous), from Messrs. Carter, Raynes Park. A very deep rose-pink variety of *P. malacoides*. It is of robust habit, and its large flowers are borne in dense trusses in great profusion.

Other Exhibits.

Messrs. Cannell, Eynsford : *Cinerarias*.

F. W. Harding, Esq., Exeter : Carnation 'Mrs. Frank Harding.'

Mr. E. J. Hicks, Twyford : Roses.

Misses Hopkins, Shepperton : hardy plants.

E. J. P. Magor, Esq., St. Tudy : *Rhododendron irroratum*.

FLORAL COMMITTEE, MARCH 7, 1916.

Mr. H. B. MAY, V.M.H., in the Chair, and seventeen members present.

Awards Recommended :—

Silver Banksian Medal.

To Messrs. Barr, Covent Garden, for hardy plants.

To Messrs. Carter, Raynes Park, for Cyclamen.

To Messrs. Cutbush, Highgate, for Carnations, forced shrubs, and hardy plants.

To Messrs. Felton, Hanover Square, for Eucalyptus, Cytisus, and Hydrangeas.

To Mr. E. J. Hicks, Twyford, for Roses.

To Mr. G. Prince, Longworth, for Roses.

To Messrs. Waterer, Sons, & Crisp, Twyford, for hardy plants.

Bronze Flora Medal.

To Messrs. Low, Bush Hill Park, for Carnations, Acacias, &c.

To Mr. M. Prichard, Christchurch, for hardy plants.

Bronze Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Cheal, Crawley, for shrubs and hardy plants.

To Miss Dixon, Edenbridge, for Polyanthus and Auriculas.

To Mr. G. Reuthe, Keston, for hardy plants.

To Messrs. Whitelegg & Page, Chislehurst, for alpinists.

Other Exhibits.

Messrs. Bees, Liverpool : *Isopyrum grandiflorum*.

Messrs. Cannell, Eynsford : Cinerarias.

Misses Hopkins, Shepperton : hardy plants.

Messrs. Piper, Bayswater : alpinists.

FLORAL COMMITTEE, MARCH 14, 1916.

Mr. H. B. MAY, V.M.H., in the Chair, and seventeen members present.

Awards Recommended :—

Gold Medal.

To Messrs. Cuthbert, Southgate, for Hyacinths.

Silver-gilt Banksian Medal.

To Messrs. Carter, Raynes Park, for a spring garden.

Silver Flora Medal.

To Messrs. Barr, Covent Garden, for rock plants.

To Messrs. Dobbie, Edinburgh, for Crocuses.

To Messrs. Gleeson, Watford, for Cyclamen.

To Messrs. Piper, Bayswater, for Chinese plants.

To Mr. G. Prince, Longworth, for Roses.

To Mr. G. Reuthe, Keston, for hardy plants.

Silver Banksian Medal.

To Messrs. Cutbush, Highgate, for forced shrubs and hardy plants.

To Mr. E. H. Hicks, Twyford, for Roses.

To Messrs. May, Upper Edmonton, for flowering plants.

To Mr. A. Perry, Enfield, for Shortias.

To Messrs. Ware, Feltham, for hardy plants.

To Messrs. Waterer, Sons, & Crisp, Bagshot, for hardy plants.

Bronze Banksian Medal.

To Messrs. Baker, Wolverhampton, for hardy plants.

To Miss C. M. Dixon, Edenbridge, for Polyanthus and Auriculas.

To Mr. C. Elliott, Stevenage, for alpinists.

To Messrs. Felton, London, for miscellaneous plants.

To Mr. W. G. Miller, Wisbech, for hardy plants.

Other Exhibits.

Messrs. Clark, Dover : hardy plants.

Miss Keates : Pelargonium seedling.

Messrs. Low, Enfield : Carnations.

Messrs. Whitelegg & Page, Chislehurst : hardy plants.

FLORAL COMMITTEE, MARCH 28, 1916.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-seven members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. Cuthbert, Southgate, for Hyacinths.

Silver Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Mr. G. Prince, Longworth, for Roses.

Silver Banksian Medal.

To Messrs. Cutbush, Highgate, for Carnations and forced shrubs.

To Messrs. Low, Enfield, for Carnations and other greenhouse plants.

To Messrs. May, Upper Edmonton, for Clematis.

To Misses Price & Fyfe, East Grinstead, for Carnations.

To Mr. M. Prichard, Christchurch, for hardy plants.

To Mr. L. R. Russell, Richmond, for Azaleas &c.

To Messrs. Sutton, Reading, for Lachenalias.

Bronze Flora Medal.

To Messrs. Cheal, Crawley, for flowering shrubs.

To Mr. E. J. Hicks, Twyford, for Roses.

To Messrs. Waterer, Sons, & Crisp, Bagshot, for hardy plants.

Bronze Banksian Medal.

To Messrs. Blackmore & Langdon, Bath, for Polyanthuses.

To Messrs. Cannell, Eynsford, for Cinerarias and Pelargoniums.

To Miss C. M. Dixon, Edenbridge, for Polyanthuses and Auriculas.

To Messrs. Jackman, Woking, for hardy plants.

To Mr. G. W. Miller, Wisbech, for hardy plants.

To Mr. G. Reuthe, Keston, for hardy plants.

To Messrs. Whitelegg & Page, Chislehurst, for hardy plants.

Award of Merit.

To Carnation 'Grisel' (votes, 18 for, 4 against) from Misses Price & Fyfe, East Grinstead. A perpetual-flowering variety having well-formed, sweetly-scented flowers of a striking reddish-violet colour.

To *Primula Juliae*, Wargrave var. (votes, 10 for) from Messrs. Waterer, Sons, & Crisp, Bagshot. A seedling of *P. Juliae*. The plant is very dwarf, the flowers having stalks about $1\frac{1}{2}$ inch long. The leaves differ in shape and are not so smooth as those of the seed parent, but resemble those of the Common Primrose. The flowers are large and of a rosy-purple colour, with a well-defined yellow eye.

To *Saxifraga* × *Sundermannii* (votes, 11 for, 2 against) from Miss E. Willmott, V.M.H. An early-flowering hybrid Saxifrage

originating from a cross between *S. marginata* and *S. Burseriana*. The foliage is in dense cushions, is intermediate between that of the parents, and has a glaucous hue. The flowers are white and about 1 inch across. They are borne very freely in twos and threes, and the stems supporting them are tinged with red. The inflorescence is about 2 inches high. (Fig. 33.)

Other Exhibits.

- Messrs. Baker, Codsall : hardy plants.
 Messrs. Barr, Covent Garden : bulbous and rock plants.
 Messrs. Bath, Wisbech : Carnation 'Pink Beauty.'
 Mr. C. Elliott, Stevenage : alpines.
 Misses Hopkins, Shepperton : hardy plants.
 Mr. A. Perry, Enfield : Shortias.
 Messrs. Tucker, Oxford : Sempervivums.
 Messrs. Ware, Feltham : hardy plants.
 Mr. J. Webber, Minehead : Violet 'Queen Mary.'

FLORAL COMMITTEE, APRIL 11, 1916.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-seven members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. Cheal, Crawley, for flowering shrubs.

Silver Flora Medal.

To Messrs. Felton, London, for Roses and Orchids.

To Messrs. Sutton, Reading, for Cinerarias.

Silver Banksian Medal.

To Messrs. B. R. Cant, Colchester, for Roses.

To Messrs. Cutbush, Highgate, for Carnations and hardy plants.

To Messrs. Low, Enfield, for Carnation and Acacias.

To Messrs. May, Upper Edmonton, for miscellaneous plants.

To Messrs. Piper, Langley, for shrubs and alpines.

To Mr. G. Reuthe, Keston, for hardy plants.

To Messrs. Waterer, Sons, & Crisp, Bagshot, for hardy plants.

Bronze Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Mr. J. Douglas, Great Bookham, for Auriculas.

To Messrs. Jackman, Woking, for hardy plants.

To Messrs. Whitelegg & Page, Chislehurst, for hardy plants.

Bronze Banksian Medal.

To Messrs. Baker, Codsall, for hardy plants.

Award of Merit.

To *Primula* 'Zuleika Dobson' (votes, unanimous), from Mr. C. Elliott. A hybrid between *Primula viscosa* and *P. Auricula*. The flowers are about 2 inches across and are deep violet purple in colour, with a white eye. The plant shown had a truss of eight flowers. (Fig. 34.)

Other Exhibits.

- Messrs. Barr, Taplow : bulbous plants.
Messrs. Cannell, Eynsford : Pelargoniums.
R. Farrer, Esq., Clapham : *Primula stenocalyx*.
Misses Hopkins, Shepperton : hardy plants.
C. J. Lucas, Esq., Horsham : Bignonia sp.
Mr. G. W. Miller, Wisbech : hardy plants.
Messrs. Carter Page, London : Violas.
Mr. A. Perry, Enfield : hardy plants.
Mr. Shoday, Bristol : Amaryllis 'Bristol's Own.'
Messrs. Tucker, Oxford : alpiners.
Mr. H. Walter, Dorking : Carnation 'Miss E. M. Vickery.'
Messrs. Ware, Feltham : alpiners.
Wisley Gardens : choice alpiners.

FLORAL COMMITTEE, APRIL 18, 1916.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-one members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. B. R. Cant, Colchester, for Roses.

Silver Flora Medal.

To Messrs. Cheal, Crawley, for flowering shrubs.

To Messrs. Piper, Langley, for alpiners.

Silver Banksian Medal.

To Messrs. May, Upper Edmonton, for miscellaneous plants.

To Mr. G. W. Miller, Wisbech, for hardy plants.

To Mr. M. Prichard, Christchurch, for alpiners.

Bronze Flora Medal.

To Mr. E. J. Hicks, Twyford, for Roses.

Bronze Banksian Medal.

To Messrs. Blackmore & Langdon, Bath, for Polyanthus.

To Messrs. Gill, Falmouth, for Rhododendrons.

To Messrs. Low, Enfield, for Carnations.

To Mr. G. Reuthe, Keston, for hardy plants.

Award of Merit.

To *Androsace Laggeri*, Warley variety (votes, unanimous), from Miss Willmott, V.M.H., Great Warley. A very beautiful deep rose-

pink form of *Androsace Laggeri*. It is very free-flowering and slightly dwarfer than the type.

To *Armeria caespitosa* (votes, 16 for), from Miss E. Willmott, V.M.H., Great Warley. A charming alpine plant bearing numerous small heads of pale lilac-pink flowers, slightly raised above the dense tufts of very short, rigid, and narrow linear leaves.

To *Primula nutans* (votes, unanimous), from Messrs. Wallace, Colchester. A new species collected by Mr. G. Forrest in the shady woodlands of Western China. It belongs to the Soldanelloid section of Primulas, and bears a head of drooping bell-form flowers of a beautiful pale violet-lilac colour, shaded with white meal inside and out. One of the most pleasing features of this *Primula* is the very pronounced scent of the flowers, which somewhat resembles that of *Philadelphus*. The plant exhibited was about 9 inches high, and carried nine fully opened flowers on a mealy stem.

Other Exhibits.

Messrs. Clark, Dover : hardy plants.

W. B. Cranfield, Esq., Enfield Chase : *Primula* 'The Admiral.'

Messrs. Dobbie, Edinburgh : Primroses.

H. J. Elwes, Esq., Cheltenham : *Fritillaria imperialis gigantea*.

Misses Hopkins, Shepperton : rock garden.

Misses Price & Fyfe, East Grinstead : Carnations.

Messrs. Veitch, Exeter : *Myosotis* 'Blue Eyes' and *Viburnum Carlesii rosea*.

ORCHID COMMITTEE.

JANUARY II, 1916.

Mr. J. GURNEY FOWLER in the Chair, and twenty-one members present.

Awards Recommended :—

Gold Medal.

To Messrs. Charlesworth, Haywards Heath, for a magnificent group of winter-flowering Orchids.

Silver Flora Medal.

To J. Gurney Fowler, Esq., Brackenhurst, Pembury, for new and rare hybrids.

To Messrs. Sander, St. Albans, for hybrids and rare species.

To Messrs. McBean, Cooksbridge, for Cymbidiums &c.

To Messrs. Stuart Low, Jarvisbrook, for *Laeliocattleyas*, *Vanda coerulea*, &c.

Silver Banksian Medal.

To Mr. Harry Dixon, Wandsworth Common, for a group.

Bronze Banksian Medal.

To Mr. C. F. Waters, Deanlands Nursery, Balcombe, for good forms of *Odontoglossum crispum* &c.

First-class Certificate.

To *Laeliocattleya* × 'Antinous' (*L.-c.* × 'Myra' × *C.* × 'Enid') (votes, unanimous), from Messrs. Charlesworth. Sepals and petals bright yellow, lip claret-purple. The colour is dominated by *Laelia flava*, a parent of *L.-c.* × 'Myra,' and the form by the *Cattleya*.

Award of Merit.

To *Laelia* × 'Flaviona' (*flava* × 'Iona') (votes, unanimous), from E. Mocatta, Esq., Woburn Place, Addlestone (gr. Mr. Stevenson). A very distinct hybrid bearing an erect spike of fine flowers each 4 inches across. Ground colour yellowish, the sepals lightly and the petals more heavily tinged and veined with claret colour. Lip dark claret colour.

To *Odontioda* × 'Irene' var. 'Glorita' (votes, 15 for, 3 against), from Messrs. Flory & Black, Slough. Inflorescence erect. Flowers 2 inches across. Segments chocolate red with rose labellum.

To *Cattleya chocoensis alba*, McBean's variety (votes, unanimous), from Messrs. McBean, Cooksbridge. A pure white form with very broad petals and light yellow disc to the lip.

To *Cattleya Percivaliana grandiflora* (votes, unanimous), from

Messrs. Stuart Low, Jarvisbrook. Flowers large, rosy-mauve, with maroon front to the lip.

Preliminary Commendation.

To *Odontoglossum* × *exultans*, Orchidhurst variety (*excellens* × *crispum* variety), from Messrs. Armstrong & Brown. Ground colour pale yellow, heavily blotched with chestnut-red.

Other Exhibits.

R. G. Thwaites, Esq. : hybrids.

H. J. Elwes, Esq. : *Coelogyne* (*Pleione*) *humilis* varieties.

G. Hamilton-Smith, Esq. : *Cymbidiums*.

Messrs. Flory & Black : hybrids.

Messrs. Hassall : *Cypripediums*.

Messrs. Armstrong & Brown : *Odontoglossums*.

ORCHID COMMITTEE, JANUARY 25, 1916.

Mr. J. GURNEY FOWLER in the Chair, and twenty-two members present.

Awards Recommended :—

Silver Flora Medal.

To Sir Jeremiah Colman, Bt., Gatton Park (gr. Mr. Collier), for hybrid *Cymbidiums*.

To Messrs. Armstrong & Brown, Tunbridge Wells, for new hybrid *Odontoglossums*.

To Messrs. Charlesworth, Haywards Heath, for a group.

To Messrs. Sander, St. Albans, for a group including rare species.

To Messrs. J. Cypher, Cheltenham, for *Cypripediums* and *Calanthes*.

To Messrs. McBean, Cooksbridge, for *Cymbidiums* and *Laelia anceps*.

To Messrs. Stuart Low, Jarvisbrook, for a group.

Award of Merit.

To *Cattleya Trianae*, Roebling's variety (votes unanimous), from Messrs. Charlesworth. The best of the *C. Trianae Backhouseana* section. Flowers large, white tinged with rose, the lip ruby-purple in front and with a yellow disc, petals having a median purple band.

Preliminary Commendation.

To *Odontoglossum* × 'Anzac' (*eximium* × 'Colossus'), from Messrs. Armstrong & Brown. The seedling bore one large flower of fine shape, white tinged with purple from the colour of the reverse side, and heavily blotched with reddish claret colour.

Other Exhibits.

Miss E. Willmott : *Oncidium Cebolleta*.

Mr. C. F. Waters : *Odontoglossums* and *Lycastes*.

Mr. G. W. Miller : *Cypripedium* hybrid.

Messrs. Flory & Black : hybrid *Orchids*.

ORCHID COMMITTEE, FEBRUARY 8, 1916.

Mr. J. GURNEY FOWLER in the Chair, and twenty-two members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for fine specimens.

To Messrs. Armstrong & Brown, Tunbridge Wells, for hybrid Cattleyas, Odontoglossums, &c.

To Messrs. Sander, St. Albans, for a group.

To Messrs. Cypher, Cheltenham, for Cypripediums, Dendrobiums, &c.

To Messrs. McBean, Cooksbridge, for Cymbidium and Odontoglossums.

Silver Banksian Medal.

To Messrs. Stuart Low, Jarvisbrook, for a group.

To Messrs. Hassall, Southgate, for hybrids.

To Mr. Harry Dixon, Wandsworth, for a group.

Award of Merit.

To *Laeliocattleya* × 'Buenos Aires' (*L.-c.* × *bletchleyensis* × *C.* × 'Enid'), (votes unanimous), from Dr. Miguel Lacroze, Bryndir, Roehampton Lane (gr. Mr. Cresswell). Flower resembling *L.-c.* × 'St. Gothard' and of fine form. Sepals and petals light rose, lip purple in front with light margin, the tube coloured like the petals and veined with purple.

To *Cymbidium* × *Alexanderi aureum* (*insigne* × *eburneo-Lowianum*) (votes unanimous), from Messrs. McBean, Cooksbridge. Flowers pale yellow with faint purple lines, and bright red blotches on the lip.

To *Odontoglossum* × *amabile*, McBean's variety (*crispum* white variety × *crispo-Harryanum*) (votes, unanimous), from Messrs. McBean. A large primrose-yellow flower with red-brown blotches.

Cultural Commendation.

To Mr. Farnes, Orchid grower to Pantia Ralli, Esq., Ashted Park, for *Lycaste Balliae* with twenty-six flowers and buds.

Other Exhibits.

Elizabeth, Lady Lawrence, Burford (Orchid grower, Mr. Swinden) : a fine inflorescence of *Eulophiella Peetersiana* with twelve rosy-mauve flowers and many buds.

Mr. C. F. Waters, Balcombe : good *Odontoglossum crispum* and Lycastes.

Messrs. Flory & Black, Slough : various hybrid Orchids.

ORCHID COMMITTEE, FEBRUARY 22, 1916.

Sir HARRY J. VEITCH in the Chair, and twenty-five members present.

Awards Recommended :—*Silver Flora Medal.*

To Messrs. Charlesworth, Haywards Heath, for hybrid *Odontoglossums* and *Odontiodas*.

To Messrs. McBean, Cooksbridge, for a group.

To Messrs. Cypher, Cheltenham, for *Cypripediums* and *Dendrobiums*.

Silver Banksian Medal.

To Messrs. Armstrong & Brown, Tunbridge Wells, for hybrids.

To Messrs. Stuart Low, Jarvisbrook, for a group.

Bronze Banksian Medal.

To Messrs. Sander, St. Albans, for *Cymbidium*s &c.

Award of Merit.

Laeliocattleya × 'Erzerum' (*L.-c.* × 'Mrs. Temple' × *C. Trianae*) (votes unanimous), from Messrs. Armstrong & Brown. In form resembling a large *C. Trianae*, but with broader, rounded lip. Sepals and petals light rose; lip reddish-purple with yellow disc.

To *Odontioda* × 'Dora' (*Odm.* 'Jasper' × *Oda. Vuylstekeae*) (votes unanimous), from Messrs. Charlesworth. Flower of perfect form, claret-red with a gold shade. Lip lilac in front, claret in the centre, crest yellow.

Other Exhibits.

Baron Bruno Schröder (gr. Mr. J. E. Shill): *Cymbidium* × *Pauwelsii*, The Dell variety.

Sir Jeremiah Colman, Bt. (gr. Mr. Collier): rare species.

F. Menteith Ogilvie, Esq. (gr. Mr. Balmforth): white *Lycaste Skinneri magnifica*.

W. Waters Butler, Esq. (gr. Mr. R. H. Jones): *Odontoglossum crispum* 'Anzac.'

Messrs. Flory & Black, Slough: hybrids.

Messrs. Hassall, Southgate: *Cattleyas*.

ORCHID COMMITTEE, MARCH 7, 1916.

Mr. J. GURNEY FOWLER in the Chair, and thirteen members present.

Awards Recommended :—*Silver Flora Medal.*

To Messrs. Charlesworth, Haywards Heath, for hybrid *Odontoglossums*.

To Messrs. Sander, St. Albans, for species and hybrids.

Silver Banksian Medal.

To Messrs. Cypher, Cheltenham, for Dendrobiums, Cypripediums, &c.

To Messrs. McBean, Cooksbridge, for hybrid Cymbidiums and other Orchids.

First-class Certificate.

To *Odontoglossum* × 'The Czar' (parentage unrecorded) (votes unanimous), from Messrs. Charlesworth. One of the largest and most remarkable of the dark-coloured section. Flowers deep mulberry-red, with very narrow white margins to the sepals and petals, and a broader white margin to the lip.

Award of Merit.

To *Odontioda* × 'Joan,' Fowler's variety (*Oda.* × *Charlesworthii* × *Odm.* × *ardentissimum*) (votes unanimous), from J. Gurney Fowler, Esq., Brackenhurst, Pembury. Ground colour cowslip-yellow blotched with chestnut-red. The original form was entirely red in colour.

To *Cymbidium* × *Alexanderi* 'Excelsior' (*insigne* × *eburneo-Lowianum*) (votes, 9 for, 2 against), from Messrs. McBean, Cooksbridge. Flowers pale rose lined with a darker tint, the lip having a spotted band of ruby-red in front.

Other Exhibits.

Sir Jeremiah Colman, Bt., Gatton Park (gr. Mr. Collier): interesting rare species and good hybrid Dendrobiums.

J. Gurney Fowler, Esq.: *Cattleya Trianae Amesiana*.

Messrs. Armstrong & Brown: hybrids.

Messrs. Flory & Black: Brassocattleyas &c.

Mr. Harry Dixon: a group.

Messrs. Stuart Low: *Laeliocattleya* × *labiosa*.

Messrs. Hassall: hybrids.

ORCHID COMMITTEE, MARCH 28, 1916.

Mr. J. GURNEY FOWLER in the Chair, and eighteen members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for a fine group, principally *Odontiodas*, of which there were sixty specimens.

Silver Flora Medal.

To Messrs. McBean, Cooksbridge, for Cymbidiums &c.

Silver Banksian Medal.

To Messrs. Sander, St. Albans, for rare species.

To Messrs. Hassall, Southgate, for a group.

First-class Certificate.

To *Sophrocattleya* × *Rex*, Orchidhurst variety (*S.-c.* × 'Doris' × *C.* × 'Empress Frederick') (votes unanimous), from Messrs. Armstrong & Brown, Tunbridge Wells. A beautiful flower, 5 inches across and of fine shape. Sepals and petals old-gold colour with a salmon-rose surface. Lip carmine crimson, with gold veining from the base.

To *Odontioda* × 'Gladys' (*Odm. Pescatorei* × *Oda. Bradshawiae*) (votes unanimous), from G. W. Bird, Esq., Manor House, West Wickham (gr. Mr. Redden). Equal in size to *Odontoglossum crispum*. Segments white with broad rose margin and red-brown markings on the inner halves. The plant bore a spike of nineteen flowers and buds.

Award of Merit.

To *Lycaste Skinneri* 'Mrs. G. Hamilton-Smith' (votes unanimous), from Cyril Mann, Esq., Bexley, Kent. A very large form, the flowers being 8 inches across and the sepals 2½ inches wide. Flowers white tinged with rosy-lilac and with ruby-red blotches on the lip.

To *Odontioda* × 'Alcantara' (*Oda.* × *Cooksoniae* × *Odm.* × *eximium*) (votes unanimous), from Messrs. Charlesworth. Colour purplish rose with dark claret markings. Crest of the lip yellow.

To *Laeliocattleya* × 'Verdun' (*L.-c.* × 'C. G. Roebing' var. 'Violetta' × *C. Schroderae*) (votes unanimous), from Messrs. Flory & Black, Slough. A finely formed flower with broad labellum. Sepals and petals white, tinged with rose; lip purplish-rose, disc yellow.

Preliminary Commendation.

Odontioda × *Cereus* (*Oda. Charlesworthii* × *Odm. excellens*). Flowers bright mahogany-red.

Odontoglossum crispum 'Perfection,' large and finely blotched.

Odontoglossum × *promerens*, Orchidhurst variety (blotched *crispum* × *eximium*).

The above three from Messrs. Armstrong & Brown.

Cultural Commendation.

To Cyril Mann, Esq., for *Lycaste Skinneri* 'Mrs. G. Hamilton-Smith,' with eight flowers.

To Messrs. Armstrong & Brown, for *Odontioda* × 'The Czar,' with seventy-five flowers.

Other Exhibits.

J. Gurney Fowler, Esq.: forms of *Brassocattleya* × *Cliftoni*.

Dr. Miguel Lacroze: two hybrids.

E. R. Ashton, Esq.: *Laeliocattleya* × *luminosa aurea*.

H. F. Goodson, Esq.: *Odontoglossum crispum* 'Lucilla.'

Messrs. Flory & Black: hybrids.

Messrs. Stuart Low: a group.

ORCHID COMMITTEE, APRIL 11, 1916.

Mr. J. GURNEY FOWLER in the Chair, and twenty members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for *Odontoglossums* and other hybrids.

To Messrs. Cypher, Cheltenham, for *Cymbidiums*, *Masdevallias*, &c.

To Messrs. McBean, Cooksbridge, for *Cymbidiums* and *Odontoglossums*.

Silver Banksian Medal.

To Messrs. Sander, St. Albans, for hybrids and rare species.

To Messrs. Hassall, Southgate, for *Cattleya Schroederæ* and hybrids.

First-class Certificate.

To *Laeliocattleya* × 'Britannia,' Blenheim variety (*L.-c.* × *Canhamiana* × *C. Warszewiczii* 'Fr. M. Beyrodt') (votes unanimous), from His Grace the Duke of Marlborough, Blenheim Palace, Woodstock (Orchid grower Mr. Smith). Flowers nearly 8 inches across. Sepals and petals pure white; lip mauve-purple with a white margin.

Award of Merit.

To *Odontoglossum* × *illustrissimum*, Shrubbery variety (*Lambeauianum* × *ardentissimum*) (votes unanimous), from F. Menteith Ogilvie, Esq., The Shrubbery, Oxford (gr. Mr. Balmforth). Flowers rich bronzy claret, with white tips to the segments.

To *Odontioda* × 'Joan,' Bryndir variety (*Oda.* × *Charlesworthii* × *Odm.* × *ardentissimum*) (votes 13 for, 4 against), from Dr. Miguel Lacroze, Bryndir, Roehampton Lane (gr. Mr. Cresswell). Sepals and petals bright magenta rose colour, with a scarlet shade, the crest of the lip being yellow.

To *Cypripedium* × 'William Lloyd' var. 'Negro' (*bellatulum* × *Swanianum*) (votes unanimous), from Messrs. Armstrong & Brown, Tunbridge Wells. One of the darkest-coloured *Cypripediums*, the flowers being blackish maroon with a freckling of rose on the upper part of the dorsal sepal.

To *Odontioda* × 'Prince Albert' (*Oda.* × 'Zephyr' × *Odm.* × *percultum*) (votes 15 for, 1 against), from Messrs. Flory & Black, Slough. Flowers of fine shape, deep rosy-red, the lip whitish, mottled with rose colour.

Preliminary Commendation.

To *Odontoglossum crispum* 'General Pétain,' from Messrs. Armstrong & Brown. The small seedling bore one large white flower heavily blotched with reddish purple.

Other Exhibits.

J. Gurney Fowler, Esq. : *Cymbidium* × 'Niobe' (*eburneo-Lowianum* × *tigrinum*) and *Odontoglossum* × 'Cloth of Gold' (*amabile* × *Wilckeanum*).

Sir Jeremiah Colman, Bt. : rare species.

F. M. Ogilvie, Esq. : *Odontoglossum Pescatorei* 'Duchess of Westminster.'

Dr. Miguel Lacroze : *Odontiodas*.

R. G. Thwaites, Esq. : *Odontoglossums*.

C. Ingram, Esq. : hybrids.

Messrs. Flory & Black : *Odontoglossums*.

Mr. Harry Dixon : *Dendrobiums* &c.

Messrs. Stuart Low : a group.

Messrs. Armstrong & Brown : seedling *Odontoglossums*.

Mr. C. F. Waters : *Odontoglossum crispum*.

ORCHID COMMITTEE, APRIL 18, 1916.

Sir HARRY J. VEITCH in the Chair, and five members present.

Award Recommended :—*Preliminary Commendation.*

To *Odontioda* × 'Brackenhurst' (*Oda.* × *Charlesworthii* × *Odm.* × *eximium*), from Messrs. Armstrong & Brown, Tunbridge Wells. Flowers rosy-red. First shown by J. Gurney Fowler, Esq., in 1914.

Other Exhibits.

H. J. Elwes, Esq. : *Phaiocymbidium* × *chardwarensense* (*P. grandifolius* × *C. giganteum*).

E. Mocatta, Esq. : *Laelia* × 'Flaviona' (*flava* × 'Iona').

Messrs. Armstrong & Brown : seedling *Odontiodas* and *Odontoglossums*, and *Dendrobium fusiforme* with ten spikes.

ESTABLISHED
1804.

INCORPORATED
1809.

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ROYAL HORTICULTURAL SOCIETY,

VINCENT SQUARE, WESTMINSTER, S.W.

NOTICES TO FELLOWS.

- | | |
|---------------------------------------|--|
| 1. Journals Wanted. | 13. Inspection of Fellows' Gardens. |
| 2. Subscriptions. | 14. Affiliation of Local Societies. |
| 3. Form of Bequest. | 15. Rules for Judging—1914 Code. |
| 4. New Fellows. | 16. Rules for Judging Cottage and Allotment Gardens. |
| 5. An Appeal. | 17. R.H.S. Daffodil Year Book. |
| 6. R.H.S. Gardeners' Diary. | 18. R.H.S. Pamphlets. |
| 7. The Society's Gardens at Wisley. | 19. Tulip Report. |
| 8. Rock Garden at Wisley. | 20. Douglas Journal. |
| 9. Students at Wisley. | 21. R.H.S. Publications. |
| 10. Distribution of Surplus Plants. | 22. Advertisements. |
| 11. National Diploma in Horticulture. | |
| 12. Information. | |

1. JOURNALS WANTED.

The Secretary would be greatly obliged by the return to the Society of ANY NUMBERS of the JOURNAL which may be of no further use to Fellows. Complete sets are occasionally applied for, but, at the present moment, the stock of the following is exhausted :—

Vols. I. to VI.
Vol. X.

Vol. XIII. Part 1.
Vol. XIV.

These are, therefore, particularly asked for.

2. SUBSCRIPTIONS.

All annual subscriptions are payable in advance on the 1st day of January in each year. A Fellow, if elected before the 1st of July, pays the annual subscription for the current year; if elected after the 1st of July and before the 1st of October, he pays half a year's subscription; if elected after the 1st of October and before the 1st of January, he pays one full year's subscription, and no further subscription until the following January twelvemonth. To avoid the inconvenience of remembering their subscriptions Fellows may *compound* by the payment of one lump sum in lieu of all further annual payments; or they can, by applying to the Society, obtain a form of instruction to their bankers to pay for them every January 1. It may be a week or more before the Tickets reach the Fellows, owing to the very large number (over 20,000) to be despatched every January. Fellows who have not already given an order on their bankers for the payment of their subscriptions are requested to do so, as this method of payment saves the Fellows considerable trouble. Fellows whose subscriptions remain unpaid are debarred from all the privileges of the Society; but their subscriptions are nevertheless recoverable at law, the Society being incorporated by Royal Charter.

In paying their subscriptions, Fellows often make the mistake of drawing their cheques for Pounds instead of for Guineas. Kindly note that in all cases it is Guineas, and not Pounds. Cheques and Postal Orders should be made payable to "The Royal Horticultural Society," and crossed "London County and Westminster Bank, Victoria Branch, S.W."

3. FORM OF BEQUEST.

I give and bequeath to the Treasurer for the time being of the Royal Horticultural Society, London, the sum of £., to be paid out of such part of my personal estate as I can lawfully charge with the payment of such legacy, and to be paid free of legacy duty, within six months of my decease; the receipt of such Treasurer to be a sufficient discharge for the same. And I declare that the said legacy shall be applied towards [the general purposes of the Society].*

4. NEW FELLOWS.

The increasing number of Fellows shows plainly the useful work the Society is doing, and its value to all lovers of the Garden. The President and Council hope that existing Fellows will enlist the sympathy of all their friends, as it is now more important than ever to fill the places of those who are taken from us.

* Any special directions or conditions which the testator may wish to be attached to the bequest may be substituted for the words in brackets.

See also Footnote, page lxxiv.

5. AN APPEAL.

What has been accomplished for the Society since 1887 is largely due to the unwearied assistance afforded by the Fellows themselves and as all belong to the same Society, so it behoves each one to do what he or she can to further its interests, especially by:—

1. Increasing the Number of Fellows.
2. Providing Lectures with Lantern Slides.
3. Presenting Books for the Library at Vincent Square and at Wisley.
4. Sending new or rare Plants and Seeds for the Garden and surplus Roots for distribution to the Fellows.*

6. R.H.S. GARDENERS' DIARY.

Please note:—The Show and Meeting entered in the 1916 Diary for December 19 has been withdrawn.

The R.H.S. Gardeners' Diary for 1917 will be the best Diary the Society has yet published. It is compiled more especially for the single-handed gardener, and contains, among other items of useful information, calendars for fruit and vegetable growing. Fellows may obtain it post free, 1s. 2½*d.*, from the R.H.S. Office, Vincent Square, London, S.W.; or 2s. 2½*d.* if leather-bound. Ready in November.

7. THE SOCIETY'S GARDENS AT WISLEY.

Fellows who are not aware of the wonderful beauty of the Gardens, particularly at certain times of the year, may find the following calendar useful. Differences of season make it impossible to give more precise indications, but any Fellow who wishes to see any of the undermentioned plants at their best should send an enquiry to the Director accompanied by a stamped and addressed envelope.

January.—Early Narcissus, Galanthus, Leucojums, Crocus, Ericas, Hamamelis, Forsythias, Orchids, &c.

February.—Early Narcissus, Crocus, Ericas, Early Saxifrages, Daphnes, Helleborus, Orchids, &c.

March.—Early Narcissus, Crocus, Ericas, Early Rhododendrons, Alpines outside and under glass, Orchids.

April.—Primulas inside and outside, Narcissus, flowering trees and shrubs, Alpines outside and under glass, Orchids.

* The attention of Fellows is specially called to the Wisley Gardens Endowment Trust Fund, the object of which is to make the Gardens self-supporting for ever, so that the important work to which they are devoted may go on uninterrupted by any fluctuation in the Society's finances. To do this £100,000 is required. In 1914 the Council voted £25,000 towards it as a nucleus. Will not Fellows help to make up this sum?

May.—*Primula japonica*, Tulips, Azaleas, Rhododendrons, Trees and shrubs, Alpines, Narcissus.

June.—Roses, Iris, Azaleas, Rhododendrons, trees and shrubs, Alpines and Pæonies, Nymphaeas.

July.—Roses, Iris Kaempferi, Phlox, *Lilium giganteum*, Kalmias, Delphiniums, &c.

August and September.—Roses, Phlox, rock plants, Herbaceous plants, *Gentiana Asclepiadea*, &c.

October, November, and December.—Autumn foliage, Michaelmas Daisies, Colchicums, &c.

The Gardens are open daily to Fellows and others showing Fellows' Transferable Tickets, from 9 A.M. till sunset, except on Sundays, Good Friday, Christmas Day, and Exhibition Days. Each Fellow's Ticket admits three to the Gardens. The Public are not admitted at any time.

The Gardens are about $3\frac{1}{2}$ miles from Byfleet, $3\frac{1}{2}$ miles from Horsley, and $5\frac{1}{2}$ miles from Weybridge, all on the South-Western Railway. Carriages to convey four persons can be obtained by writing to Mr. D. White, fly proprietor, Ripley, Surrey; the charge being, to and from Weybridge, waiting two hours at the Gardens, 8s.; or waiting three hours, 10s.; or to and from Horsley or Byfleet, 7s. Motor cars will be found at Byfleet Station. Accommodation and refreshments can be had at the Hut Hotel, close to the Gardens, and also at the Hautboy, Ockham.

8. ROCK GARDEN AT WISLEY.

In response to the interest taken in what are popularly called "Alpines," or "Rock Plants," the Council have constructed a Rock Garden at Wisley on a somewhat extensive scale. The idea is to obtain the best possible positions and soils for the different plants to grow in, the growth and well-being of the plants being considered to be of greater importance than the artistic effect of the rockwork. In a Horticultural Society's Garden every single detail should teach something, so that Fellows visiting it may be able to take away an idea of how best to do this or that, or where best to plant this or that.

9. STUDENTS AT WISLEY.

The Society admits young men, between the ages of sixteen and twenty-two years, to study Gardening at Wisley. The curriculum includes not only practical garden work in all the main branches of Gardening, but also Lectures, Demonstrations, and Horticultural Science in the Laboratory, whereby a practical knowledge of Garden Chemistry, Biology, &c., may be obtained.

10. DISTRIBUTION OF SURPLUS PLANTS.

A few years ago the Council drew attention to the way in which the annual distribution of surplus plants has arisen. In a large garden there must always be a great deal of surplus stock, which must either be given away or go to the waste-heap. A few Fellows, noticing this, asked for plants which would otherwise be discarded ; and they valued what was so obtained. Others hearing of it asked for a share, until the Council felt they must either systematize this haphazard distribution or else put a stop to it altogether. To take the latter step seemed undesirable. Why should not such Fellows have them as cared to receive such surplus plants ? It was, therefore, decided to keep all plants till the early spring, and then give all Fellows alike the option of claiming a share of them by Ballot.

Fellows are, therefore, particularly requested to notice that only waste and surplus plants raised from seeds or cuttings are available for distribution. Many of them may be of very little intrinsic value, and it is only to avoid their being absolutely wasted that the distribution is permitted. The great majority also are, of necessity, *very small*, and may require careful treatment for a time.

Fellows are particularly requested to note that a Form of Application and list to choose from of the plants available for distribution is sent in January *every year* to every Fellow, enclosed in the " Report of the Council." To avoid all possibility of favour, all application lists are kept until the last day of February, when they are all thrown into a Ballot ; and as the lists are drawn out, so is the order of their execution, the plants being despatched as quickly as possible after March 1.

Of some of the varieties enumerated the stock is small, perhaps not more than twenty-five or fifty plants being available. It is, therefore, obvious that when the Ballot is kind to any Fellow he will receive the majority of the plants he has selected, but when the Ballot has given him an unfavourable place he may find the stock of almost all the plants he has chosen exhausted. A little consideration would show that all Fellows cannot be first, and some must be last, in the Ballot. Application forms received after March 1 and before April 30 are kept till all those previously received have been dealt with, and are then balloted in a similar way. Fellows having omitted to fill up their application form before April 30 must be content to wait till the next year's distribution. The work of the Garden cannot be disorganized by the sending out of plants at any later time in the year. All Fellows can participate in the annual distribution *following* their election.

The Society does not pay the cost of packing and carriage.

Fellows residing beyond a radius of thirty-five miles from London are permitted to choose double the number of plants to which they are otherwise entitled.

Plants cannot be sent to Fellows residing outside the United Kingdom.

No plants will be sent to Fellows whose subscriptions are in arrear, or who do not fill up their forms properly.

11. A NATIONAL DIPLOMA IN HORTICULTURE.

Most gardeners have welcomed the initiation by the Society of a scheme whereby a National Diploma in Horticulture may be gained by those who pass the Preliminary and Final Examinations. The Diploma is thoroughly "National," for, by the consent of H.M. Government, the Department of Agriculture consented to co-operate with the Society if the Society would undertake the work of organizing the Examinations, and authorized the Diploma bearing the following words: "Awarded by the Royal Horticultural Society under a scheme approved by the Board of Agriculture."

The Examinations, which are held in June, are practical, viva voce, and written; the practical part being held in a suitable garden.

Information may be obtained by sending a directed envelope, stamped, to the Secretary, Royal Horticultural Society, Vincent Square, S.W.

12. INFORMATION.*

Fellows may obtain information and advice from the Society as to the names of flowers and fruits, on points of practice, insect and fungus attacks, and other questions, by applying to the Secretary, R.H.S., Vincent Square, Westminster, S.W. Where at all practicable it is particularly requested that letters and specimens may be timed to reach Vincent Square by the first post on the mornings of the fortnightly Meetings, so as to be laid before the Scientific or other Committees at once.

13. INSPECTION OF FELLOWS' GARDENS.

The Inspection of Gardens belonging to Fellows is conducted by a thoroughly competent Inspector from the Society, who reports and advises at the following cost—viz. a fee of £3 3s. for one day (or £5 5s. for two consecutive days), together with all out-of-pocket expenses. No inspection may occupy more than two days, save by special arrangement. Fellows wishing for the services of an Inspector are requested to give at least a week's notice and choice of two or three days, and to indicate the most convenient railway station and its distance from their gardens. Gardens can only be inspected at the *written* request of the *owner*.

14. AFFILIATION OF LOCAL SOCIETIES.

One of the most successful of the many branches of the Society's work is the affiliation of local Horticultural Societies to the R.H.S.; no fewer than 300 Societies having joined our ranks.

* See R.H.S. Gardeners' Diary, 1916, page 60. "How to send Specimens for Identification."

Secretaries can obtain a specimen Card for the use of Affiliated Societies for Certificates, Commendations, &c. Price, including postage, 4s. for 10 copies, 6s. for 20, 12s. 6d. for 50, 21s. for 100. At the request of several of the Societies, the Council have had the Card coloured. The coloured Card is sold at 1s. a single copy, or 10 for 6s., post free.

The Council have also struck a special Medal for the use of Affiliated Societies. It is issued at cost price in Bronze, Silver, and Silver-gilt—viz. Bronze, 5s. 9d., with case complete; Silver, 12s. 9d., with case complete; Silver-gilt, 16s. 9d., with case complete. Award Cards having the Medal embossed in relief can be sent with the Medal if ordered, price 9d. each.

15. RULES FOR JUDGING—1914 CODE.

The "Rules for Judging, with Suggestions to Schedule Makers and Exhibitors," have been revised. The Secretaries of Local Societies are advised to obtain a copy. It will be sent post free on receipt of a postal order for 1s. 9d., addressed to the Secretary, Royal Horticultural Society, Vincent Square, Westminster, S.W.

16. RULES FOR JUDGING COTTAGE AND ALLOTMENT GARDENS.

To assist Allotment Holders and Cottage Gardeners in their competitions, a set of Rules, with hints to both Exhibitors and Judges, has been drawn up. These Rules may be had at threepence a copy, or fifty for 8s.

A companion Judges' Sheet in a very convenient book-like form can also be had for 2s. 6d. a dozen. This Judges' Sheet has, in tabulated form, a list of the subjects usually grown in allotment gardens, flower gardens, and for window and wall decoration. The allotments or gardens to be judged are all numbered, and columns are provided in the judging sheet for the points given.

17. R.H.S. DAFFODIL YEAR BOOK.

The Daffodil Year Books of the Society are amongst the most interesting works on gardening. The first issue (1913) was sold out within a month of publication. Double the quantity of the 1914 Year Book was printed, but of this only a few copies remain unsold. The 1915 Year Book has 144 pages (with 33 illustrations) of clear, reliable information, and it makes pleasant reading. These Year Books can be obtained from Messrs. Wesley, 28 Essex Street, Strand, London, W.C., price 3s. post free.

18. R.H.S. POPULAR PRACTICAL PAMPHLETS.

The following pamphlets can be ordered from the Royal Horticultural Society, Vincent Square, London, S.W. They have been prepared with a view of meeting the needs of the present urgent times and will be found eminently practical and useful. During the last twelve months over 72,000 copies have been sold. The prices of each are as follows:—

Single Copy, 3*d.*; 25, 5*s.* 6*d.*; 50, 8*s.* 6*d.*; 100, 15*s.*:—

- (1) A selected List of Hardy Fruits, with Notes on Cultivation, etc., 1916 edition.
- (2) The Training of Fruit Trees.
- (3) The Pruning of Fruit Trees.
- (4) Keeping Fruit Trees clean.
- (5) Vegetables and How to Grow Them.
- (6) Autumn Vegetables from seed sown in July.
- (7) The Herbaceous Garden.
- (8) The Rose Garden.
- (9) Flowers for Small Gardens, Window Boxes, etc.
- (10) Hardy and Half-Hardy Annuals in the Open Air.
- (11) Fruit Bottling.
- (12) Vegetable Bottling, Storing, and Salting.
- (13) Vegetable Cookery.
- (14) Salads and Salad Making.
- (15) War-time Economy in Gardening.
- (16) Medicinal Plants and their Cultivation.

19. TULIP REPORT.

The results of the exhaustive Trial of Tulips at Wisley will be issued shortly as a separate publication, at a charge of 2*s.* 6*d.* (3*s.* post free). This illustrated Report will constitute the standard authority on Tulips for many years to come, and will contain lists of varieties useful for various purposes and arranged according to colours. Descriptions will be given of all the Tulips which were grown in the Trials at Wisley, illustrations of the various types of forms and colouring, lists of synonyms, references to the principal literature of the Tulip, &c. To be obtained from the Society's Publishers, Messrs. Wesley & Son, 28 Essex Street, Strand.

20. DOUGLAS JOURNAL.

At the request of the U.S.A. Department of Agriculture the Society has quite recently published the Diary, kept by David Douglas nearly 100 years ago, of his exploration of the wildest parts of North and

North-Western America, whither the Society had sent him chiefly with a view to the introduction of new plants. It will be found to be vastly interesting, not only on account of the extraordinary number of the plants he discovered, but also on account of the topographical notes it contains and the evidence it affords of the condition of the country and of the Indians 100 years ago. It is published by Messrs. Wesley & Son, 28 Essex Street, Strand, London. Price £1 1s.

21. R.H.S. PUBLICATIONS.

In future, only Fellows can obtain the Society's publications from the R.H.S. Office, Vincent Square, S.W. Non-Fellows should order direct from Messrs. Wesley & Son, 28 Essex Street, Strand, W.C., who have been appointed Agents for the Society.

22. ADVERTISEMENTS.

Fellows are reminded that the more they can place their orders with those who advertise in the Society's Publications the more likely others are to advertise also, and in this way the Society may be indirectly benefited.

EXTRACTS FROM THE PROCEEDINGS
OF THE
ROYAL HORTICULTURAL SOCIETY.

GENERAL MEETING.

MAY 2, 1916.

Dr. F. KEEBLE, F.R.S., in the Chair.

Fellows elected (27).—Mrs. J. H. Bainbridge, Mrs. E. Bellville, A. E. Billingham, Mrs. R. Gilman Brown, G. S. Crisford, Miss Garnett, Mrs. Arnold Gyde, Miss C. Hall, Mrs. B. Hall, Miss Humby, Mrs. F. J. Huxtable, Mrs. Johnstone, Mrs. H. Graham King, Mrs. E. McLure, Miss M. Messel, Mrs. Cunningham Moncrieff, Geo. J. Morgan, Mrs. E. A. Neatby, Mrs. E. Nelson, S. Salisbury, Chas. Shaw, A. K. Stothert, Geo. N. Tebbutt, Edwin E. Turner, General Sir Charles Warren, G.C.M.G., E. H. Wilding, Miss Woolls.

Fellow resident in Australia (1).—W. D. Searl.

A lecture on "Some Aspects of Spraying against Pests" was given by Mr. A. H. Lees, M.A. (See p. 213.)

GENERAL MEETING.

MAY 16, 1916.

W. B. CRANFIELD, Esq., in the Chair.

Fellows elected (56).—George P. Allen, Miss O. B. Amos, Miss J. M. Anderson, Mrs. Baring, L. Bayer, A. Bazett, Mrs. Beadel, E. H. Bernhard, W. C. Bishop, Mrs. J. Carter, Mrs. W. H. Cobb, Mrs. H. A. Coddington, O. Craven, E. Cunard, A. d'Ambrumenil, Mrs. Dunbar, Mrs. Ianto Evans, Mrs. J. J. Foster, Miss Franklin, Mrs. G. Rae Fraser, Mrs. M. Mewburn-Garnett, Robt. Gemmell, E. G. Grimsdale, Mrs. G. Hannaford, Mrs. Harris, G. Hocking, W. F. S. Hodgson, G. J. Holloway, Miss E. B. Hulme, Mrs. Hyslop, W. E. James, Thos. Johnson, Mrs. Joshua, Mrs. Kershaw, T. S. C. Lee, John Lewis, W. W. Loch, C. F. Martin, Mrs. Middleton, Capt. Chas. Mitchell, F. Craven Moore, Miss Mountford, Dr. Neatby, Chas. Oldham, Mrs. Henry Platt, Miss Powell, J. C. R. Rahder, Mrs. P. W. Robertson, J. Q. Rowett, Mrs. W. E. F. Smyth, Col. B. Strange, Lady Verney, Mrs. Vitali, Mrs. Chas. Wilson, Mrs. Woolls, J. Young.

Fellows resident abroad (3).—T. Aldridge (Auckland, N.Z.), B. Barreto (Argentina), Mrs. G. Chirnside (Victoria, Australia).

A lecture on "Daffodil Developments" was given by the Rev. J. Jacob. (See p. 229.)

CHELSEA SHOW.

MAY 23, 24, 25, 1916.

LIST OF JUDGES.

ORCHIDS.

Amateurs' Exhibits.

Bolton, W.
Cypher, J., V.M.H.
Charlesworth, J.
Sander, F., V.M.H.

Nurserymen's Exhibits.

Colman, Sir Jeremiah, Bart.
Hanbury, F. J.
Ralli, Pantia.
Shill, J. E.

ROSES.

Page Roberts, Rev. F.
Jennings, John.
Orpen, O. G.

CARNATIONS.

Turner, Arthur
Barnes, N. F.
Page, W. H.

TULIPS.

Hall, A. D., M.A., F.R.S.
Jacob, Rev. J.
Ware, W. T.

FLOWERING PLANTS.

On Tables.

{ Veitch, P. C. M., J.P.
{ Notcutt, R. C.
{ Knowles, P. O.
{ Hudson, J., V.M.H.
{ Paul, G., V.M.H.
{ Hales, W.

FLOWERING PLANTS.

Groups.

Morter, W.
Dixon, C.
Howe, W.
Crump, W., V.M.H.

FOLIAGE PLANTS.

Coomber, T., V.M.H.
Baker, W. G.
Tivey, G.

FRUIT AND VEGETABLES.

Challis, T., V.M.H.
Poupart, W.
Rollit, Sir Albert, LL.D.
Reynolds, G.

BEGONIAS.

MacLeod, J. F.
Chapman, A.
Heal, J., V.M.H.

SWEET PEAS.

Stevenson, Thos.
Jones, H. J.
Watkins, Alfred

HARDY HERBACEOUS PLANTS.

Groups.

Lynch, R. Irwin, V.M.H.
Cuthbertson, W., V.M.H.
Fielder, C. R., V.M.H.

Exhibits on Tables.

Pearson, A. H., V.M.H.
Turner, T. W.
Crisp, Bernard

FLOWERING TREES AND SHRUBS. "DAILY GRAPHIC" CUP.

Cheal, Joseph, V.M.H.
Beckett, E., V.M.H.
Harrow, George

Bowles, E. A., M.A.
Thomas, Carmichael.
Parsons, Alfred, R.A.

GROUPS IN THE OPEN AIR.

Bowles, E. A., M.A.
Bilney, W. A., J.P.
Clutton Brock, A.
Grandfield, J.

HORTICULTURAL SUNDRIES.
Hooper, H.
Chittenden, F. J., F.L.S.

ROCK AND FORMAL GARDENS.

Bowles, E. A., M.A.
Bilney, W. A., J.P.
Clutton Brock, A.
Morris, Sidney
Grandfield, J.

PICTURES AND STATUARY.
Bowles, E. A., M.A.
Parsons, Alfred, R.A.
Wilks, Rev. W., M.A., V.M.H.
White, Edward

AWARDS GIVEN BY THE COUNCIL AFTER CONSULTATION
WITH THE JUDGES.

[The order in which the names are entered under the several medals and cups has no reference whatever to merit, but is purely accidental.

The awards given on the recommendation of the Fruit, Floral, and Orchid Committees will be found under their respective reports.]

ORCHIDS.

Gold Medal.

Sir Jeremiah Colman, Bt., V.M.H., Gatton Park, Reigate (gr. J. Collier).

Messrs. Armstrong & Brown, Tunbridge Wells.

Williams Orchid Medal.

Messrs. Charlesworth, Haywards Heath.

Messrs. J. & A. McBean, Cooksbridge.

Silver-gilt Flora Medal.

Messrs. Stuart Low, Bush Hill Park, Enfield.

Messrs. Sander, St. Albans, Herts.

Silver-gilt Banksian Medal.

Messrs. J. Cypher, Cheltenham.

Messrs. Mansell & Hatcher, Rawdon, Leeds.

Silver Flora Medal.

Mr. H. Dixon, Spencer Park Nursery, Wandsworth.

Messrs. Flory & Black, Slough.

Silver Banksian Medal.

Mr. C. F. Waters, Balcombe, Sussex.

Davidson Cup.

Messrs. McBean, Cooksbridge.

EXHIBITS IN THE OPEN AIR.

Silver-gilt Flora Medal.

Messrs. Cutbush, Highgate, N., for clipped trees.

Silver-gilt Banksian Medal.

Messrs. Fromow, Chiswick, W., for Japanese maples.

Silver Flora Medal.

Messrs. J. Piper, Bayswater, W., for topiary work and Japanese trees and shrubs.

Silver Banksian Medal.

Mr. E. Dixon, Putney, S.W., for formal garden.

Mr. L. R. Russell, Richmond, S.W., for shrubs.

GROUPS ON THE GROUND.

Gold Medal.

Messrs. Carter, Raynes Park, S.W., for flowering plants.

Messrs. W. Paul, Waltham Cross, for Roses.

Messrs. Suttons, Reading, for flowering plants.

Messrs. Waterer & Crisp, Bagshot, for Rhododendrons.

Silver-gilt Flora Medal.

Messrs. Barr, Covent Garden, for herbaceous and alpinas.

Messrs. Bees. Liverpool, for rare alpinas, Primulas, and Chinese plants.

Messrs. G. Bunyard, Maidstone, for herbaceous.

Messrs. Cuthbert, Southgate, for Azaleas.

Messrs. Cutbush, Highgate, for Roses.

Messrs. Hobbies, Dereham, for Roses.

Messrs. Jackman, Woking, for herbaceous plants.

Messrs. John Peed, West Norwood, for Caladiums.

Mr. Amos Perry, Enfield, for Pæonies and herbaceous plants.

Mr. Chas. Turner, Slough, for Roses.

Messrs. R. Wallace, Colchester, for flowering plants.

Messrs. T. S. Ware, Feltham, for Begonias.

Messrs. E. Webb, Stourbridge, for flowering plants.

Silver-gilt Banksian Medal.

R. L. Mond, Esq., Sevenoaks, for Amaryllis.

R. L. Mond, Esq., Sevenoaks, for Azaleas and Rhododendrons.

Messrs. W. Artindale, Sheffield, for herbaceous and alpine plants.

Messrs. Barr, Covent Garden, for Tulips.

Messrs. Blackmore & Langdon, Bath, for Begonias and Delphiniums.

Messrs. J. Cheal, Crawley, for flowering trees and shrubs.

Messrs. Jackman, Woking, for Clematis.

Messrs. Stuart Low, Enfield, for Carnations.

- Messrs. H. B. May, Upper Edmonton, for Ferns.
 Mr. R. C. Notcutt, Woodbridge, for Lilacs.
 Mr. R. C. Notcutt, Woodbridge, for flowering shrubs.
 Messrs. Paul & Son, Cheshunt, for Roses.
 Mr. Amos Perry, Enfield, for ferns.
 Messrs. J. Piper, Bayswater, for flowering trees and shrubs.
 Messrs. T. Rochford, Broxbourne, for Rambler Roses.
 Messrs. Sutton, Reading, for Tulips.
 Messrs. T. S. Ware, Feltham, for herbaceous and alpine plants.
 Messrs. Waterer & Crisp, Bagshot, for herbaceous plants.

Silver Flora Medal.

- Messrs. R. H. Bath, Wisbech, for Tulips.
 Messrs. W. Cutbush, Highgate, for Carnations.
 Messrs. J. Piper, Bayswater, for Roses.
 Mr. George Prince, Longworth, for Roses.
 Mr. G. Reuthe, Keston, for perennials and rare shrubs.
 Messrs. T. Rochford, Broxbourne, for Spiræas.
 Mr. L. R. Russell, Richmond, for ornamental trees.
 Messrs. R. Wallace, Colchester, for Tulips.
 Messrs. Waterer & Crisp, Bagshot, for Tulips.

Silver Banksian Medal.

- Messrs. Barr, Covent Garden, for pygmy trees.
 Messrs. G. Bunyard, Maidstone, for Rhododendrons.
 Messrs. Carter Page, London Wall, for Dahlias.
 Messrs. Stuart Low, Enfield, for Australian plants.
 Mr. R. C. Notcutt, Woodbridge, for flowering plants.
 Messrs. J. Piper, Bayswater, for Azaleas.
 Messrs. J. Piper, Bayswater, for Clematis.

Bronze Flora Medal.

- Messrs. W. J. Brown, Stamford, for Lilacs, Roses, and flowering plants.
 Messrs. H. Cannell, Swanley, for Roses, Pelargoniums, Myosotis.

EXHIBITS ON THE TABLES.

Gold Medal.

- Hon. John Ward, C.V.O., Hungerford, for collection of fruit (gr. Mr. C. Beckett).
 Messrs. Dobbie, Edinburgh, for Sweet Peas.
 Mr. A. F. Dutton, Iver, Bucks, for Carnations.

Silver-gilt Flora Medal.

- The Hon. Vicary Gibbs, Elstree (gr. Mr. Beckett), for Cape Pelargoniums.
 Mr. J. C. Allgrove, Langley, Slough, for herbaceous and alpine plants.
 Messrs. Allwood Bros., Haywards Heath, for Carnations.
 Messrs. G. and W. H. Burch, Peterborough, for Roses.

- Messrs. B. R. Cant, Colchester, for Roses.
Messrs. Frank Cant, Colchester, for Roses.
Messrs. A. Dickson, Newtownards, for Sweet Peas.
Messrs. Dobbie, Edinburgh, for Antirrhinums.
Mr. J. Douglas, Great Bookham, for Border Carnations.
Messrs. Hogg & Robertson, Belfast, for Tulips.
Messrs. Ker, Liverpool, for Amaryllis.
Mr. G. W. Miller, Wisbech, for herbaceous plants.
Mr. J. Stevenson, Wimborne, for Sweet Peas.
Mr. G. G. Whitelegg, Chislehurst, for herbaceous plants.

Silver-gilt Knightian Medal.

- Messrs. T. Rivers, Sawbridgeworth, for fruit trees in pots.
Messrs. Sutton, Reading, for vegetables.

Silver-gilt Banksian Medal.

- Messrs. S. Bide, Farnham, for Sweet Peas.
Mr. A. P. Bruce, Manchester, for Sarracénias.
Messrs. A. Dickson, Newtownards, for Tulips.
Mr. Clarence Elliott, Stevenage, for alpine plants.
Mr. Elisha J. Hicks, Twyford, for Roses.
Messrs. Waterer & Crisp for alpine plants.
Messrs. J. Piper, Bayswater, for herbaceous plants.
Messrs. J. Piper, Bayswater, for Sweet Peas.
Mr. M. Prichard, Christchurch, for herbaceous plants.
Messrs. Wells, Merstham, for Carnations.

Silver Flora Medal.

- Mr. R. J. Barnes, Malvern, for Roses.
Messrs. Clark, Dover, for herbaceous plants.
Mr. Alfred Dawkins, Chelsea, for Schizanthus.
Messrs. A. Dickson, Newtownards, for Roses.
Messrs. J. Forbes, Hawick, for herbaceous plants and Violas.
Mr. M. Prichard, Christchurch, Hants, for alpine plants
Mr. R. Prichard, Wimborne, for alpine plants.
Messrs. Pulham, Broxbourne, for alpine and herbaceous plants.
Mr. G. Reuthe, Keston, for alpine plants.
Mr. L. R. Russell, Richmond, S.W., for stove plans.
Mr. G. G. Whitelegg, Chislehurst, for alpine plants.

Silver Knightian Medal.

- Messrs. Laxton, Bedford, for Strawberries.

Silver Banksian Medal.

- Mr. J. Douglas, Great Bookham, for Auriculas.
Messrs. Godfrey, Exmouth, for Pelargoniums.
Messrs. Godfrey, Exmouth, for Poppies and herbaceous plants.
Messrs. Jarman, Chard, for Pelargoniums.
Messrs. B. Ladhams, Southampton, for herbaceous plants and shrubs.

- Mr. F. Lilley, Guernsey, for Gladioli.
 Mr. J. MacDonald, Harpenden, for grasses.
 Messrs. J. Peed, W. Norwood, for Gloxinias and Streptocarpus.
 Rev. J. H. Pemberton, Havering-atte-Bower, for Roses.
 Messrs. J. Piper, Bayswater, W., for alpine plants.
 Messrs. Reamsbottom & Co., Geashill, Ireland, for St. Brigid
 Anemones.
 Mr. G. Reuthe, Keston, for herbaceous plants.
 Messrs. R. Sydenham, Birmingham, for Sweet Peas.
 Mr. A. D. Thompson, 11 Adam Street, W.C., for hardy and alpine
 plants.
 Messrs. R. Tucker, Oxford, for alpine plants.
 Mr. C. Turner, Slough, for Lilacs.
 Yokohama Nursery Co., for Japanese trees and miniature gardens.
 Messrs. Bakers, Codsall, Staffs., for herbaceous plants.

Bronze Flora Medal.

Misses Price & Fyfe, East Grinstead, for Carnations.

GARDEN STATUARY &C.

Silver-gilt Flora Medal.

Messrs. T. Crowther, 282 North End Road, Fulham, for garden
 ornaments, figures, and sundries.

Silver Banksian Medal.

Mr. T. West Carnie, 59 Seymour Street, W., for flower glasses and
 garden ornaments.

Messrs. Liberty, Regent Street, W., for Japanese trees and garden
 ornaments.

PLANS AND PICTURES.

Silver Flora Medal.

Mrs. E. M. Fraser, Onslow Hotel, Queen's Gate, S.W., for water-
 colour drawings.

Messrs. Milner, Son & White, 7 Victoria Street, S.W., for garden
 plans.

Silver Banksian Medal.

Mr. Montagu Summers, F.Z.S., 52 New Broad Street, E.C., for
 patent butterfly mountings.

Mrs. M. Townsend, 79 Yale Court, W. Hampstead, N.W., for water-
 colour drawings.

Bronze Banksian Medal.

Miss E. Lamont, 2 Carlisle Place, S.W., for paintings of garden
 flowers.

Miss V. Lindsell, Dunchurch, nr. Rugby, for water-colour drawings.

Mrs. J. McTurk, 116a King Henry's Road, N.W., for water-colour
 paintings and pictures.

HORTICULTURAL SUNDRIES—OUTSIDE.

Silver Banksian Medal.

Castle's Shipbreaking Co., Millbank, S.W., for teakwood and garden furniture.

Dryad Cane and Metal Works, Leicester, for cane furniture.

Four Oaks Spraying Machine Co., Sutton Coldfield, for spraying machines, pumps, &c.

Messrs. A. W. Gamage, Holborn, for garden houses, furniture, &c.

Holder Harriden, Ltd., Noble Street, E.C., for spraying machines.

Messrs. Hughes, Bolckow & Co., 10 Dover Street, W., for teakwood garden furniture.

Messrs. Maggs & Co., Bristol, for garden seats and tables.

United Brassfounders and Engineers, Ltd., Birmingham, for spraying and lime-washing machines.

Bronze Banksian Medal.

Messrs. J. Christopher, 39 Clerkenwell Road, London, E.C., for trucks, ladders, lifts, and the gardener's improved water-tap.

Messrs. Drew, Clark, Leyton, for telescopic ladders.

Messrs. Pearce, Holloway Road, for greenhouses and rustic summer-houses.

Messrs. Peters, Derby, for carbolineum wood preservative.

Messrs. H. C. Philcox, Brixton, S.W., for ladders, steps, and barrows.

Mr. H. C. Slingsby, 142 Old Street, E.C., for patent ladders, barrows, &c.

HORTICULTURAL SUNDRIES IN THE TENTS.

Silver Banksian Medal.

Mrs. Miller, Marlow, for Moyleen confections.

Miss Hilda G. Sewell, 67 Harcourt Terrace, S.W., for Elmhurst preserves.

Messrs. J. Weeks, 72 Victoria Street, S.W., for greenhouse ventilating gearing, &c.

Messrs. Westmacott, 368 Strand, W.C., for South African confections.

Messrs. E. A. White, for syringes, &c.

Bronze Banksian Medal.

Messrs. Abbott Bros., Southall, for garden tables, fruit stand, &c.

Mr. Percy F. Bunyard, Kidderminster Road, Croydon, for lamps, spraying apparatus, &c.

Messrs. Fowler, Lee, Reading, for bottling appliances.

Garden City Trug Co., Fleet, Hants, for garden trugs.

Mr. J. Haws, Clapton, N.E., for water-cans.

Messrs. H. Pattisson, Streatham, for garden appliances.

GENERAL MEETING.

JUNE 6, 1916.

V. H. BLACKMAN, Esq., in the Chair.

Fellows elected (52).—A. J. Ashmore, Mrs. H. G. Baldwin, Mrs. Barker-Hahlo, Philip Barnett, A. B. Booth, Major D. S. Browne, Mrs. Gordon Campbell, H. J. Chapman, J. M. Clement, Mrs. R. A. Currie, Mrs. Dawson, Miss Erskine, L. L. Faudel-Phillips, J. Gordon Gordon, W. R. Hammond, Mrs. H. Harris, Mrs. J. Holt, Mrs. Hood, L. Hulse, Mrs. G. D. Jebb, Mrs. Judkins, F. H. Kaye, Mrs. J. Kempson, Lady Laidlaw, Miss A. H. Little, W. T. Madden, J. E. Mills, G. Moore, E. A. H. Mosenthal, Mrs. E. A. H. Mosenthal, H. C. Mott, Arthur E. Nathan, J. Paine, Miss V. G. Parsons, Lt.-Col. D. C. Phillott, Thomas Powell, C. Rata, Mrs. C. Scott, C. T. Scott, E. H. Seakins, H. Stanley Sharp, Miss Dora Skipwith, Mrs. Harry Smith, Mrs. J. J. Smith, Mrs. L. H. Smith, E. F. Taylor, Mrs. Walker, R. W. S. Weir, E. A. Wigan, W. L. Wilson, Lady Worsley, L. v. Zwanenberg.

Associates (2).—Miss C. Cadbury, Miss J. Gregory.

A lecture on "Seed Germination" was given by Mr. Kidd.

GENERAL MEETING.

JUNE 20, 1916.

JOSEPH CHEAL, Esq., V.M.H., in the Chair.

Fellows elected (29).—Miss Beynon, Mrs. Blandy, F. L. Bosqui, W. H. Bull, W. E. Chaplin, J. A. Cooper, Countess of Coventry, Miss L. Crabb, Percy Dudding, Miss Ericsson, C. N. French, Mrs. M. Haegger, Surg.-Genl. G. F. A. Harris, Miss Hastings, C. H. Hopwood, W. B. Jones, Mrs. W. B. Jones, Lt.-Col. C. G. W. Lowdell, Major R. Maclaren, Mrs. Percy Mann, Mrs. Mendl, Miss E. A. Parker, Arthur Pott, Mrs. Rawlinson, Mrs. Smith-Bingham, A. J. Cohen Stuart, Mrs. Wheatley, Mrs. A. J. Wilson, S. A. Wolton.

A lecture on "The Colour of Flowers, Wild and Cultivated," was given by Prof. Percival.

HOLLAND HOUSE SHOW.

JULY 4, 5, 6, 1916.

LIST OF JUDGES.

ORCHIDS.

Amateurs' Exhibits.

Bolton, W.
Cypher, J., V.M.H.
Charlesworth, J.

Nurserymen's Exhibits.

Colman, Sir Jeremiah, Bt.
Hanbury, F. J., F.L.S.
Ralli, Pantia
Shill, J. E.

ROSES.

Page Roberts, Rev. F.
Piper, T. W.
Orpen, O. G.

CARNATIONS.

Turner, A.
Jennings, J.
Page, W. H.

BEGONIAS.

(*Tuberous.*)

MacLeod, J. T.
Chapman, A.
Heal, J., V.M.H.

SWEET PEAS.

Curtis, C. H.
Bates, W.
Watkins, A.

FRUIT AND VEGETABLES.

Rollit, Sir Albert Kaye
Challis, T., V.M.H.
Poupart, W.
Reynolds, G.
Harris, E.

HERBACEOUS PLANTS.

{ Blakey, W. J.
{ MacLeod, J. F.
{ Paul, G., V.M.H.
{ Notcutt, R. C.
{ Beckett, E., V.M.H.
{ Hales, W.

ALPINES, ROCK AND WATER GARDENS.

{ Bilney, W. A., J.P.
{ Bowles, E. A., M.A., F.L.S.
{ Bedford, A.
{ Divers, W. H., V.M.H.

FOLIAGE PLANTS.

Hudson, Jas., V.M.H.
Baker, W. G.
Howe, W.

FLOWERING PLANTS.

{ Heal, J., V.M.H.
{ Morter, W. H.
{ Tivey, G. T.
{ Coomber, T., V.M.H.
{ Knowles, P. O.
{ Turner, T. W.

GROUPS IN OPEN AIR.

Pearson, C. E.
Cheal, J., V.M.H.
Dixon, C.

FLOWERING TREES AND SHRUBS.

Gibbs, Hon. Vicary
Thomas, Owen, V.M.H.
Harrow, G.
Balfour, F.R.S.

SHERWOOD AND WIGAN CUPS.

Wigan, A. L.
Pearson, A. H., V.M.H.
Green, J.

AFFILIATED CUP AND GORDON LENNOX CUP.

Notcutt, R. C.
Crisp, Bernard
Blakey, W. J.

CLAY CUP.

Jefferies, W. J.
Orpen, O. G.
Maud, Miss

SUNDRIES.

Chittenden, F. J., F.L.S.
Fielder, C., V.M.H.

PICTURES AND STATUARY.

Bowles, E. A., M.A., F.L.S.
Wilks, Rev. W., M.A., V.M.H.

AWARDS GIVEN BY THE COUNCIL AFTER CONSULTATION WITH
THE JUDGES.

[The order in which the names are entered under the several medals and cups has no reference whatever to merit, but is purely accidental.

The awards given on the recommendation of the Fruit, Floral, and Orchid Committees will be found in their respective reports.]

Coronation Cup.

Mr. Amos Perry, Enfield, for herbaceous plants.

Wigan Cup.

Messrs. Wm. Paul, Waltham Cross, for Roses.

Clay Cup not awarded.

ORCHIDS.

Gold Medal.

Sir Jeremiah Colman, Bt., Gatton Park, Reigate, for Orchids.

Messrs. Charlesworth, Haywards Heath, for Orchids.

Williams Orchid Medal.

Messrs. Mansell & Hatcher, Rawdon, for Orchids.

Messrs. Stuart Low, Bush Hill Park, N., for Orchids.

Messrs. Sander, St. Albans, for Orchids.

Silver Lindley Medal for Cultivation.

F. Menteith Ogilvie, Esq., Oxford, for a specimen *Epidendrum*.

Silver-gilt Flora Medal.

Messrs. McBean, Cooksbridge, for Orchids.

Silver Flora Medal.

Mr. H. Dixon, Wandsworth, for Orchids.

Silver Banksian Medal.

Mr. C. F. Waters, Balcombe, for Orchids.

EXHIBITS IN THE TENTS AND OPEN AIR.

Gold Medal.

Messrs. Alex. Dickson, Newtownards, for Roses.

Mr. Elisha J. Hicks, Twyford, for Roses.

Mr. Amos Perry, Enfield, for Ferns.

Mr. Amos Perry, Enfield, for herbaceous plants.

Messrs. J. Piper, Bayswater, for rock and water garden and Chinese trees.

Mr. G. Reuthe, Keston, for shrubs, Lilies, herbaceous and rock plants.

Messrs. Richmond, Feltham, for fruit trees in pots.

Mr. C. Turner, Slough, for Roses.

Messrs. R. Wallace, Colchester, for Irises, Water-lilies, and herbaceous bulbous plants.

Silver-gilt Flora Medal.

Messrs. Bakers, Codsall, for Delphiniums, herbaceous plants, and water garden.

Messrs. S. Bide, Farnham, for Sweet Peas.

Messrs. Blackmore & Langdon, Bath, for Begonias.

Messrs. W. & J. Brown, Stamford, for Roses.

Messrs. B. R. Cant, Colchester, for Roses.

Messrs. Frank Cant, Colchester, for Roses.

Messrs. Alex. Dickson, Newtownards, for Sweet Peas.

Mr. A. F. Dutton, Iver, for Carnations.

Messrs. E. W. King, Coggeshall, for Sweet Peas.

Messrs. Stuart Low, Bush Hill Park, for Roses.

Messrs. H. B. May, Upper Edmonton, for Ferns.

Messrs. Paul, Cheshunt, for Roses.

Messrs. Wm. Paul, Waltham Cross, for Roses.

Mr. G. Prince, Oxford, for Roses.

Mr. L. R. Russell, Richmond, for ornamental Ivies and shrubs.

Mr. L. R. Russell, Richmond, for stove plants.

Silver-gilt Banksian Medal.

Mr. J. C. Allgrove, Langley, Slough, for herbaceous plants.

Messrs. G. Bunyard, Maidstone, for herbaceous plants.

Messrs. Cheal, Crawley, for trees and shrubs.

Messrs. Wm. Cutbush, Highgate, for Carnations.

Messrs. Cuthbert, Southgate, for flowering plants.

The Donard Nursery Co., Newcastle, Co. Down, for ornamental shrubs.

Mr. James Douglas, Gt. Bookham, for Carnations.

Mr. Clarence Elliott, Stevenage, for alpine plants.

Messrs. Harkness, Bedale, Yorks, for herbaceous plants.

Mary Countess of Ilchester, Holland House, W., for *Sempervivum* and *Saxifragas*.

Messrs. Stuart Low, Bush Hill Park, for Begonias.

Messrs. Stuart Low, Bush Hill Park, for Carnations.

Mr. G. W. Miller, Wisbech, for herbaceous plants and *Lilium giganteum*.

Messrs. J. Peed, West Norwood, S.E., for *Streptocarpus*.

Messrs. J. Piper, Bayswater, for Sweet Peas.

Mr. C. Turner, Slough, for Carnations.

Messrs. Waterer & Crisp, Bagshot, for *Kalmias*.

Silver Flora Medal.

Messrs. Blackmore & Langdon, Bath, for Delphiniums.

Mr. J. Box, Lindfield, for herbaceous plants.

Messrs. G. & W. Burch, Peterborough, for Roses.

Messrs. John Forbes, Hawick, for *Phloxes*, *Pentstemons*, and *Delphiniums*.

Messrs. G. Jackman, Woking, for Roses.

Messrs. G. Jackman, Woking, for herbaceous plants.

Messrs. B. Ladhams, Shirley, Hants, for hardy flowers.
 Mr. J. MacDonald, Harpenden, for grasses.
 Messrs. J. Peed, West Norwood, for Begonias.
 Messrs. J. Peed, West Norwood, for Caladiums.
 Rev. J. H. Pemberton, Havering-atte-Bower, for Roses.
 Messrs. J. Piper & Son, Bayswater, for Chinese trees.
 Mr. M. Prichard, Christchurch, Hants, for alpine plants.
 Messrs. Pulham, Broxbourne, for a formal garden.
 Messrs. T. S. Ware, Feltham, for Begonias.
 Messrs. T. S. Ware, Feltham, for herbaceous plants.
 Messrs. Waterer & Crisp, Bagshot, for herbaceous plants.

Silver Knightian Medal.

Messrs. Laxton Bros., Bedford, for Strawberries.

Silver Banksian Medal.

Messrs. Barr, Covent Garden, W.C., for hardy flowers.
 Mr. J. Box, Lindfield, for alpine plants.
 Messrs. Wm. Cutbush, Highgate, N., for stove plants.
 Messrs. Godfrey, Exmouth, for Campanulas and Pelargoniums.
 Messrs. Jarman, Chard, for Roses.
 Messrs. H. J. Jones, Lewisham, for Phloxes.
 Mr. Jenner, Rayleigh, for Carnations.
 Messrs. Kelway, Langport, for Delphiniums and hardy plants.
 Mr. Frank Lilley, Guernsey, for Gladioli and Irises.
 Messrs. J. Piper & Son, Bayswater, W., for Cacti.
 Messrs. R. Sydenham, Birmingham, for Sweet Peas.
 Mr. A. D. Thompson, 11 Adam Street, W.C., for hardy plants.
 Messrs. T. S. Ware, Feltham, for alpine plants.
 Messrs. Waterer, Sons & Crisp, Bagshot, for alpine plants.
 Mr. G. G. Whitelegg, Chislehurst, for alpine plants.
 The Yokohama Nursery Co., for Japanese and miniature gardens.

Bronze Flora Medal.

Messrs. R. H. Bath, Wisbech, for herbaceous plants.
 Messrs. Rogers, Southampton, for Roses.
 Mr. G. Stark, Ryburgh, for herbaceous plants.

Very Highly Commended.

The Market Gardeners, Nurserymen, & Farmers' Association for fruit and vegetables.

HORTICULTURAL SUNDRIES.

Silver Flora Medal.

Mr. Herbert Jones, Bath, for Old World stone garden ornaments.

Silver Banksian Medal.

Messrs. Abbott Bros., Southall, for table trays, &c.
 Mrs. Sophia Miller, Marlow, for confections.
 Messrs. E. Westmacott, Strand, W.C., for South African jams.

Castle's Shipbreaking Co., Millbank, for teakwood garden furniture.
The Four Oaks Spraying Co., Sutton Coldfield, for spraying machines.

Messrs. Hughes, Bolckow, 10 Dover Street, W., for teakwood furniture.

Messrs. Maggs, for garden seats and tables.

Messrs. H. C. Philcox, Streatham, for ladders, steps, and barrows.

Bronze Banksian Medal.

Mr. Percy Bunyard, Croydon, for fumigating compounds.

Mrs. Oliver, 39 Old Bond St., for garden ornaments.

Messrs. H. Pattisson, Streatham, for horse boots and weeding tools.

Mr. J. Singleton, Preston, Lancs., for Nuespray.

The Garden City Trug Co., Fleet, for garden trugs.

PICTURES, STATUARY, &C.

Silver Banksian Medal.

Miss E. Lamont, 2 Carlisle Place, S.W., for paintings of flower gardens.

Miss M. I. Shakerley, Congleton, for paintings of flower-gardens.

Mr. Montagu Summers, F.Z.S., 52 New Broad Street, for butterfly pictures.

Bronze Banksian Medal.

Miss C. M. Alston, Barnes, for paintings of flower-gardens.

Miss B. E. Corry, Kilburn, for paintings of flower-gardens.

Mrs. Edith Fisher, E. Molesey, for drawings of flower-gardens.

Mrs. E. Heisch, Chelsea, for drawings of flower-gardens.

Miss Linnell, Adelaide Road, N.W., for paintings of flower-gardens.

Miss Pilkington, Pembridge Gardens, W., for paintings of flower-gardens.

Miss F. Randolph, Putney, S.W., for paintings of flower-gardens.

Miss Wilkinson, Barnes, S.W., for paintings of flower-gardens.

GARDEN ORNAMENTS.

Silver-gilt Banksian Medal.

Messrs. T. Crowther, Fulham, for figures, sundials, seats, &c.

GENERAL MEETING.

JULY 18, 1916.

W. HALES, Esq., A.L.S., in the Chair.

Fellows elected (99).—Mrs. Atherley, Mrs. T. Beamish, P. E. Beard, E. E. Bernhard, Mrs. A. Beverley, Miss G. Blandy, Mrs. Booth, P. Botting, J. M. Branfoot, F. J. Brett, F. Brown, J. Brown, Mrs. S. C. Buckland, D. Bulmer, C. T. Burke, Mrs. Burton, Mrs. A. F. Buxton,

Mrs. I. Byng, Mrs. R. Cary, Miss E. A. Cates, Mrs. Chilton Thomas, H. Close, G. H. Cook, D. Cowan, Miss Denney, H. N. Devenish, Captain M. Drummond, Mrs. C. Drummond, F. Dunn, Mrs. A. Ellert, T. Fagg, Mrs. Fisher, R. J. Foot, Miss H. Fryer, Miss B. Gill, Mrs. Goord, Mrs. I. V. Gwynne, Miss Hale, C. Hall, J. B. Hawes, Lady Heath, Mrs P. Hennessy, E. Herbert, H. S. Herring, Lady Mary Hervey, T. J. Hicks, Mrs. J. M. Hogge, Mrs. Howard, H. Ide, Mrs. Keirle, Rev. J. Wallace Kidston, E. King, A. J. Kingham, Mrs. P. Lang, Mrs. S. O. Lazarus, W. Leonard, J. Lilley, The Earl of Lisburne, Miss C. M. P. Lyon, Mrs. P. Maclean, Miss M. McCracken, Mrs. J. M. Malcolm, R. V. Marriner, E. T. Marriott, M.A., Mrs. C. Muhlenkamp, Mrs. H. L. Napier, W. H. Noath, Miss E. Oswald, The Hon. E. G. Pakington, E. S. Parker, Miss W. Peake, Mrs. F. L. Penno, Colonel H. C. Petre, Mrs. W. A. Pryor, G. Ramsden, Rev. R. Reade, W. Redding, H. D. Roberts, Baroness A. von Roeder, A. E. Sabine, C. D. Sawers, A. Saywell, Mrs. Scorer, Prof. C. G. Seligman, C. Shenton, Mrs. E. Smith, E. W. Sprott, H. Stevens, Mrs. H. F. Sturdy, Mrs. J. Suttill, G. H. T. Swinton, A. Tangye, H. S. Tuke, R. M. Turnbull, H. E. A. Twyford, Miss C. Warner, T. M. Winch, L. Winterbotham, H. Wright.

Fellows resident abroad (3).—G. Farmer (Mombasa), Rohani T. Raja (S. India), Mrs. H. H. Rousseau (Troy, U.S.).

Associates (4).—Miss J. Hollway, Miss C. Hughes, Miss K. Long, Miss M. M. Ridley.

A lecture on "The Uses of Lime in Agriculture and Horticulture" was given by Mr. H. E. P. Hodsoll, F.C.S. (See p. 236.)

GENERAL MEETING.

AUGUST 1, 1916.

Sir ALBERT K. ROLLIT, LL.D., in the Chair.

Fellows elected (32).—Mrs. K. L. Ainger, W. E. Batchelor, J. Brophy, J. Cameron, Miss C. J. Carless, J. Clark, W. W. Cook, J. R. Crompton, Miss R. G. Devenish, Mrs. Earle, J. V. Eyre, M. A. Farrow, Mrs. Farside, E. O. Fordham, Mrs. Hargraves, Mrs. A. Kennard, Mrs. T. K. Laidlaw, Mrs. G. H. Langdon, Miss M. Little, Joe Lumb, Mrs. Hugo Müller, Mrs. A. C. Naumann, Mrs. F. W. Schofield, Dr. E. Stead, Mrs. W. A. Stretton, G. Taylor, E. J. Venner, Mrs. L. C. Waldron, Sir P. H. Waterlow, Bt., H. Woollcombe, Miss A. Worland, Mrs. M. B. Wright.

A Conference on Bulb-growing took place at the meeting. (See p. 296.)

SHOW OF HARDY BRITISH-GROWN FLOWER BULBS.

TUESDAY, AUGUST 1.

(See Report of Conference, p. 296.)

N.B.—For the purposes of this exhibition Corms and Tubers, such as Crocuses and Anemones, may be considered as Bulbs.

Class 3. *Amateurs*.—Collection of Dry Home-grown Hardy Flower Bulbs, in not more than 20 varieties, of which 7 at least must be Daffodils; and not more than 15, nor less than 10, bulbs of any one variety.

* First Prize, £2 10s.; Second, £1 10s.; Third, £1.

NOTE.—An exhibitor in Class 3 was not allowed to exhibit in Class 4.

No entries.

Class 4. *Amateurs*.—Collection of Dry Home-grown Hardy Flower Bulbs, in not more than 10 varieties, of which 5 at least must be Daffodils; and not more than 15 nor less than 10, bulbs of any one variety.

* First Prize, £2 10s.; Second, £1 10s.; Third, £1.

1. George Stocks, Esq., 44 Bentley Road, Doncaster.

2. George Churcher, Esq., Woodcote, Alverstoke, Hants.

No third.

Class 5. *Open*.—Collection of Dry Home-grown Daffodil Bulbs, in not more than 20 varieties nor more than 20 bulbs of any one variety; in a space 10 ft. by 3 ft.

Silver-gilt Banksian Medal.—Donard Nursery Co., Newcastle, Co. Down.

Silver Flora Medal.—Messrs. J. R. Pearson, The Nurseries, Lowdham, Notts.

Silver Banksian Medal.—Messrs. Barr, King Street, Covent Garden, W.C.

Class 6. *Open*.—Collection of Dry Home-grown Market Varieties of Daffodil Bulbs, in 10 varieties, 20 bulbs of each, to include 'Emperor,' 'Empress,' 'Sir Watkin,' 'Victoria,' *Barrii conspicuus*, and *Poeticus ornatus*, in a space 7 ft. by 3 ft.

Silver Flora Medal.—George Monro, Junr., Esq., The Malting, Spalding.

Silver Banksian Medal.—Messrs. R. H. Bath, Ltd., Floral Farms, Wisbech.

Bronze Flora Medal.—J. Mallender, Esq., Scrooby, Bawtry.

* The money prizes in Classes 3 and 4 have been accepted from Mr. George Monro, Junr., who kindly presented them. Should there be very limited or inferior competition, any of them may be withheld from insufficient exhibits.

Class 7. *Open*.—Collection of Dry Home-grown Tulip Bulbs, in not more than 20 varieties, nor more than 20 bulbs of any one variety, in a space 10 ft. by 3 ft.

Silver-gilt Banksian Medal.—Geo. Monro, Junr., Esq.

Silver Flora Medal.—Messrs. R. H. Bath.

Silver Banksian Medal.—Messrs. J. R. Pearson.

Silver Banksian Medal.—Messrs. Barr.

Class 8. *Open*.—Collection of any Dry Home-grown Hardy Flower Bulbs other than Daffodils and Tulips, which are excluded. Not more than 30 varieties, nor more than 30 or less than 20 bulbs of any one variety. Diversity of Genera and Species will be favourably considered by the Judges; in a space 12 ft. by 3 ft.

Silver-gilt Banksian Medal.—Messrs. R. Wallace, Kilnfield Gardens, Colchester.

Silver Flora Medal.—Messrs. Barr.

Silver Banksian Medal.—Messrs. John Waterer, Sons, & Crisp, Twyford, Berks.

Silver Banksian Medal.—Messrs. R. H. Bath.

GENERAL MEETING.

AUGUST 15, 1916.

Sir JEREMIAH COLMAN, Bt., V.M.H., in the Chair.

Fellows elected (20).—Miss W. G. Beddington, F. R. Biggleston, G. H. Brooke, Miss Clay, W. R. Dodd, Miss Donkin, Mrs. Forrest, G. C. Johnson, Mrs. C. M. Lloyd, Mrs. F. McConnel, Mrs. Mantell, Rev. E. S. Marshall, A. Matthews, John Moodie, Mrs. Roscoe, A. G. Sandeman, Mrs. Bernard Shaw, Mrs. Walker, P. Worrall, W. Young.

A lecture on "Orchids" was given by Mr. Gurney Wilson, F.L.S.

GENERAL MEETING.

AUGUST 29, 1916.

Dr. F. KEEBLE, F.R.S., in the Chair.

Fellows elected (7).—Miss Lilian Clark, Miss Muriel Gillett, Mrs. King-Farlow, Arthur E. Palmer, Mrs. Rothschild, Mrs. Sheriff, Mrs. Veatch.

Fellow resident abroad (1).—R. C. Thomas (Melbourne, Aus.).

A lecture on "The Bamboo" was given by Mr. James Hudson, V.M.H. (See p. 245.)

GENERAL MEETING.

SEPTEMBER 12, 1916.

GURNEY WILSON, Esq., F.L.S., in the Chair.

The Minutes of August 29 were read and signed.

A lecture on "The History and Development of the Red Currant" was given by Mr. Edward A. Bunyard, F.L.S. (See p. 260.)

COMPETITION FOR THE CORY CUP FOR DAHLIAS.

TUESDAY, SEPTEMBER 12.

As this Cup was given solely with the object of encouraging raisers to produce Dahlias, of any class or section, that would be of Garden Decorative value, a Selection Committee has been formed by the R.H.S. and the National Dahlia Society.

This Committee has carefully prepared a list of such Dahlias as they consider conform to the above requirement, and only such varieties as are contained in the list will be eligible for competition; the staging of any other variety will disqualify the exhibitor. Every vase, or group of vases (should they contain the same variety), *must* be distinctly labelled, and no other words but the name of the variety may appear on the label. Copies of the list can be obtained on request from the Secretary of the R.H.S. and from the N.D.S.

The Cup is offered for a group of Decorative Garden Dahlias. Twenty-five feet run of 3 feet tabling, not to be built up more than 8 feet in height from the ground level to the top of the flowers. *Open*.

First Prize.—Seventy-five Guinea Challenge Cup, presented to the R.H.S. by Reginald Cory, Esq.

1. Cory Cup.—Messrs. Carter Page, 52 London Wall, London, E.C.
 2. Messrs. W. Treseder, Cardiff.
 3. Messrs. J. Cheal, Lowfield Nurseries, Crawley, Sussex.
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GENERAL MEETING.

SEPTEMBER 26, 1916.

GURNEY WILSON, Esq., F.L.S., in the Chair.

Fellows elected (35).—E. G. Brownhill, Mrs. J. D. Brunton, Miss R. Bryant, A. R. Collins, Miss Marie Corelli, J. P. Cree, Mrs. Darrell, T. Cleaton Davies, Mrs. M. Dickinson, A. G. Donaldson, Mrs. E. C. Greenfield, Mrs. R. Harcourt, Miss E. S. Harrold, Miss Helena Haver-gal, John Hollams, J. W. Hussey, Mrs. C. King, Mrs. V. Lewis, Mrs. R. H. Lindam, Capt. H. G. F. Macdonald, Mrs. C. Magrath, M. Morgan, C. O'Kane, C. H. Oliverson, J. G. H. Pace, Mrs. K. E. Savile, Mrs. L. Smithers, Miss J. Sweeny, Mrs. L. Urquhart, Mrs. E. A. Wallace, W. H. Whipp, Col. A. L. Woodland, C.B.

Fellows resident abroad (3).—Francis McLennan, K.C. (Canada), Surendra Naryan Sinha (India), G. G. Stuart, K.C. (Canada).

Associate.—F. W. Miles.

A lecture on "The Cooking of Fruit" was given by Mr. C. Herman Senn. (See p. 253.)

VEGETABLE SHOW.

SEPTEMBER 26.

OPEN TO AMATEURS ONLY.

Collections.

N.B.—A competitor was allowed to enter in one only of the first three Classes. Arrangement was taken into consideration by the Judges.

Class 1.—Twelve kinds distinct, to be selected from :—Beets, Brussels Sprouts, Cabbages, Broccoli or Cauliflower, Carrots, Celery, Cucumbers, Endive, Leeks, Lettuce, Mushrooms, Onions, Parsnips, Peas, Potatos, Tomatos, Turnips, Beans (Runner or French), Vegetable Marrows.

First Prize, The Sutton Challenge Cup (value £21) and £10; Second, £5; Third, £3; Fourth, £2.

The winner holds the Cup for one year subject to a sufficient insurance against loss, and a guarantee of its return in good condition, or failing this to refund to the R.H.S. the sum of £25. An Exhibitor may win the Cup only once in 3 years, but the winner may compete the following year, and if adjudged first in these two successive years will receive a smaller commemorative cup.

1. Capt. H. Spender Clay, M.P., Ford Manor, Lingfield (gr. D. Gibson).

2. Duke of Portland, Welbeck Abbey, Worksop (gr. J. Gibson).

3. E. Matthews, Esq., Strathfieldsaye, Mortimer.

4. Sir D. Gooch, Bt., Hylands, Chelmsford (gr. Wm. Heath).

Class 2.—Nine kinds distinct, to be selected from the list in Class 1. The object of this Class is to illustrate not only those vegetables which are in daily use, but especially the quality and size in which they are most acceptable and useful for table use, and possess the qualities most valued for table use by cooks.

First Prize, £5; Second, £3; Third, £2; Fourth, £1.

N.B.—The Judges were authorized to disqualify any exhibit which they considered not to contain the most suitable vegetables, or to contain specimens not in the most suitable condition in regard to size and quality for table use.

1. W. H. Myers, Esq., Swanmore Park, Bishop's Waltham (gr. G. Ellwood).

2. Mrs. Jenner, Wen Voe Castle, nr. Cardiff (gr. H. Wheeler).

3. E. E. Palmer, Esq., Drayton House, Sherfield-on-Loddon, Basingstoke (gr. H. E. Wallis).

4. Mrs. Knox, Holt Hatch, nr. Alton (gr. W. West).

Class 3.—Six kinds distinct, to be selected from the list in Class 1.

First Prize, £3; Second, £2 5s.; Third, £1 10s.; Fourth, 15s.

1. Thomas Jones, Esq., Ruabon, N. Wales.

2. Miss E. L. Bradshaw, The Grange, Steeple Aston (gr. R. Wadham).

3. D. W. Bedford, Esq., The Braes, Berkhamsted.

4. G. Thorn, Esq., Sprotlands, Willesborough, Kent (gr. M. Hoad).

Class 4.—Potatos, collection of twelve varieties distinct.

First Prize, £3 ; Second, £2 ; Third, £1.

1. Rev. T. McMurdie, Woburn Park, Weybridge (gr. A. Basile).
2. G. Thorn, Esq.
3. A. Thomas, Esq., Willow Road, Kingsnorth, Ashford, Kent.

Class 5.—Potatos, collection of six varieties distinct.

First Prize, £1 10s. ; Second, £1 ; Third, 10s.

Competitors in Class 4 were not allowed to enter in 5.

1. Mrs. Austen, Capel Manor, Horsmonden (gr. A. Woodgate).
2. Thomas Jones, Esq.
3. W. H. Myers, Esq.

Class 6.—Onions, collection of six varieties distinct, as follows :

2 dishes of the ' Ailsa Craig ' type, one oval and the other round, one each of Red Onions, Silverskins, James' or other selection of long-keeping brown globe Onions, White Spanish or Nuneham Park type (flat, not globe).

N.B.—More than 2 dishes of selections of Ailsa Craig type, or varieties indistinguishable from it, disqualified.

First Prize, £2 ; Second £1 ; Third, 10s.

1. Mrs. Jenner.
2. R. Staward, Esq., Panshanger Gardens, Hertford.
3. D. W. Bedford, Esq.

Class 7.—Salads, collection of nine kinds distinct, each kind staged separately.

First Prize, £3 10s. ; Second, £2 10s. ; Third, £1 5s.

1. Duke of Portland.
 2. Capt. H. Spender Clay, M.P.
- No third.

Class 8.—Salads, collection of six kinds distinct, each kind staged separately.

First Prize, £2 5s. ; Second, £1 10s. ; Third, 15s.

Competitors in Class 7 were not allowed to enter in Class 8.

1. Miss Bradshaw.
2. W. H. Myers, Esq.
3. Sir D. Gooch.

Class 9.—Other Vegetables, six kinds distinct, to be selected from the following :—Cardoons, Capsicum or Chilli, Celeriac, Stachys tuberifera, Seakale, Egg Plant, Jerusalem Artichokes, Salsify, Scorzonera, Kohl Rabi, Couve Tronchuda.

First Prize, £2 10s. ; Second, £1 10s. ; Third, 15s.

1. Duke of Portland.
- No second.
No third.

Classes for Educational Gardening Establishments.

2a to 9a.—These classes are open to Educational Gardening Establishments, and followed verbally and identically Classes 2 to 9 in all respects.

No entries.

Single Dish Classes for Amateurs.

In Classes 10–40 the First Prize is in each case 10s. ; the Second, 7s. 6d. ; Third, 5s. The specimens shown in each Class were always to be of one and the same variety.

Class 10.—Beans, Scarlet Runners.

1. Miss Bradshaw.
2. Mrs. Hunt, 83 Upper Thrift Street, Northampton.
3. Duke of Portland.

Class 11.—Beans, French Climbing.

1. Rev. T. McMurdie.
2. Mrs. Knox.
3. Duke of Portland.

Class 12.—Beans, French Dwarf.

1. A. Thomas, Esq.
2. Mrs. Jenner.
3. Duke of Portland.

Class 13.—Beet, Globe type.

1. Mrs. Jenner.
2. T. Jones, Esq.
3. A. Thomas, Esq.

Class 14.—Beet, long type.

1. Duke of Portland.
2. Capt. H. Spender Clay, M.P.
3. Miss Bradshaw.

Class 15.—Brussels Sprouts, 50 buttons.

1. T. Jones, Esq.
2. Mrs. Jenner.
3. W. H. Myers, Esq.

Class 16.—Brussels Sprouts, three plants.

1. Miss Bradshaw.
2. W. H. Myers, Esq.
3. Duke of Portland.

Class 17.—Cabbage.

1. Duke of Portland.
2. Capt. H. Spender Clay, M.P.
3. G. Thorn, Esq.

cii PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

Class 18.—Cabbage, Savoy.

1. Duke of Portland.
2. Capt. H. Spender Clay, M.P.
3. E. E. Palmer, Esq.

Class 19.—Cauliflower or Broccoli

1. Duke of Portland.
2. T. Jones, Esq.
3. W. H. Myers, Esq.

Class 20.—Celeriac.

1. Duke of Portland.
- No second.
No third.

Class 21.—Celery, White.

1. Duke of Portland.
2. Capt. H. Spender Clay, M.P.
3. E. Matthews, Esq.

Class 22.—Celery, Red.

1. Duke of Portland.
2. Capt. H. Spender Clay, M.P.
3. Sir M. C. Turner, Bedfords, Havering (gr. A. Barrett).

Class 23.—Cucumbers.

1. G. Thorn, Esq.
2. W. H. Myers, Esq.
3. Duke of Portland.

Class 24.—Leeks.

1. Duke of Portland.
2. Capt. H. Spender Clay, M.P.
3. T. Jones, Esq.

Class 25.—Marrows.

1. Duke of Portland.
2. Mrs. Jenner.
3. Capt. H. Spender Clay, M.P.

Class 26.—Mushrooms.

1. W. H. Myers, Esq.
 2. T. Jones, Esq.
- No third.

Class 27.—Onions.

1. Mrs. Jenner.
2. E. Matthews, Esq.
3. Duke of Portland.

Class 28.—Parsnips.

1. Rev. W. H. P. Harvey, Chipping Sodbury Vicarage, Glos.
(gr. E. J. Bazeley).
2. Mrs. Jenner.
3. Duke of Portland.

Class 29.—Carrots, Long.

1. T. Jones, Esq.
2. Duke of Portland.
3. Miss Bradshaw.

Class 30.—Carrots, stump-rooted or short.

1. T. Jones, Esq.
2. Mrs. Jenner.
3. W. H. Myers, Esq.

Class 31.—Peas.

1. Miss Bradshaw.
2. T. Jones, Esq.
3. H. L. Collins, Esq., The Fleece, Lindley, Huddersfield.

Class 32.—Turnips, white skin and flesh.

1. Duke of Portland.
2. Mrs. Jenner.
3. G. Thorn, Esq.

Class 33.—Turnips, purple-top, red-top, or green-top, flesh white.

1. Duke of Portland.
2. T. Jones, Esq.
3. D. W. Bedford, Esq.

Class 34.—Turnips, yellow flesh.

1. Duke of Portland.
2. Mrs. Jenner.
3. R. Staward, Esq.

Class 35.—Potatos, white.

1. Rev. T. McMurdie.
2. G. Thorn, Esq.
3. D. W. Bedford, Esq.

Class 36.—Potatos, coloured.

1. Duke of Portland.
2. G. Thorn, Esq.
3. A. Thomas, Esq.

Class 37.—Kale, curled.

1. Duke of Portland.
2. Capt. H. Spender Clay, M.P.
3. R. Staward, Esq.

Class 38.—Tomatos, red.

1. G. Thorn, Esq.
2. Duke of Portland.
3. T. Jones, Esq.

Class 39.—Tomatos, yellow.

1. Duke of Portland.
2. H. L. Collins, Esq.
3. R. Staward, Esq.

Class 40.—Any other Vegetable not named in the Schedule.

1. Rev. T. McMurdie.
2. R. Staward, Esq.
3. W. H. Myers, Esq.

CHAMPION CHALLENGE CUP.

The Champion Cup will be held for one year (subject to a guarantee of its return in good condition) by the winner of the greatest number of First Prize points throughout the whole Exhibition, the winner in Class 1 being excluded. An Exhibitor may only win this Cup once in three years, but the winner may compete the following year, and if adjudged first in these two successive years will receive a smaller commemorative Cup. In calculating for this Champion Cup the number of points reckoned for each First Prize will be as follows:—

Classes 2 and 2a	9 points each.
Classes 3, 4, 7, and 3a, 4a, 7a	6 " "
Classes 5, 6, 8, 9, and 5a, 6a, 8a, 9a	4 " "
All other Classes	1 " "

In case of an equality (and only in that case) Second Prizes will be counted in order to arrive at a decision, each Second Prize counting half the points allotted to the First Prize.

The Duke of Portland.

BRITISH FRUIT SHOW, 1916.

OCTOBER 3 AND 4,

IN THE ROYAL HORTICULTURAL HALL.

DIVISION I.

FRUITS GROWN UNDER GLASS OR OTHERWISE.

OPEN TO GARDENERS AND AMATEURS ONLY.

NOTE.—Exhibitors were allowed to compete in one Class only of Classes 1, 2, and of Classes 3, 4.

Class 1.—Collection of nine dishes of ripe dessert fruit: 6 kinds at least; only 1 Pine, 1 Melon, 1 Black and 1 White Grape allowed; not more than two varieties of any other kind, and no two dishes of the same variety.

First Prize, Small Silver Cup and £5; Second, £5; Third, £3.

1. Lord Somers, Eastnor Castle, Ledbury (gr. G. Mullins).
2. Duke of Newcastle, Clumber, Worksop (gr. S. Barker).
3. C. A. Cain, Esq., J.P., The Node, Welwyn (gr. T. Pateman).

Class 2.—Collection of six dishes of ripe dessert fruit: 4 kinds at least; only 1 Melon, 1 Black and 1 White Grape allowed; not more than two varieties of any other kind, and no two dishes of the same variety. Pines excluded.

First Prize, Small Silver Cup and £3; Second, £3; Third, £2.

1. Lord Hillingdon, Wilderness Gardens, Sevenoaks (gr. J. Skelton).
2. John Liddell, Esq., Sherfield Manor, Basingstoke (gr. R. Learmonth).
3. F. R. Rodd, Esq., Trebartha Hall, Launceston (gr. F. A. Billings).

Class 3.—Grapes, six distinct varieties (2 bunches of each), of which two at least must be White.

First Prize, Small Silver Cup and £6; Second, £6; Third, £4.

1. Duke of Newcastle (gr. S. Barker).
2. G. Miller, Esq., Newberries, Radlett (gr. J. Kidd).
3. E. Matthews, Esq., Strathfieldsaye, Mortimer.
- 3 (extra). W. Mackay, Esq., Ascog, Bute (gr. D. Halliday).

Class 4.—Grapes, four varieties (2 bunches of each), selected from the following: 'Madresfield Court,' 'Prince of Wales,' 'Muscat Hamburgh,' 'Muscat of Alexandria' or 'Canon Hall' (not both), 'Mrs. Pearson,' and 'Dr. Hogg.'

First Prize, Small Silver Cup and £3; Second, £3; Third, £2.

1. Lord Hillingdon.
- No other award.

Class 5.—Grapes, 'Black Hamburgh,' 2 bunches.

First Prize, £2; Second, £1 10s.; Third, £1.

1. Lord Hillingdon.
2. Lord Savile, K.C.V.O., Rufford Abbey, Ollerton, Notts (gr. J. Doe).
3. Exors. late J. Brunton, Moor Hall, Stourport (gr. W. H. Wilson).

Class 6.—Grapes, 'Mrs. Pince,' 2 bunches.

First Prize, £2; Second, £1 10s.

1. Lord Hillingdon.
2. W. Mackay, Esq.

Class 7.—Grapes, 'Alicante,' 2 bunches.

First Prize, £2; Second, £1 10s.; Third, £1.

1. Mrs. Raphael, Castle Hill, Englefield Green (gr. H. Brown).
2. Exors. late J. Brunton.
3. W. Mackay, Esq.

Class 8.—Grapes, 'Madresfield Court,' 2 bunches.

First Prize, £2; Second, £1 10s.; Third, £1.

1. Lord Hillingdon.
2. Duke of Newcastle.
3. Exors. late J. Brunton.

Class 9.—Grapes, 'Prince of Wales,' 2 bunches.

First Prize, £2; Second, £1 10s.

1. G. Mayer, Esq., Whistler's Wood, Woldingham (gr. T. Newton).
2. Lord Savile.

Class 10.—Grapes, any other Black Grape, 2 bunches. (The name of the variety must be stated.)

First Prize, £2; Second, £1 10s.

1. Duke of Newcastle.
2. Lord Hillingdon.

Class 11.—Grapes, 'Muscat of Alexandria,' 2 bunches.

First Prize, Silver Knightian Medal and £2; Second, £2; Third, £1 10s.

1. Duke of Newcastle.
2. Lord Somers.
3. E. P. Emanuel, Esq., Oatlands Lodge, Weybridge (gr. J. Lock).

Class 12.—Grapes, any other White Grape, 2 bunches. (The name of the variety must be stated.)

First Prize, £2; Second, £1 10s.

1. Duke of Newcastle.
2. W. Mackay, Esq.

Class 13.—Collection of Hardy Fruits, in a space not exceeding 12 × 3.

Thirty dishes distinct, grown entirely in the open; not more than 12 varieties of Apples or 8 of Pears.

First Prize, The Cain Silver Cup; Second, £2; Third, £1 10s.

1. Lord Somers.
2. Major Powell-Cotton, Quex Park, Birchington.

DIVISION II.

FOR FRUIT GROWN ENTIRELY OUT OF DOORS.

OPEN TO NURSERYMEN ONLY.

An Exhibitor was allowed to compete in one only of these three classes.

Medals awarded at the discretion of the Council.

Class 14.—30 feet run of 6 feet tabling.

Gold Medal.—Messrs. H. Cannell, Nurseries, Eynsford, Kent.

Silver-gilt Knightian Medal.—Messrs. Seabrook, The Nurseries, Chelmsford.

Class 15.—20 feet run of 6 feet tabling.

Silver-gilt Hogg Medal.—Messrs. J. Cheal, Crawley, Sussex.

Silver-gilt Knightian Medal.—Messrs. Laxton, Bedford.

Silver Knightian Medal.—Messrs. S. Spooner, Nurseries, Hounslow.

Silver Banksian Medal.—Mr. R. C. Notcutt, The Nursery, Woodbridge.

Class 16.—12 feet run of 6 feet tabling.

Silver Knightian Medal.—Mr. E. J. Parsons, Worcester.

For Orchard-house grown Fruit, and Trees in Pots.

Class 17.—24 feet by 6 feet of stage. Grapes excluded.

Medals awarded at the discretion of the Council.

Silver-gilt Hogg Medal.—Messrs. Thos. Rivers, Sawbridgeworth.

DIVISION III.

OPEN TO MARKET GROWERS ONLY.

An Exhibitor was allowed to compete in one only of the Classes 18 and 19.

Class 18.—Apples, 20 baskets of (cooking and dessert, distinct).

Fruit suitable for market purposes had more consideration than a large number of varieties.

Silver Cup or Medals at the discretion of the Council.

Gold Medal.—Messrs. Gaskain & Whiting, Dargate, Faversham, Kent.

Silver-gilt Hogg Medal.—Lieut.-Col. H. Lumley Webb, Ham Green Farm, Upchurch, Sittingbourne.

Class 19.—Apples, 12 baskets of (6 cooking and 6 dessert, distinct).
Silver-gilt Medal presented by the Fruiterers' Company, and other
Medals at the discretion of the Council.

Horticultural College, Swanley, Miss G. J. Sanders.

Silver Knightian Medal.—Lieut.-Col. H. Lumley Webb.

Class 20.—Pears, 6 baskets of, distinct.

Prizes given by the Council according to quality of exhibits.

The size of the baskets limited to half-bushels if round, to grape (baby) baskets if rectangular.

Silver Hogg Medal.—Lieut.-Col. H. Lumley Webb.

DIVISION IV.

FRUITS GROWN ENTIRELY IN THE OPEN AIR.

OPEN TO GARDENERS AND AMATEURS ONLY.

Nurserymen and Market Growers excluded.

Exhibitors of Apples or Pears in Division IV. were excluded from Division VI.

NOTE.—Exhibitors were allowed to compete in one class only of the Classes 21, 22, 23; or 26, 27, 28.

Class 21.—Apples, 24 dishes distinct, 16 cooking, 8 dessert. The latter to be placed in the front row.

First Prize, Silver Cup and £3 ; Second, £4 ; Third, £3.

1. Lord Somers.
2. J. Liddell, Esq.
3. C. A. Cain, Esq.

Class 22.—Apples, 18 dishes distinct, 12 cooking, 6 dessert. The latter to be placed in the front row.

First Prize, Silver Knightian Medal and £3 ; Second, £2 ; Third, £1.

1. E. E. Pearson, Esq., Brickendonbury, Hertford (gr. W. Stephenson).

2. Major Powell-Cotton.

3. J. T. Charlesworth, Esq., Nutfield Court, Surrey (gr. T. W. Herbert).

Class 23.—Apples, 12 dishes distinct, 8 cooking, 4 dessert. The latter to be placed in the front row.

First Prize, Fruiterers' Company Silver Medal and £2 ; Second, £1 ; Third, 15s.

1. G. Miller, Esq.

Class 24.—Cooking Apples, 6 dishes distinct.

First Prize, £1 ; Second, 15s.

1. J. Liddell, Esq.

2. E. E. Pearson, Esq.

Class 25.—Dessert Apples, 6 dishes distinct.

First Prize, £1 ; Second, 15s.

1. Lord Somers.

2. J. Liddell, Esq.

Class 26.—Dessert Pears, 18 dishes distinct.

First Prize, Silver Cup and £2 ; Second, £3 ; Third, £2.

1. C. A. Cain, Esq.

2. J. Liddell, Esq.

3. Dr. T. Jackson.

Class 27.—Dessert Pears, 12 dishes distinct.

First Prize, Fruiterers' Company Silver Medal and £2 ; Second, £1 10s. ; Third, £1.

1. Major Powell-Cotton.

2. Lord Hillingdon.

3. Lord Somers.

Class 28.—Dessert Pears, 9 dishes distinct.

First Prize, £1 10s. ; Second, £1.

1. E. E. Pearson, Esq.

2. G. Miller, Esq.

Class 29.—Dessert Pears, 6 dishes distinct.

First Prize, £1 ; Second, 15s.

1. C. A. Cain, Esq.
2. J. T. Charlesworth, Esq.

Class 30.—Stewing Pears, 3 dishes distinct.

First Prize, 15s. ; Second, 10s.

1. Major Powell-Cotton.
2. C. A. Cain, Esq.

Class 31.—Plums, 3 dishes distinct.

First Prize, £1 ; Second, 10s.

1. C. H. Berners, Esq., Wolverstone Park, Ipswich (gr. W. Messenger).
2. J. Liddell, Esq.

Class 32.—Damsons, or Bullaces, 3 dishes distinct.

First Prize, 10s. ; Second, 7s. 6d.

1. F. G. Gerrish, Esq., Pendley Manor Gardens, Tring.
- No second.

Class 33a.—Morello Cherries, 50 fruits.

First Prize, 7s. ; Second, 5s.

1. F. G. Gerrish, Esq.
2. F. R. Rodd, Esq.

Class 33b.—Autumn Raspberries, 1 dish of 50 fruits.

First Prize, 7s. ; Second, 5s.

1. Lord Suffield, Gunton Park, nr. Norwich (gr. W. Allen).
2. J. Liddell, Esq.

Class 33c.—Alpine Strawberries, 1 dish of 1 lb., with stalks attached.

First Prize, 7s. ; Second 5s.

No entries.

DIVISION V.

SPECIAL DISTRICT COUNTY PRIZES.

OPEN TO GARDENERS AND AMATEURS ONLY.

(In this Division all fruit must have been grown entirely in the open.)

N.B.—Exhibitors in Division V. must not compete in Divisions II. or III., or in Classes 1-4, 13, 21-28.

Class AA.—Apples, 6 dishes distinct, 4 cooking, 2 dessert.

First Prize, £1 and 3rd class single fare from Exhibitor's nearest railway station to London.

Second Prize, 15s. and railway fare as above.

Class BB.—Dessert Pears, 6 dishes distinct.

First Prize, £1 10s. and railway fare as above.

Second Prize, £1 and railway fare as above.

The two above Classes Nos. AA and BB are repeated eleven times as follows, and Exhibitors must enter for them thus :—" Class AA 36 " or " BB 37," and so on, to make it quite clear whether they mean Apples or Pears.

Class 34.—Open only to growers in Kent.

- AA. { 1. Rev. J. R. Leigh, The Vicarage, Yalding, Kent (gr. G. Johnson).
2. Rev. H. Bull, Wellington House, Westgate (gr. J. King).

BB. 1. Rev. H. Bull.

Class 35.—Open only to growers in Surrey, Sussex, Hants.

- AA. { 1. Sir James Horlick, Bt., West Dean Park, Chichester (gr. W. H. Smith).
2. C. H. Combe, Esq., Cobham Park, Surrey (gr. A. Tidy).

- BB. { 1. Rev. T. McMurdie, Woburn Park, Weybridge (gr. A. Basile).
2. C. H. Combe, Esq.

Class 36.—Open only to growers in Wilts, Dorset, Somerset, Devon, and Cornwall.

- AA. { 1. F. J. Wingfield-Digby, Esq., Sherborne Castle, Dorset (gr. T. Turton).
2. Lady Mary Morrison, Fonthill House, Tisbury, Wilts (gr. H. H. Mills).

- BB. { 1. F. J. Wingfield-Digby, Esq.
2. Lady Mary Morrison.

Class 37.—Open only to growers in Gloucester, Oxford, Bucks, Berks, Beds, Herts, and Middlesex.

- AA. { 1. C. Gurney, Esq., Henlow Grange, Biggleswade (gr. A. Carlisle).
2. J. B. Fortescue, Esq., Dropmore, Maidenhead (gr. Chas. Page).

- BB. { 1. C. Gurney, Esq.
2. J. B. Fortescue, Esq.

Class 38. Open only to growers in Essex, Suffolk, Norfolk, Cambridge, Hunts, and Rutland.

- AA. { 1. Rt. Hon. J. W. Lowther, Campsea Ashe, Wickham Market (gr. A. Andrews).
2. Sir M. Turner, Bedfords, Havering, Romford (gr. A. Barrett).

- BB. { 1. Lord Suffield.
2. C. H. Berners, Esq.

Class 39.—Open only to growers in Lincoln, Northampton, Warwick, Leicester, Notts, Derby, Staffs., Shropshire, and Cheshire.

AA. No entries.

BB. 1. Duke of Portland, Welbeck Abbey, Worksop (gr. J. Gibson).

Class 40.—Open only to growers in Worcester, Hereford, Monmouth, and Wales.

- AA. { 1. C. Crooks, Esq., Impney, Droitwich.
2. Mrs. Smart, Coverpoint, Llansannan, Abergele (gr. R. Rogers).
BB. 1. C. Crooks, Esq.

Class 41.—Open only to growers in the six northern counties of England, and in the Isle of Man.

No entries.

Class 42.—Open only to growers in Scotland.

- AA. { 1. Capt. Gordon, Threave House, Castle Douglas (gr. James Duff).
BB. No entries.

Class 43.—Open only to growers in Ireland.

- AA. { 1. Earl of Bessborough, Pilltown, Co. Kilkenny (gr. T. E. Tomalin).
BB. No entries.

Class 44.—Open only to growers in the Channel Islands.

No entries.

DIVISION VI.

SINGLE DISHES OF FRUIT GROWN ENTIRELY IN THE OPEN AIR.

Six Fruits to a Dish.

OPEN TO GARDENERS AND AMATEURS ONLY.

Nurserymen and Market Growers excluded.

All the Varieties named in Division VI. are excellent and worthy of general cultivation.

Prizes in each Class, except 75, 76, 112, 148, and 149, as follows :—
First Prize, 7s. ; Second Prize, 5s. ; but when the entries exceed six in any Class the Judges at their discretion recommend a Third Prize of 4s.

Choice Dessert Apples.

N.B.—The Judges were instructed to prefer quality, colour, and finish to mere size.

Class 45.—Adams' Pearmain.

1. Rev. J. R. Leigh.
2. F. J. Wingfield-Digby, Esq.
3. Major St. Maur, Stover Park, Newton Abbot (gr. H. Richardson).

Class 46.—Allington Pippin.

1. Major St. Maur.
2. H. S. Colt, Esq., Earlywood Corner, Ascot.
3. Sir James Horlick, Bt.

Class 47.—American Mother.

1. F. J. Wingfield-Digby, Esq.
2. F. R. Rodd, Esq.
3. Sir Jas. Horlick, Bt.

Class 48.—Barnack Beauty.

1. F. G. Marsh, Esq.
2. F. J. Wingfield-Digby, Esq.

Class 49.—Belle de Boskoop.

1. J. A. Stidston, Esq.
2. F. J. Wingfield-Digby, Esq.

Class 50.—Ben's Red.

1. C. H. Berners, Esq.
2. J. A. Stidston, Esq.

Class 51.—Blenheim Orange.

1. Sir Jas. Horlick, Bt.
2. Rev. H. Bull.
3. Rev. J. R. Leigh.

Class 52.—Charles Ross.

1. F. J. Wingfield-Digby, Esq.
2. Rt. Hon. J. W. Lowther.
3. J. A. Stidston, Esq.

Class 53.—Christmas Pearmain.

1. F. J. Wingfield-Digby, Esq.
2. J. A. Stidston, Esq.

Class 54.—Claygate Pearmain.

1. E. Matthews, Esq.
2. F. J. Wingfield-Digby, Esq.

Class 55.—Cockle's Pippin.

1. F. J. Wingfield-Digby, Esq.
2. Sir Jas. Horlick, Bt.

Class 56.—Coronation.

1. Sir Jas. Horlick, Bt.
2. Lady Mary Morrison.

Class 57.—Cox's Orange.

1. Rev. J. R. Leigh.
2. Lord Suffield.
3. Major St. Maur.

Class 58.—Duke of Devonshire.

1. E. Matthews, Esq.
2. J. B. Fortescue, Esq.

Class 59.—Egremont Russet.

1. Rt. Hon. J. W. Lowther
2. E. Matthews, Esq.

Class 60.—Ellison's Orange.

1. Lady Mary Morrison.

Class 61.—Houblon.

1. Not awarded.

2. Lady Mary Morrison.

Class 62.—James Grieve.

1. C. Gurney, Esq.

2. Rt. Hon. J. W. Lowther.

3. Lady Mary Morrison.

Class 63.—King of Tompkins County (small fruits).

1. E. Matthews, Esq.

2. Earl of Bessborough.

Class 64.—Lord Hindlip.

1. Major St. Maur.

2. C. H. Berners, Esq.

Class 65.—Mannington's Pearmain.

No award.

Class 66.—Margil.

1. J. A. Stidston, Esq.

2. J. B. Fortescue, Esq.

Class 67.—Reinette du Canada.

1. Major St. Maur.

Class 68.—Ribston Pippin.

1. C. Gurney, Esq.

2. E. Matthews, Esq.

3. Major St. Maur.

Class 69.—Rival.

1. F. J. Wingfield-Digby, Esq.

2. Major St. Maur.

3. E. G. Mocatta, Esq., Woburn Place, Addlestone (gr. T. Stevenson).

Class 70.—Scarlet Nonpareil.

1. Rt. Hon. J. W. Lowther.

2. Rev. J. R. Leigh.

Class 71.—St. Edmund's Pippin.

1. F. J. Wingfield-Digby, Esq.

2. Lord Suffield.

Class 72.—St. Everard.

1. E. Matthews, Esq.

2. J. B. Fortescue, Esq.

Class 73.—Wealthy.

1. C. H. Berners, Esq.

2. Lady Mary Morrison.

3. C. Gurney, Esq.

Class 74.—William Crump.

No entries.

Class 75.—Eight fruits of any early variety, not named above, fit for use.

Four Prizes, 7s., 6s., 5s., 4s.

1. C. Gurney, Esq.
2. C. Crooks, Esq.
3. G. F. Marsh, Esq.
4. Lady Mary Morrison.

Class 76.—Eight fruits of any late variety, not named above.

Four Prizes, 7s., 6s., 5s., 4s.

1. E. G. Mocatta, Esq.
2. E. Matthews, Esq.
3. F. J. Wingfield-Digby, Esq.
4. G. F. Marsh, Esq.

Choice Cooking Apples.

NOTE.—That many Cooking Apples, if kept long enough, make very fair Dessert fruits, as for example Blenheim, Gascoygne's Scarlet, &c.; and also vice versa, many Dessert Apples make, early in the season, very fair cookers, Charles Ross for example.

First Prize, 7s.; Second, 5s.; but when the entries exceed six in any Class the Judges, at their discretion, recommend Third a Prize of 4s.

N.B.—The Judges were instructed to prefer quality and size to mere colour.

Class 77.—Alfriston.

1. Major St. Maur.
2. Rt. Hon. J. W. Lowther.

Class 78.—Annie Elizabeth.

1. F. J. Wingfield-Digby, Esq.
2. Rev. H. Bull.

Class 79.—Beauty of Kent.

1. Rev. T. McMurdie.
2. F. J. Wingfield-Digby, Esq.

Class 80.—Bismarck.

1. Earl of Bessborough.
2. E. Matthews, Esq.
3. Sir M. Turner.

Class 81.—Blenheim Orange (large fruits).

1. E. Matthews, Esq.
2. F. J. Wingfield-Digby, Esq.

Class 82.—Bramley's Seedling.

1. Rev. T. McMurdie.
2. Major St. Maur.
3. Henry Whiteley, Esq., Highfield, Lelant, Cornwall.

Class 83.—Cellini.

1. G. F. Marsh, Esq.
2. Rt. Hon. J. W. Lowther.

Class 84.—Crimson Bramley.

1. J. A. Stidston, Esq.

Class 85.—Dumelow's Seedling.

1. Earl of Bessborough.
2. Major St. Maur.

Class 86.—Ecklinville.

1. Rev. T. McMurdie.
2. E. Matthews, Esq.

Class 87.—Edward VII.

1. F. J. Wingfield-Digby, Esq.
2. I. Lewis, Esq., Bedgebury Park, Goudhurst.

Class 88.—Emneth Early.

2. I. Lewis, Esq.

Class 89.—Emperor Alexander.

1. C. Gurney, Esq.
2. E. Matthews, Esq.

Class 90.—Encore.

1. F. J. Wingfield-Digby, Esq.
2. G. F. Marsh, Esq.

Class 91.—Gascoygne's Scarlet (large fruits).

1. Major St. Maur.
2. Rt. Hon. J. W. Lowther.

Class 92.—Golden Noble.

1. C. Gurney, Esq.
2. F. J. Wingfield-Digby, Esq.

Class 93.—Grenadier.

1. Capt. Gordon.
2. Earl of Bessborough.

Class 94.—Hambling's Seedling.

1. Major St. Maur.
2. Earl of Bessborough.

Class 95.—Hector Macdonald.

No entries.

Class 96.—Horstead Pearmain.

1. F. J. Wingfield-Digby, Esq.
2. J. B. Fortescue, Esq.

Class 97.—King of Tompkins County (large fruits).

1. J. B. Fortescue, Esq.

Class 98.—Lane's Prince Albert.

1. Earl of Bessborough.
2. F. J. Wingfield-Digby, Esq.
3. Sir Jas. Horlick, Bt.

Class 99.—Lord Derby.

1. E. Matthews, Esq.
2. Rev. J. R. Leigh.
3. A. E. Cumberbatch, Esq., Ware Park, Ware, Herts (gr. F. W. Miles).

Class 100.—Mère de Ménage.

1. Major St. Maur.
2. F. J. Wingfield-Digby, Esq.

Class 101.—Newton Wonder.

1. W. A. Voss, Esq., Fairlight Glen, Rayleigh, Essex.
2. Major St. Maur.
3. F. J. Wingfield-Digby, Esq.

Class 102.—Norfolk Beauty.

1. Rt. Hon. J. W. Lowther.
2. Lord Suffield.

Class 103.—Peasgood's Nonesuch.

1. Rev. J. R. Leigh.
2. Major St. Maur.
3. Sir Jas. Horlick, Bt.

Class 104.—Potts' Seedling.

1. F. J. Wingfield-Digby, Esq.
2. Rt. Hon. J. W. Lowther.
3. Major St. Maur.

Class 105.—Rev. W. Wilks.

No entries.

Class 106.—Roundway Magnum Bonum

1. J. A. Stidston, Esq.
2. J. B. Fortescue, Esq.

Class 107.—Royal Jubilee.

1. J. B. Fortescue, Esq.

Class 108.—Scarlet Victoria.

No entries.

Class 109.—Stirling Castle.

1. G. F. Marsh, Esq.
2. E. Matthews, Esq.
3. Lady Mary Morrison.

Class 110.—The Queen.

1. Earl of Bessborough.
2. Rt. Hon. J. W. Lowther.
3. J. A. Stidston, Esq.

Class 111.—Tower of Glamis.

1. F. J. Wingfield-Digby, Esq.

Class 112.—Warner's King.

1. Major St. Maur.
2. Rt. Hon. J. W. Lowther.
3. Rev. T. McMurdie.

Class 113.—Eight fruits of any variety not named above.

Four Prizes, 7s., 6s., 5s., 4s.

1. E. Matthews, Esq.
2. F. R. Rodd, Esq.
3. Major St. Maur.
4. Earl of Bessborough.

Choice Dessert Pears.

First Prize, 7s. ; Second, 5s. ; but when the entries exceed six in any Class, the Judges may, at their discretion, recommend a Third Prize of 4s.

Class 114.—Beurré Alexander Lucas.

1. F. J. Wingfield-Digby, Esq.
2. Rev. T. McMurdie.

Class 115.—Beurré d'Amanlis.

1. C. H. Berners, Esq.
2. Rev. T. McMurdie.

Class 116.—Beurré d'Anjou.

1. C. H. Fortescue, Esq.
2. F. J. Wingfield-Digby, Esq.

Class 117.—Beurré d'Avalon, *syns.* Porch's Beurré and Glastonbury.
No entries.

Class 118.—Beurré Bosc.

1. F. J. Wingfield-Digby, Esq.
2. Rev. T. McMurdie.

Class 119.—Beurré Dumont.

1. Rev. T. McMurdie.

Class 120.—Beurré Hardy.

1. W. A. Voss, Esq.
2. F. J. Wingfield-Digby, Esq.
3. Rev. H. Bull.

Class 121.—Beurré Superfin.

1. F. J. Wingfield-Digby, Esq.
2. C. H. Berners, Esq.

Class 122.—Blickling.

1. Lord Suffield.

Class 123.—Charles Ernest.

1. Duke of Portland.
2. Rev. T. McMurdie.

Class 124.—Comte de Lamy.

1. J. B. Fortescue, Esq.
2. C. Gurney, Esq.

Class 125.—Conference.

1. H. Shipley, Esq., The Bungalow, Cobham, Surrey.
2. Rev. T. McMurdie.
3. C. H. Berners, Esq.

Class 126.—Directeur Hardy.

No entries.

Class 127.—Doyenné du Comice.

1. F. J. Wingfield-Digby, Esq.
2. E. Matthews, Esq.
3. Rev. J. R. Leigh.

Class 128.—Durondeau.

1. Rev. T. McMurdie.
2. F. J. Wingfield-Digby, Esq.
3. Lord Suffield.

Class 129.—Easter Beurré.

1. J. F. Wingfield-Digby, Esq.
2. Rev. T. McMurdie.

Class 130.—Emile d'Heyst.

1. C. H. Berners, Esq.
2. Lord Suffield.
3. F. J. Wingfield-Digby, Esq.

Class 131.—Fondante d'Automne.

1. Rev. T. McMurdie.
2. Lord Suffield.

Class 132.—Fondante de Thirriot.

1. Rev. T. McMurdie.
2. C. H. Berners, Esq.

Class 133.—Glou Morceau.

1. Rev. T. McMurdie.
2. F. J. Wingfield-Digby, Esq.

Class 134.—Gratioli of Jersey.

No entries.

Class 135.—Joséphine de Malines.

1. F. J. Wingfield-Digby, Esq.

2. E. Matthews, Esq.

Class 136.—Le Brun.

1. F. R. Rodd, Esq.

2. Rev. T. McMurdie.

Class 137.—Le Lectier.

1. C. H. Berners, Esq.

2. Rev. T. McMurdie.

Class 138.—Louise Bonne of Jersey.

1. C. H. Berners, Esq.

2. G. F. Marsh, Esq.

Class 139.—Marie Benoist.

1. Rt. Hon. J. W. Lowther.

2. C. H. Berners, Esq.

Class 140.—Marie Louise.

1. F. R. Rodd, Esq.

2. Rev. T. McMurdie.

3. C. H. Berners, Esq.

Class 141.—Nouvelle Fulvie.

1. Lord Suffield.

2. F. J. Wingfield-Digby, Esq.

Class 142.—Olivier des Serres.

1. F. J. Wingfield-Digby, Esq.

Class 143.—Pitmaston Duchess.

1. C. H. Berners, Esq.

2. Rt. Hon. J. W. Lowther.

Class 144.—Santa Claus.

1. J. B. Fortescue, Esq.

Class 145.—Souvenir du Congrès.

1. Rev. T. McMurdie.

2. F. J. Wingfield-Digby, Esq.

Class 146.—Thompson.

1. Duke of Newcastle.

2. F. J. Wingfield-Digby, Esq.

Class 147.—Triomphe de Vienne.

1. Rev. T. McMurdie.

2. Duke of Newcastle

Class 148.—Winter Nélis.

1. F. J. Wingfield-Digby, Esq.
2. J. B. Fortescue, Esq.

Class 149.—Eight fruits of any early variety not named above.

Four Prizes, 7s., 6s., 5s., 4s.

1. W. A. Voss, Esq.
2. Rev. T. McMurdie.
3. Sir M. Turner.
4. F. J. Wingfield-Digby, Esq.

Class 150.—Eight fruits of any late variety not named above.

Four Prizes, 7s., 6s., 5s., 4s.

1. I. Lewis, Esq.
2. C. H. Berners, Esq.
3. Lord Suffield.

GENERAL MEETING.

OCTOBER 10, 1916.

E. A. BOWLES, Esq., M.A., F.L.S., in the Chair.

Fellows elected (22).—J. Ashton, Mrs. S. Boulnois, Miss E. Case, Mrs. T. S. Cuninghame, Miss D. F. Gaisford, Mrs. E. P. Godfrey, Miss E. R. Harrison, Miss Henderson, David Jones, N. Nightingale, Bradford Perin, E. C. Pinks, F. W. Pixley, H. Senior, Lady Seton, Miss E. M. Tice, G. K. Turner, E. T. Walker, Mrs. F. Wearne, W. I. Weldon, T. D. Wren, W. Wright.

Fellow resident abroad.—P. N. Dakshini Dor (India).

A lecture on "A Sussex Rock Garden" was given by F. J. Hanbury, Esq., F.L.S. (see p. 271).

GENERAL MEETING.

OCTOBER 24, 1916.

Sir HARRY J. VEITCH, V.M.H., in the Chair.

Fellows elected (10).—A. H. Barnard, Lady Every, E. Grimble, Lady Pearl Norcott Hanson, A. Kreglinger, A. S. Lamprey, Mrs. Gilmour McCorkell, J. R. Mann, W. T. Shackson, Mrs. R. Skipwith.

GENERAL MEETING.

NOVEMBER 7, 1916.

JOSEPH CHEAL, Esq., V.M.H., in the Chair.

Fellows elected (15).—W. J. Back, Mrs. R. B. Baker, G. Cave, Mrs. Close, Lieut. G. P. Davis, Miss Denniston, Sir Thomas Devitt, Lady Juliet Duff, Mrs. C. E. Johnston, J. Lamont, Mrs. G. Lewis, A. Scarfe, Lieut.-Col. C. G. Vatcher, Mrs. J. B. Webster, T. J. Willetts.

Fellow resident abroad.—E. Robson-Pereira (India).

Associate.—Miss Blanche Romero.

A lecture on "Border Chrysanthemums" was given by Mr. Thomas Stevenson (see p. 282).

GENERAL MEETING.

NOVEMBER 21, 1916.

Dr. F. KEEBLE, F.R.S., in the Chair.

Fellows elected (11).—Lady Egerton, L. Gibbs, W. S. Griffiths, Mrs. G. Guinness, Mrs. A. R. Jackson, Mrs. Jenkins, Mrs. H. G. Lyons, Mrs. E. M. Musgrave, D.Sc., Mrs. S. Newstead, S. Vernon Price, Mrs. H. H. S. Watson.

Fellow resident abroad.—A. Krishnamoorthy Iyer (South India).

Associate.—Miss Bertha Josephy.

Affiliated Society (1).—School Nature Study Union (Essex).

A lecture was given by A. G. Jackman, Esq., on "Some Fallacies regarding the Clematis" (see p. 292).

GENERAL MEETING.

DECEMBER 5, 1916.

Sir HARRY J. VEITCH, V.M.H., in the Chair.

Fellows elected (26).—Mrs. M. A. Astley, Miss E. Bailey, Mrs. A. L. Barber, G. Beckwith, Miss A. J. Cohen, Mrs. A. F. Davenport, Mrs. G. M. Davey, Mrs. Forbes, A. E. Griffith, Miss E. N. H. Johnson, Miss L. F. Keates, R. J. Kinze, Miss F. Lewis, Miss K. M. I. Lillingston, Rev. A. G. Locke, Mrs. F. MacGibbon, Mrs. Melville, Lieut.-Col. A. Mitchell, W. H. Perkin, Wm. Power, Mrs. E. H. Riddoch, F. Robinson, Miss E. M. Smith, J. N. Steele, E. F. Wesley, Captain G. A. Keith Wisely.

Resident Abroad (1).—Isdale Robertson (Andalusia)

Associate (1).—Robert Tyler.

GENERAL MEETING.

DECEMBER 19, 1916.

Sir HARRY J. VEITCH, V.M.H., in the Chair.

Fellows elected (17).—Miss M. A. Bagot, Mrs. J. Bell-Irving, A. R. D. Brown, Mrs. J. Gardner, A. Hodgkinson, H. Humphrey, J. Inglis, Mrs. S. Kent, Miss E. R. McHardy, Miss C. E. Madgwick, E. G. Oakley, J. S. Pearce, Mrs. E. Robson, H. Tulloch, B. A. Wagstaff, Mrs. B. A. Wennink, Mrs. Eaton White.

Affiliated Societies (2).—Ferndale and Blaenllechan Horticultural Society; Wath Brow and District Horticultural Society.

SCIENTIFIC COMMITTEE.

MAY 2, 1916.

Mr. H. J. ELWES, F.R.S., in the Chair, and eleven members present.

Narcissus with two spathes.—Mr. W. C. Worsdell, F.L.S., said that he had been particularly interested in the *Narcissus* shown at the last meeting by Mr. Bowles. It had two membranous spathes at levels separated by some inches from one another, a state probably arising from proliferation.

Maize with twin seedlings.—Mr. Worsdell also showed a grain of Maize with twin seedlings—an uncommon state.

Fungus attacking Myrtus communis.—Mr. J. Ramsbottom, M.A., exhibited foliage of Myrtle with brown margins and tips due to the attacks of *Phyllosticta nuptialis*, the fruits of which were present on the dead areas. The specimens came from Torquay.

Dividing leaves of Elm.—Mr. J. Fraser, F.L.S., showed shoots of *Ulmus campestris viminalis* with leaves divided at the tips, and said he had noticed the variety *aurea* behaving in the same way at Holland House. The more vigorous shoots were most affected, and, as members pointed out, there was a considerable amount of variation in the foliage (especially in the amount of variegation in variegated forms) from year to year.

Moraea spathacea.—Mr. Elwes showed flowers and foliage of a plant which had proved perfectly hardy at Colesborne, and which may be a form of *Moraea spathacea*. It differs somewhat from the figure of that plant in the *Botanical Magazine* (sub nom. *Diets Huttonii*) and has foliage about 6 feet long and about $\frac{1}{2}$ inch wide, whereas the original form had leaves only 2 feet long and an inch wide, as Mr. Worsdell had seen it growing wild. The seed of Mr. Elwes' plant came from Mr. Grove.

Regelio-cyclus Irises.—Mr. Elwes showed flowers of some *Regelio-cyclus* hybrids raised by Mr. van Tubergen. He had plants growing since their introduction, but found that some of the forms were far less vigorous and reliable than others. They do best in fairly stiff soil and need to be kept dry from June onwards.

Epidendrum coriaceum.—Mr. Lane exhibited a well-grown specimen of this species, which Mr. Worsley said was very much like a form he had seen growing in Brazil, but which was there considerably taller than the present form.

Fritillaria.—Mr. Elwes exhibited flowers of *Fritillaria acutiloba*, *F. Kochiana*, *F. gracilis*, *F. pomona*, *F. acmopetala*, *F. Elwesii*, *F. pyrenaica*, *F. pontica*, *F. Sieheana*, *F. Whittallii*, *F. lutea*, and a small form with flowers of the same colour and scent as *F. obliqua*, but only half the size.

Aberrations in Tropaeolum majus.—Colonel H. E. Rawson, C.B., showed a further series of aberrations in *Tropaeolum* which he attributed to interference with the incidence of certain rays of light, brought about by shading in various ways.

SCIENTIFIC COMMITTEE, MAY 16, 1916.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and twelve members present.

Bryanthus taxifolius.—Mr. J. Fraser, F.L.S., showed a specimen of the common British plant *Bryanthus taxifolius* collected in 1883 in the Sow of Atholl. He said it had recently been found again and its exact locality made known in a local paper, with the result that it had become almost if not quite extinct.

Abnormal foliage of Haematoxylon.—Mr. W. Fawcett, F.L.S., showed a specimen of the foliage of *Haematoxylon* produced after the trees had been stripped by a hurricane. It was many times larger than the normal, which he also showed. The difference was similar to that which resulted from the complete cutting back of such plants as Ash and *Euonymus europaeus*, which immediately thereafter produce very much larger leaves than they normally bear.

Tropaeolum malformed.—Col. H. E. Rawson, C.B., showed a further series of specimens illustrating malformations in *Tropaeolum majus*. In these the posterior petals had become stamens, and in one an anther had developed a small leaf-like appendage. In two instances axillary proliferation was also occurring in the flower.

Double purple Anemone.—Mr. E. A. Bowles showed the flowers of the double *Anemone nemorosa bracteata* which develop a purplish colour as they become older and fade. He suggested that this was probably Clusius' *Anemone purpurea fl. pl.*

Various Plants.—Mr. H. J. Elwes, F.R.S., showed a number of uncommon and interesting plants from his garden at Colesborne, including *Notholirion macrophyllum* (= *Lilium Thompsonianum*). This plant rarely flowers in England, but is more to be relied upon, Mr. Elwes believes, if the bulbs are lifted every year and the small ones removed. A new Iris related to *Iris japonica* from Burma, called by Mr. Dykes *I. Wattii*. A beautiful white Pæony for which the name *Paeonia Willmottiae* had been proposed, and the rarely seen *Alpinia nutans*, of which Mr. Elwes said he had seen a form in Formosa with drooping racemes a foot in length.

Dry-rot among Books.—Mr. W. G. Smith sent a painting to illustrate the following note:—"The drawing represents one book only from a collection of similar examples which were attacked by the fungus *Merulius lachrymans* in the library of F. J. Gurney, Esq., at Eggington, near Dunstable, in 1915. The growth of the fungus started from beneath the floor boards, whence it grew upwards and matured itself

on both sides of an interior wall. Close to one of these walls were bookshelves and books. The fungus luxuriated among the books, some of which were placed one upon the other on the shelves; it grew upon and in the bindings and amongst the leaves; it made the leaves stick together, and reduced them to soft pasty masses; it caused the paper to be broken and pieces to drop out. In favourable positions the flesh of the fungus developed a thickness of from one to one and a half inches. On the surface a good typical hymenium was produced with abundant reddish-brown spores. As the books were removed, a colourless fluid dripped from them.

SCIENTIFIC COMMITTEE, JUNE 6, 1916.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, with ten members present, and Mr. R. Farrer, visitor.

Certificates of Appreciation Recommended.—A Certificate of Appreciation was recommended to Mr. H. J. Chapman for his work in raising Dutch Irises belonging to the Xiphium section, that flower about a fortnight earlier than the Spanish; and to Messrs. Charlesworth for work in raising the new intergeneric hybrid Orchid, *Wilsonara* × *insignis* (*Oncidioda* × *Charlesworthii* × *Odont. illustrissimum*), combining species of the genera *Cochlioda*, *Oncidium*, and *Odontoglossum*, exhibited by Mr. Gurney Wilson, F.L.S.

Weldenia candida.—A Botanical Certificate was recommended to this bog plant, with frogbit-like foliage, shown at the Chelsea meeting by Messrs. Bees, of Liverpool.

Aberrations in Tropaeolum.—Col. H. E. Rawson, C.B., who recently showed pressed specimens of *Tropaeolum majus* in which multi-spurred peloria and proliferation had separately appeared on different plants, now exhibited specimens in which both were combined in the same flower as well as on the same plant.

Allium narcissiflorum varying.—Mr. Bowles drew attention to a slender form of *A. narcissiflorum* which Mr. Reuthe exhibited in the Hall, collected from the Alpes Maritimes. It had smaller flowers, narrower foliage, and longer stems than the normal form, which was also exhibited.

Hybrid Saxifrages and Viola.—Mr. Murray Hornibrook sent from his garden at Knapton, Abbeyleix, Queen's Co., two apparently hybrid Saxifrages and a hybrid Viola, with the following notes:

"*Saxifraga Aizo-retioides.*—This was a small plant sent to me, growing among the rosettes of a collected plant of *S. aretioides*. Mr. Irving, of Kew, who saw it here last year, took it back for comparison, and thinks it a natural hybrid, and intermediate between its parents. It seems nearer to *S. Aizoon*, but note its *Kalischia* habit of growing from one tap-root; in one of the plants sent (the flatter one) the rosettes lie so loosely on the surface that this characteristic is easily

perceived. It is the same in the other, but its (again) *Kalischia*-like 'humped' growth makes its tap-root not so easily perceived. The flowers are pale yellow.

"*S. Cotyledon* seedling, picked out of a pan. I do not know what it crossed itself with, but its flowers are most distinct, being not 'spotted' but 'blotched' with vivid crimson-lake, so much so as sometimes practically to cover the whole petal; at other times the white margin is more or less in evidence.

"*Viola* × *knaptonensis* is a hybrid between *V. bosniaca* and *V. tricolor*, having the colour of the former (but richer) and the 'velvet' of the latter. Its flowers usually have lemon-yellow blotches on the lower petals, but sometimes, especially in full sun, the flowers are altogether crimson-rose."

Malformed Delphinium.—Mr. H. S. L. Wilson, of Crofton Hall, Wakefield, sent some curious flowers of *Delphinium* from his garden, having large foliose sepals. The flower at the upper part of the stem was normal, and only one stem on the plant bore malformed flowers.

SCIENTIFIC COMMITTEE, JUNE 20, 1916.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and fourteen members present.

White-flowered Securidaca Lamarckii.—Mr. W. Fawcett, F.L.S., exhibited a specimen of a white-flowered form of the Polygonaceous *Securidaca Lamarckii* found growing in St. Vincent, W. Indies—the first recorded occurrence of the albino form of this species.

Tulip with elongated axis.—Mr. R. Hooper Pearson showed a bulb of a garden Tulip from which a stem about 3 inches in length had developed bearing a bulb at its apex.

Fusarium on Potato.—Dr. A. S. Horne showed old Potato tubers which had been attacked by winter rot, now bearing deep red pustules similar to those attributed to *Nectria Solani*. No *Nectria* spores had, however, been produced.

Various Plants.—Mr. H. J. Elwes, F.R.S., showed a series of plants from his garden, including *Myosotis micrantha*, a purplish-flowered species from New Zealand with a curious but not unpleasing scent; *Arisaema concinnum*, from Sikkim, which has proved quite hardy at Colesborne when planted deep in shady places; *A. utile* from the upper valleys of Sikkim, where the tubers are eaten in times of famine—a plant with curious transparent stripes on the spathe; a variety of *Paeonia officinalis* from Asia Minor, single, flowering late, and received by Mr. Elwes from Messrs. Barr under the name "Smyrna," but for which he proposes the name *Whittallii*; a form of *Tropaeolum polyphyllum* similar in habit to that known as *T. Leichtlinii*, raised from seed collected by him at an elevation of 9,000 feet near the mouth of the Transandean Tunnel at Puente del Inca; *Iris Clarkei*,

from the Tonglo swamp, Sikkim, at an elevation of 10,000 feet, bearing much finer flowers than those figured in Mr. Dykes' monograph—it grows on the dry, hot rockery at Colesborne, but does not thrive in wet, peaty soil, like that of its native home; the Siberian form of *Cypripedium macranthum*; *Anigozanthus* sp.; *Bomarea* sp. raised from seed collected at Rio Janeiro, Brazil, and grown planted out in a warm-house border; *Urceocharis* × *Clibrari*; *Eremurus* seedlings raised at Colesborne by crossing the broad-leaved early-flowering *robustus-himalaicus* forms with the narrow-leaved Bungei-Olgae group and giving a race intermediate in flowering between the two.

Castilleja sp.—Mr. Elwes also showed a shoot of a *Castilleja* from the rock garden at Colesborne, possibly the same species as that exhibited by Mrs. Longstaff last year (*Journ. R.H.S.* xli. p. cvii) and grown also by Mr. Beamish near Cork. This plant was one of several sent home by Mr. F. R. S. Balfour in August 1913. Mr. Balfour says concerning it: "Others of the same lot and of the same species are in bloom at my place, Darysk, in Tweeddale. I am uncertain whether it is *C. purpurascens* Greenm. or *C. miniata* Dougl. I am inclined to think the latter, as it grows above timber line and is cardinal-scarlet, whereas the former is more usual at lower altitudes and of usually a purplish hue. The plants I sent home were lifted at about 8,000 feet near Lake Agnes in the Canadian Rockies, and formed sheets of scarlet near snow level in the mountain meadows, where it is at its best in late July and August. It is occasionally pinkish or rarely whitish in colour. There is, however, a white species, *C. pallida*, which occurs in similar situations with more hairy bracts.

"On Mount Rainier (Washington) in September I saw *Castilleja* in masses above timber line mixed with *Pulsatilla occidentalis* and *Aster pulchellus*, *Gentiana calycosa*, *Polygonum bistorta*, *Veratrum viride*, *Dodecatheon Jeffreyi*—altitude about 9,000 feet—the flowers of a distinctly purplish-crimson, not at all the scarlet shade of what seemed otherwise the same species as I found in the Canadian Rockies. *C. septentrionalis* must, I think, be a synonym of *C. purpurascens*, though of this I am not sure. I notice Mrs. Henshaw says they are of every colour from coral-pink to cardinal and from canary-tint to tangerine.

"They are all, I think, undoubtedly parasitic to some extent, but not saprophytic. The genus is not represented in Europe. For mass of colour I never saw anything to equal them, except, perhaps, a British Poppy field."

New Notholirion.—Mr. J. C. Allgrove sent a plant collected by Purdom in China and evidently nearly related to *Notholirion Hookeri*, differing, however, in being much more robust, reaching 2 feet 6 inches in height, in having much more curved stamens, and in having the spreading tips of the perianth green. It is an interesting plant, sharing with *N. roseum* (= *macrophyllum*) and *N. Hookeri* a position intermediate between *Fritillaria* and *Lilium*. *N. roseum* has been and often is still assigned to *Lilium* as *L. Thompsonianum* (see p. cxxiv).

Purple-tubed Primula sikkimensis.—Mr. E. A. Bowles showed

flowers of *Primula sikkimensis* with a purple tube to the corolla, another with very widely spreading petals, and another with very pale flowers, all from Mr. Farrer's garden at Clapham, Yorks.

SCIENTIFIC COMMITTEE, JULY 18, 1916.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and eight members present.

Fasciation in Tropaeolum majus.—Col. H. E. Rawson, C.B., showed a fasciated specimen of *Tropaeolum majus* which he had had growing for two years and ten months, and which had hitherto grown normally. When, however, it had been moved to a different aspect it had become fasciated. Col. Rawson attributed this to change in illumination.

A curious Meconopsis.—Mr. H. J. Elwes, F.R.S., showed a *Meconopsis* from the garden of Mr. Dimsdale of Ravenshill, Eastleach, Lechlade. It was thought to be a seedling which Mr. Elwes had given him from *Meconopsis latifolia*, but it bore curiously-shaped leaves. Sir David Prain, to whom it was referred, said it was a form which he had not seen before, but save for the absence of bracts on the pedicels it agrees in essentials with Mr. Hay's *M. decora*, with blue flowers. It has the peculiar hairs of *M. decora*, which look simple at first sight, but which have very minute protuberances as seen under a low power. Sir David Prain considers it probable that *M. decora* is a hybrid between *M. latifolia* and *M. Wallichii*. Mr. Elwes wrote later that he had seen a specimen in Mr. Grove's garden which had thrown out side shoots very like Mr. Dimsdale's plant, and the pistil resembling that of *latifolia* (see p. cxxix.)

Various Plants.—Mr. Elwes also raised the question as to which flower opened first in *Lilium giganteum*, and said that at Wisley he had found that the bottom flower did not first open, as had been reported, nor did it in the specimen he showed. He also showed *Crinum lineare*, which he thought was probably a desert form of *C. capense*; *Iris Taitii*, from the Tagus valley, a late-flowering form of the Xiphium group, with an exceedingly short tube; *Campanula alliariaefolia*, which, he said, makes a decorative plant when starved in a pot; Burbank's hybrid Lily (*L. Parryi* × *L. pardalinum*); *Blandfordia princeps*; *Arisaema curvatum*, hardy at Colesborne; and some hybrid Calceolarias raised in the John Innes Horticultural Institution at Merton.

Hybrid Calceolarias.—Mr. E. J. Allard said that the hybrid Calceolarias which Mr. Elwes showed had for one of their parents *Calceolaria cana*, a Chilean species, obtained from plants raised at Kew from Chilean seed. Crossed with *C. angustifolia* × *C. herbacea*, it gave pink spotted flowers, while the same hybrid crossed *C. integrifolia* × *C. cana* gave dwarfed forms. *C. integrifolia* × *C. alba* gave cream unspotted forms, since *C. alba* behaves as a dominant white.

Fasciated Plants.—Mr. W. Hales, A.L.S., showed fasciated shoots of peloric *Antirrhinums*. The peloric form of *Antirrhinum majus* had been grown at Chelsea Physic Garden for many years, and had been propagated by cuttings. It had now for the first time produced fasciated plants. Mr. Allard referred to the fasciated Rose shoot which Dr. Bateson took last year, and which, on being propagated from, had produced only normal shoots.

Papaver nudicaule with Carpellody of Stamens.—Mr. E. M. Holmes, F.L.S., sent a flower of *Papaver nudicaule* in which many of the stamens had become carpels, in the same way as it is often seen in *Papaver orientale*.

SCIENTIFIC COMMITTEE, AUGUST 1, 1916.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, with twelve members present, and Mr. M. C. Allwood, visitor.

Meconopsis.—With reference to the *Meconopsis* shown at the last meeting by Mr. Elwes, Mr. Bowles said he had a plant almost exactly like the one Mr. Elwes showed. Sir David Prain also wrote further that he had seen Mr. Grove's plant to which reference had been made, and that had "upraised" bracts on the pedicels, of which there is no trace on the piece of Mr. Dimsdale's plant.

Hybrid Carnations and Pinks.—Mr. M. C. Allwood showed a long series of hybrids between the perpetual-flowering *Carnation* and garden *Pinks*, varying considerably in colour from white to purplish-pink. He said, also, that the habit varied very much from plants about 4 inches in height up to 2 feet 6 inches, while many were of the perpetual-flowering type. A question of nomenclature arose, but was deferred for further inquiries (p. cxxxii). A Certificate of Appreciation was unanimously recommended to Mr. Allwood for his work in connexion with the raising of these hybrids.

Grasses, &c., on a London Green.—Mr. J. Fraser referred to a discussion which had taken place regarding the Grasses which occur on London greens, and said that he had recently examined Kew Green with the following result. Common: *Poa annua*, *P. pratensis*, *Lolium perenne*. Frequent: *Dactylis glomerata*, *Cynosurus cristatus*, *Koeleria cristata*. Less frequent: *Poa trivialis*, *Agrostis stolonifera*, *Festuca rubra*, *F. elatior*, *Alopecurus pratensis*, *Hordeum murinum*, *Holcus lanatus*. Casual: *Poa compressa polynoda*. Among other plants were *Plantago major*, *P. lanceolata*, *Trifolium repens*, *T. dubium*, *Achillea Millefolium*, *Capsella Bursa-pastoris*, *Taraxacum officinale*, *Spergularia rubra*, and *Silene latifolia*.

Colours of Flowers in Tropaeolum majus.—Colonel H. E. Rawson, C.B., showed a further series of specimens illustrating the range of colour in this plant, which he attributed to alterations in the amount and kind of light falling upon it. Mr. Allard said that a similar series

of colours had occurred at the John Innes Institution due to the intercrossing that had been done there during experimental investigations.

Hollyhock Rust.—Mr. J. Ramsbottom, M.A., remarked upon the death of Hollyhocks through attacks of rust (*Puccinia Malvacearum*) commenting upon the supposed falling off of virulence in that fungus, or the gain of resistant power in Hollyhocks, which had evidently not occurred in all races.

Fasciation.—Mr. E. M. Holmes, F.L.S., showed a fasciated piece of *Verbascum virgatum* in which the upper 2 feet of an 8-foot stem only showed the fasciation. Mr. A. Wilson, of Shovell, Bridgwater, sent a piece of fasciated Delphinium which had occurred on a plant in his garden, one side of which, year after year, showed this fasciated growth.

Proliferation in Salsify.—Mr. W. C. Worsdell, F.L.S., showed a proliferated head of Salsify (*Tragopogon porrifolius*) from Mr. Miller Christy's garden at Chelmsford. Each floret, which was stalked, had produced a secondary capitulum.

Stapelia Leendertziae, N. E. Brown.—Mr. W. E. Ledger exhibited *Stapelia Leendertziae*, and commented upon it as follows:—

“The plant exhibited first flowered in England in August 1912 (the only other specimen flowering subsequently at Kew), and was figured at t. 8561 of the *Botanical Magazine* for June 1914.

“It is remarkable for its large, purple-crimson campanulate flowers. Both in shape and colour it differs, I believe, from all other species of the genus, although *S. nobilis*, N. E. Br., figured on t. 7771 of the *Bot. Mag.*, is also campanulate, but the tube is considerably shorter.

“The flowers of *S. Leendertziae* are about $2\frac{1}{2}$ inches deep, 2 inches across the tube, and over 4 inches to the tips of the spreading lobes. The interior of the flower is beset with long, purple-crimson hairs, and the flowers emit the evil smell common to the genus.

“The stems are erect, decumbent at the base, 3 to 5 inches or more long, about $\frac{1}{2}$ inch thick, velvety-puberulous, the sides rather hollowed, and the angles furnished with small, soft, erect teeth or leaflets. The follicles are large, 4 to over 5 inches in length.

“The shape and colour of the flowers are so distinct that the species might well constitute a separate sub-genus or section.

“The plant was discovered in 1909 by Miss Leendertz, now Mrs. Pott, curator of the Transvaal Museum at Pretoria, growing among sunny rocks near Heidelberg in the Transvaal, and is said to flower freely and over a long period.

“I received the plant exhibited from Mr. G. Thorncroft, of Barberton, in August 1910, and so it was just two years in my collection before flowering.

“The species was first described by Mr. N. E. Brown in *The Annals of the Transvaal Museum*, vol. ii. p. 168; the only other account of it is the one accompanying the figure of my plant in the *Bot. Mag.* for June 1914.

“ In the *Kew Bulletin* for 1903, p. 17, is an interesting article on the ecology of the genus by Mrs. M. E. Barber, the well-known artist and African botanist. According to this lady, in spite of their extraordinary power to adapt themselves to the varying and uncertain climate, these plants appear to be rapidly disappearing from all parts of S. Africa. She says: ‘ Civilization and colonization are both dead against them. They are eaten up by ‘ all kinds and conditions ’ of cattle. For instance, if an ostrich finds a *Stapelia* plant he seldom leaves without taking nearly the whole of it with him. Cattle, sheep, and goats, in like manner, feed upon them greedily. The native tribes during years of severe drought and famine use these plants as food, and native children delight in their sweet, young, succulent branches. The florist and gardener go hand-in-hand with the rest in the work of destruction, for you will hear them exclaiming, ‘ Oh ! here is one of those curious *Stapelias*, ’ and it will speedily be pulled up and planted in some flower-bed, where, for want of care, it will be overgrown by other plants and lost.

“ Nevertheless, though dependent on insect agency for fertilization, and, according to Mrs. Barber, they do not as a rule seed freely, the species before you, judging from follicles, sent to me by Mrs. Pott some time ago, is in no danger of extinction. Though the species is so rare in cultivation, the large follicles I received were abundantly packed with their beautiful winged seeds, so it may be hoped that this plant, at least, will not soon die out.”

Sir Everard im Thurn said that in the case of some of the very evil-smelling Aroids the scent was evident in the tropics only during the day, and the plants could be brought into the house and used for room decoration after dark. Mr. Ledger subsequently wrote that he found at 8.30 P.M. the offensive smell of the flower had gone, and at 10.15 it was still absent. The plant remained in the dining-room all night, and in the morning, at 9.30, it had not reappeared, the sun having not yet been upon it.

Various Plants.—Mr. H. J. Elwes, F.R.S., showed *Rodgersia* with bronzy foliage, later flowering than other types and retaining the pink in its flowers for a long time. He had grown it for some time as *R. pinnata*, though the name was somewhat in doubt; *Allium macranthum* from Sikkim, which had proved perfectly hardy at Colesborne, and which, like the other Himalayan *Alliums*, had a compressed and sharply-angled stem; a very dark-leaved Fennel, which originally came from Mr. Howard Baker’s garden, but which Mr. Bowles said, reverted in seedlings to the normal green of the common Fennel; *Campanula Vidalii*; *C. longistyla*, with tall stems; a *Hemerocallis* from Japan, collected there in 1904, but only now reaching its full flowering state; *Allium pulchellum*; *A. sphaerocephalum*; *Ceropegia Sandersonii*; and a beautiful white form of *Campanula Hostii*.

Spiral Torsion in Mint.—Mr. C. H. Curtis sent a curious, very tightly twisted Mint from the garden of Mr. Malcolm, of Duns,

Berwick. Spiral torsion does not seem uncommon in opposite-leaved plants.

Humogen.—Mr. F. J. Chittenden, F.L.S., said that a further small test of humogen, obtained this time through Messrs. Sutton, from the Manchester Corporation, had been made at Wisley, with the result that previous findings had been confirmed, viz., that the material is not standardized (this like three other samples, but unlike the first received, gave no increase in yield), and that large doses are apt to have a bad effect upon germination (see p. 349).

Ceropegia Sandersoni ♀ × *C. gemmifera* ♂.—Flowering sprays of this hybrid were exhibited by Mr. Elwes.

A note by Mr. H. F. Comber describing this plant appeared in the *Gardeners' Chronicle* for December 4, 1915, where, however, the male parent was erroneously stated to be *C. Monteiroae*.

The cross occurred fortuitously in the gardens at Nymans, Hand-cross, but the plants were raised at Colesborne.

Among the seedlings were found plants showing variations in shape and colour, and one plant produces flowers which are persistently deformed. The cross is fairly intermediate between the parents and somewhat resembles *C. × Rothii* Gürke (*C. Sandersoni* × *C. radicans*)—a hybrid exhibited before the Committee by Mr. Ledger on November 7, 1911.

SCIENTIFIC COMMITTEE, AUGUST 15, 1916.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and ten members present.

Dianthus plumarius × *D. Caryophyllus*.—A letter was read from Mr. F. N. Williams, F.L.S., saying that he was aware of no recorded name for the Carnation-Pink cross shown at the last meeting, although two species of the sections of the genus to which these plants belong, viz. *D. attenuatus* and *D. monspessulanus*, had been found to hybridize naturally in the Department of Pyrénées Orientales and had been named *D. × Richteri*. The Carnation-Pink cross has been made in gardens but apparently not named, and the Committee was of the opinion that the name *D. × Allwoodii*, proposed at the last meeting for this cross, would stand and be appropriate.

Variation in Origanum vulgare.—Mr. J. Fraser, F.L.S., drew attention to specimens of wild marjoram which he showed, and commented upon variations which he had found among wild plants of this species. The variety *megastachyum* he had found on the Surrey Downs in 1913, but cultivated in his garden it became much larger and very much greener. Var. *album* is fairly common, and he had found a form near var. *viride* of the Continental botanists, but with slightly tinted bracts.

Variations in Tropaeolum.—Col. H. E. Rawson, C.B., showed further specimens of *Tropaeolum majus* exhibiting suppression of parts, which he attributed to alterations in light during growth.

Spiral torsion in Gentiana Pneumonanthe.—Mr. Bowles showed a spirally contorted specimen of *Gentiana Pneumonanthe* from a field near Myddelton House for comparison with the Mint shown at the last meeting. A specimen of *Gentiana Asclepiadea* showing similar torsion had already been before the Committee.

Variation in Carduus lanceolatus and C. palustris.—He also showed a white-flowered Spear Thistle in which the flowers were slightly tinged with pink, and purple, flesh-coloured, and white-flowered specimens of *Carduus palustris*, all from near his house.

Hybrid Romneya Coulteri and R. trichocalyx.—Mr. W. H. B. Fletcher, of Aldwick Manor, Bognor, sent specimens of *R. Coulteri*, *R. trichocalyx*, and a hybrid he had raised between them, with the following note:—"It will be noticed that the buds of the hybrids are intermediate, having traces of the bristly hairs of *R. trichocalyx* and the more egg-shaped form and especially the apiculate sepals of *Coulteri*. When the plants are seen in a row, as at my brother's vicarage garden near Chichester, the tint of the foliage of the cross-breds differs greatly from that of *R. Coulteri*."

"So far as my experience goes, the Romneys do not set seed unless artificially cross-pollinated. I have grown *R. Coulteri* for between twenty and thirty years, but never had any fruit set until in 1913 I was able to use the pollen of *R. trichocalyx* for the first time. The flowers which are cross-pollinated bear fruit with the utmost freedom. Though the two forms are with me planted in actual contact, neither insect nor wind has the slightest effect in crossing them. I find *R. trichocalyx* to produce pollen very freely, but *R. Coulteri* much more sparingly."

Agapanthus crosses.—Mr. Fletcher also sent *Agapanthus Mooreanus* ♀ × *A. umbellatus* ♂, and *A. Mooreanus* ♀ × *A. umbellatus* (deciduous white form) ♂. Mr. Fletcher has also raised the reciprocal of the last. The hybrids seemed to be extremely floriferous and had good flowers, which varied considerably in colour (as do those of the form known as *A. intermedius*), some forms with golden anthers being particularly pretty.

Foxglove with dialysis of corolla.—Mr. Whitton sent a specimen of Foxglove with the corolla deeply divided into four or five parts. This phenomenon is not very uncommon in plants with gamopetalous corollas, such as Campanulas and the like.

Bi-coloured Marrow.—Mr. H. L. Bassett, of Anerley, sent a vegetable marrow in which one half was yellow and the other green, the line of demarcation being very sharp. Mr. Bassett wrote that the seed parent was white, and thought it possible that it may have been crossed with a green marrow growing near in 1915.

SCIENTIFIC COMMITTEE, AUGUST 29, 1916.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and eight members present.

Pelargonium Hybrid.—Mr. Fraser showed a dried specimen of *Pelargonium semi-trilobum Raduliferinum* × *crispum* which he had received from Mr. Bennett-Poë, and which he found to be distinct from 'Lady Mary' and from *crispum*.

Tomato flesh discoloured.—Mr. Harold W. Smith sent some tomato fruits disfigured with yellow coloration which goes right into the fruit, asking for the cause, the remedy, and whether they are harmful to eat. The cause is probably insufficiency of potash in the soil, and while the yellowish part is hard it is not actually harmful. Some varieties are more liable to this uneven ripening than others.

Peach Curl &c.—Messrs. G. & A. Clark sent some twigs of Peach trees afflicted with leaf-curl and die-back disease. Miss D. M. Cayley, of the John Innes Institution, who examined them, wrote: "I have looked at the specimens of diseased Peach branches sent and make the following notes: One specimen has had a bad attack of Peach leaf-curl, *Exoascus deformans*. The only sign of *Exoascus* on the second specimen is the discoloration of the pith and wood at the base of the shoot. The third specimen has a decided attack of gumming and also die-back. The cause of gumming, as far as I know, has not yet been attributed to any specific organism. It certainly causes the twigs to die, if badly attacked, but I hold that gumming and die-back are not one and the same thing, although the cause of die-back in Peaches is not known, and no definite proof has been found that it is due to *Botrytis*, as in Apricots.

"Remedies for Peach Leaf-curl.—The mycelium of Peach leaf-curl hibernates in the bark, pith, and medullary rays of the twigs, and on the bud-scales. Spraying with Bordeaux mixture in the early spring before the leaves unfold is to be recommended. All affected twigs should be cut away right down to healthy wood, and burnt. By healthy wood I mean that the surface of the cut should show no trace of discoloration in the internal tissues. Once a tree has become so badly infected (as I am led to believe by the condition of No. 1) there is very little chance of it ever recovering sufficiently to be of any market value, and it should be burnt. Almond trees are affected by the same organism, and all diseased Almond trees should be carefully attended to, if anywhere in proximity to a Peach nursery. Nurserymen do not sufficiently realize the importance of keeping down leaf-curl. They think that, as the second leaves appear healthy and the shoots grow vigorously, the trees have recovered, but this is not the case, as, as before stated, the mycelium lives in the inner tissues of the stem and the disease is thus carried on from year to year. Should the disease appear on the leaves of young Peach trees, spraying from time to time in the spring with Bordeaux mixture

or liver of sulphur (potassium sulphide), one ounce to three gallons of water, or, if the weather is hot and sunny, one ounce to four gallons of water, would help to keep the disease under control. Neither of these sprays must be applied strong, as the result would be leaf-scorching. For gumming and die-back there is no known remedy. The only thing is to cut away badly gummed portions of the tree and cover the cut with some common knotting. Clean and healthy conditions, with well-drained soil, all help to keep the plants free of gumming."

Pear foliage diseased.—Mr. J. Knight, of Verwood, Dorset, sent some spotted leaves of Pears 'Chaumontel' and 'Doyenné de Comice,' and of the Apples 'Red Victoria,' 'Peasgood's Nonsuch,' and 'Gascoygne's Scarlet.' Miss Cayley wrote: "The leaves were rather too dry and disorganized to enable me to give a very satisfactory report, but to judge from general appearances and the presence of a considerable amount of *Fusicladium dendriticum* (on the apple leaves) and *Fusicladium pyrinum* on the pear leaves and twigs, I should say that the principal cause of trouble is these fungi. There are some excrescences on the under-side of the pear leaves, probably due to the pear-mite, *Eriophyes pyri*, which has bored under the epidermis, but I think the general condition of the leaves is not due to this pest. Spraying with Bordeaux mixture before the blossoms open and twice after the blossom has set, at intervals of about fourteen to twenty-one days, is generally recommended. Keeping the stems and branches clean with winter washes is also advisable."

Cattleya guttata, albino form.—Mr. Gurney Wilson exhibited an albino form (the first ever obtained) of *Cattleya guttata* var. *Sanderæ*, exhibited by Messrs. Sander, St. Albans. The sepals and petals are greenish yellow and the labellum white. It was sent up from the Orchid Committee to have a Botanical Certificate confirmed. Mr. Gurney Wilson moved and Mr. W. C. Worsdell seconded that a Botanical Certificate be given; this was carried by six to one.

Various Plants.—Mr. H. J. Elwes exhibited the following plants in flower, with the notes attached:—*Hedychium elegans ellipticum* and *Rhynchanthus longiflorus*, grown in greenhouse, but might be hardy in the south-west of England; *Dioscorea pulchella*, a climbing yam from Sikkim with ornamental pendent racemes, which might be hardy in the south; *Hymenocallis guianensis*, a tropical species, very dwarf and fragrant, with deciduous foliage quite distinct from the nearly hardy *H. Harrisiana*, which it resembles; *Allium Wallichii* var. from Tibet, much more robust and twice as tall, but of the same colour and habit as the Himalayan species introduced by Capt. Bailey; *Amphicome arguta*, quite hardy at Colesborne, an ornamental procumbent plant which does not start growth till June; *Phlomis* sp. from Kashmir, 5 ft. high; *Poterium hakusanense*, from Japan, seems identical with *P. obtusum*; *Zephyranthes candida* var. *major*, from Uruguay, much finer but more tender than the type; *Lonicera* species, or var. of common Honeysuckle, very late and distinct from any other I know, a hardy climber; *Astragalus stipulatus*, from Sikkim,

a very robust and striking plant for its foliage, but the flowers are small, hardy; *Vallota* × *Gastronema sanguinea*—I have raised this plant from both parents and find them easier to grow than either and very showy; *Alstroemeria Hookeri*, introduced by me from Chilian Andes at 9,000 feet, a very dwarf and pretty species; *Yucca rupicola*, one of the tallest and hardiest of the genus.

SCIENTIFIC COMMITTEE, SEPTEMBER 12, 1916.

Mr. H. J. ELWES, F.R.S., in the Chair, with eight members present and Mr. Hayes, visitor.

Cyrtanthus epiphyticus, J. M. Wood, in *Kew Bull.* 1913, p. 182.—Mr. Ledger exhibited a flowering plant of this new species, remarkable for its robust growth, but more especially on account of its epiphytic habit. The flowers, of a bright orange-scarlet colour, are of the narrow-tubed funnel shape characteristic of the subgenus *Monella*.

In sending the bulbs to Mr. Ledger in February 1913 Dr. Medley Wood wrote: "I am sending you . . . a new species of *Cyrtanthus* which was procured for me by my nephew, Mr. J. W. Haygarth. This plant is unique in the genus by the fact that it grows not on the ground, but in masses of moss on the trunks and branches of 'Yellow-wood' (*Podocarpus*) trees at 50 or 60 feet from the ground (in the forest of Ensikeni, Natal; at 1,200 m. alt.). . . . It will be a splendid plant for hanging baskets. I had at first intended a different specific name for it on account of its habit—the peduncles first bend downwards from the branch on which it grows, then upwards with a graceful curve, and then outwards to the umbel, almost exactly like the neck of a swan, but . . . I came to the conclusion that this was only caused by the position in which it found itself, so that in other circumstances it would grow like its fellows."

Mr. Ledger exhibited these bulbs in a dry state before the Committee on March 4, 1913, under the name of *C. dendrophilus*—a MS. name given by Dr. J. Medley Wood, which he changed to *C. epiphyticus* before publication.

Various Flowers.—Mr. Elwes exhibited flowers of *Incarvillea* (Forrest, No. 12,000), *Gloriosa Leopoldii*, *Hymenocallis*, *Ismene Macleanii*, *Kniphofia* (seedlings from *K. MacOwanii*), *Agapanthus*, and *Gladioli*.

Inflorescence of Rhododendron barbatum.—Mr. W. C. Worsdell, F.L.S., showed an inflorescence of *Rhododendron barbatum* received from Mr. E. A. Bowles at St. Keverne, Cornwall, in which the majority of the bracts had changed into foliage leaves, the venation of which was quite different from that of the ordinary foliage leaves, being more like that of the bracts and with the petals broader and flatter; one of the prophylls of a flower had become changed into a foliage leaf. He also showed leaves of Lilac damaged and curled by grubs, probably those of a leaf-miner.

Thorn Apples.—Miss E. A. Portal sent two Thorn Apples, *i.e.*, apples in which the petals and stamens appear to have been transformed into sepals with fleshy bases exactly like those which constitute the apple fruit below; these bases are spirally arranged; the whole fruit is roughly four-lobed and seedless.

Plum-tree affected with Silver-leaf.—Mr. L. M. Cooper, of Goring-on-Thames, sent a portion of a plum-tree badly affected with silver-leaf disease and also having on the leaves a brown fungus. It was suggested that the plant had been starved, and that better feeding and some lime should be given the tree.

Enations on leaves of Aristolochia Siphon.—Miss K. Ashley, of Crouch End, sent a leaf of *Aristolochia Siphon* bearing enations of various sizes on the lower surface; these enations, unlike those observed on the leaves of most other plants, did not seem to be along the main veins but across the smaller vein branches.

Walnut diseased.—From Petworth Park Gardens came twigs of a walnut with both fruit and foliage attacked by the fungus *Marssonina Juglandis*, which Klebahn has shown to be the conidial stage of *Gnomonia leptostyla*. It is rare for the fruit to be attacked.

SCIENTIFIC COMMITTEE, SEPTEMBER 26, 1916.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and six members present.

Polyporus betulinus.—Mr. J. Fraser, F.L.S., showed a large specimen of *Polyporus betulinus* from a birch tree, measuring $8\frac{3}{4}$ in. in diameter.

Lobed-leaved Pear.—He also showed three-lobed leaves of pear from a shoot springing from a cut-back branch, and a twin fruit of Victoria Plum with two separate stones.

Proliferation in Dianthus barbatus.—Mr. W. C. Worsdell, F.L.S., showed a curious case of proliferation in the Sweet William from Mr. Miller Christy's garden, in which, after flowering, shoots had developed from the bracts just below the flower.

Carpellody of anthers in Papaver orientale.—Mr. E. A. Bowles showed an example of *Papaver orientale* from Mr. Sidney Morris's garden in which a very large number of the stamens had become transformed into carpels and were tightly packed around the ovary. He also showed, from the same garden, shoots of seedlings from *Laburnum Vossii*, in which the leaves had a remarkably curled appearance, due to the failure of the midrib to elongate normally, while the lamina had developed to the usual extent.

Peronospora grisea on Veronica Hulkeana.—Mr. Bowles also showed, from the same source, shoots of *Veronica Hulkeana* attacked by *Peronospora grisea*, a fungus common on wild Veronicas in this country. Spraying with Bordeaux mixture or Burgundy mixture would

probably check the spread of this trouble, but affected parts in which the resting spores are produced should also be burned.

Apple Sporting.—Mr. E. A. Bunyard, F.L.S., showed two forms of apple from a standard tree of 'Royal Jubilee,' one normal, the other russeted and a little smaller. The leaves on the shoots bearing these forms respectively were similar to one another, and the flavour was approximately the same.

SCIENTIFIC COMMITTEE, OCTOBER 10, 1916.

Dr. A. B. RENDLE, M.A., F.R.S., in the Chair, and twelve members present.

Fungus Gall on Alnus glutinosa.—The Rev. W. Wilks, V.M.H., sent a curious reddish gall on the "cones" of *Alnus glutinosa*, which he had found in Scotland. The gall is produced by the growth of the fungus *Ascomyces alnitorquum* on some of the bracts, which become several times their normal size and project almost like leaves from the cones.

Lychnis from China.—Mr. E. J. Allard showed a *Lychnis* with large flowers somewhat like those of *L. Flos-cuculi*, but with much longer sepals and considerably larger in all its parts, raised from seed sent home by Mr. R. Farrer from inland China. It has flowered at Wisley and in other gardens, but has not yet been named, and its perennial character remains to be proved.

Variations in Tropaeolums.—Col. H. E. Rawson, C.B., showed some specimens of *T. tuberosum*, which bore entire leaves on one part of their growth and more divided leaves in another. This he attributed, as with other variations in this and allied species, to differences in illumination. He also showed variations in *T. majus* towards the production of divided leaves. He had secured parallel variations in flowers and foliage in the two species.

Crocus from Gunnersbury.—Mr. J. Hudson, V.M.H., showed some flowers of a *Crocus* which he had originally received from Mr. Smith, of Newry, as a new species. Mr. Bowles took them to examine further.

Kniphofia modesta, &c.—Mr. H. J. Elwes, F.R.S., showed a spike of this white-flowered plant, which is not quite hardy, and of an *Aeschynanthus*, with bright, scarlet flowers, which he had found at an elevation of 7,000 feet in Sikkim, growing as an epiphyte. It is apparently an undescribed species, and might prove hardy in Cornwall.

SCIENTIFIC COMMITTEE, OCTOBER 24, 1916.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and eight members present.

Sycamore leaf-spot.—Mr. J. Fraser, F.L.S., showed specimens of this common disease collected from Ockham Common, Surrey, and

caused by the fungus *Rhytisma acerinum*, in which the leaves were almost entirely covered by the black spots which the fungus produces. The fungus hibernates on the dead leaves on the ground, and produces ascospores there which re-infect the tree in the succeeding year.

Variiegated Tropaeolums.—Col. H. E. Rawson, C.B., remarked that he found the plants of variegated *T. majus* which he showed at the last meeting liable to be attacked by black aphides, which congregated only on certain parts which were exposed to particular rays of light.

Massonia jasminiflora.—Mr. Bowles exhibited a plant of this interesting species which had been figured in the *Bot. Mag.* t. 7465, and which grows on the veldt at the Cape, whence the bulb from which this plant was derived came. The white flowers, which rise but little above the deep green foliage, are very sweetly scented. It had flowered in a garden at Waltham Cross.

Plantago lanceolata.—Mr. Bowles also showed a scape of *Plantago lanceolata* measuring over a yard in length, which Mr. P. D. Williams had found on a very cold, wet clay near Lanarth, usually regarded as an infertile spot.

Colour Standards.—A letter from Mrs. D. F. Kerr, of Kelowna, B.C., aroused a discussion concerning existing colour standards and the criticisms to which they were open. It was thought, however, that the time was inopportune for attempting the necessary revision at present, desirable as the revision is.

Gall on Rose.—Mr. Cocks, of Winnipeg, Canada, sent a gall from a Rose measuring about 3 inches in diameter, which Dr. Rendle took for further examination.

Preservation of Green Colour in dried Leaves.—Dr. A. B. Rendle, F.R.S., showed a series of Fern fronds, some of which had been dried and exposed to the light for three years, to illustrate the value of the copper acetate method of preserving the colour. He gave the following account of the method:—A stock solution is made by saturating commercial strong acetic acid with powdered copper acetate. For treatment, dilute the stock solution with water in the proportion of 3 or 4 parts of water to one of stock solution. The solution is heated in a non-metallic vessel—a glass beaker being probably the most suitable—to boiling-point; the specimen is placed in the boiling solution, which is kept boiling, for a time varying from 1 minute to 40 minutes, according to the action of the copper salt upon the plant. If the action is proceeding satisfactorily, a period of 1 to 5 minutes should suffice; the end of the operation is easily judged by the colour, or by treating two different specimens for different periods; a specimen that by such comparison appears to require longer treatment can always be re-immersed to get the desired effect. Many plants, notably the leaves of evergreen shrubs, are more difficult and generally less satisfactory in the ultimate colour, probably owing to the presence of mucilaginous or decomposition products or tannins. These require long treatment, varying from twenty to forty minutes; after the first immersion they turn yellowish, and then after action the yellow gradually gives place

to green, generally olive green. Other plants, notably *Aucuba*, fail entirely as they pass from the yellow to a muddy brown or black colour. After treatment the plants should be washed (like photographic prints) in running water for about two hours. They are then dried under as light pressure as is compatible with keeping the plants from twisting, or, after shaking off as much water as possible, may be dried in sand.

In many cases the plants are rendered so flaccid by boiling that sand-drying is difficult or impossible. Plants that have required long boiling not infrequently revert to a bad colour when sand-dried. Young parts of plants green better than old; better results may be expected from "spring" leaves than from "autumn" leaves. Wooden (not metal) forceps should be used. An article on the subject by Professor Trail was published in the *Kew Bulletin*, p. 49, 1908.

SCIENTIFIC COMMITTEE, NOVEMBER 7, 1916.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and eleven members present.

A curious Willow.—Mr. J. Fraser, F.L.S., showed a specimen of a large-leaved form of *Salix repens* which is called *argentea*, and used at times for producing weeping trees by grafting or budding on an upright-growing stock. It occurs wild in sea sands here and there on the coast.

Cephalotus with partial Pitchers.—Mr. W. Hales, A.L.S., showed a well-grown specimen of *Cephalotus* with many well-developed pitchers and ordinary foliage leaves, and among the latter a leaf of structure intermediate between the pitcher and the foliage leaf.

Colour Standards.—Mr. J. Ramsbottom, M.A., remarked that a committee of the British Association had been formed to consider the question of producing an efficient colour standard chart, as the result of a paper he read at the meeting in 1915. The committee was not, on account of the war, sitting at the present time, but its meetings would be resumed as soon as possible.

Variiegated Tropaeolum majus.—He also said that he had examined the foliage of the *Tropaeolum* shown by Colonel Rawson at a recent meeting, and found the silver sheen upon it due to the separation of the epidermis from the subjacent tissue as in silver-leaf. A fungus was present, possibly a species of *Fusarium*, in some of the cells, but not in all, and he thought that it had followed, not caused, the disturbances in metabolism which had resulted in the variegation.

Abnormal Colchicum autumnale.—Mr. E. A. Bowles exhibited an abnormal *Colchicum* in which the floral segments were divided down to the base, very similar to the one figured in Sowerby's *British Botany*, but now flowering in autumn.

Rhodostachys andina.—Mr. Bowles also showed flowers of a Bromeliad raised from seed collected in Chile by Mr. Elwes, and probably *Rhodostachys andina*, figured in the *Bot. Mag.* t. 7148.

Uncommon Fruits.—Fruits of a variety of *Diospyros Kaki* called 'Vashomarri' and of *Encephalartos caffer* were shown from the Duke of Devonshire's gardens at Chatsworth.

Curious growth in Pear.—Mr. Sandeman, of Ware, sent a curious hard growth, consisting largely of sclerenchymatous cells, from the inside of a Pitmaston Duchess Pear. It seemed to be of gall nature, for on cutting it open two grubs of an unknown species were found feeding in it.

SCIENTIFIC COMMITTEE, NOVEMBER 21, 1916.

MR. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and six members present.

Ptelea trifoliata.—Mr. W. C. Worsdell, F.L.S., showed shoots of *Ptelea trifoliata* seedlings with five leaflets. The tree itself bears trifoliolate leaflets, but suckers at times have five leaflets, as in the case of the shoots shown, so that this character appears to be confined to the juvenile stage. No specimens in the Herbarium at Kew or the British Museum show five leaflets.

Damage by Stoke-hole Fumes &c.—Dr. J. A. Voelcker drew attention to specimens he had received showing damage to various plants, particularly in the occurrence of brown spots on the leaf-tissue by fumes from coke fires and ovens.

Damage to Apple by Capsid Bugs.—Mr. E. M. Holmes, F.L.S., sent an apple from a Wisbech garden having warts, russeted on the outside, over its surface, each of them with a brown stain about the middle. These, which seem to have become increasingly prevalent during the past few years, are the result of attacks by Capsid bugs upon the growing fruits.

Passiflora Failing to Flower.—Shoots of a Passion Flower which failed to produce flowers were received from Ashford. Neither the parent plant nor offshoots from it planted in different spots had flowered, and inspection of the shoots showed that they bore the leaves characteristic of immature shoots, not those characteristic of flowering shoots. It appears that the offshoots from *Passifloras* almost always take a considerable time to arrive at the flowering condition.

SCIENTIFIC COMMITTEE, DECEMBER 5, 1916.

MR. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and eight members present.

Terrestrial Orchid from New Zealand.—Mr. H. J. Elwes, F.R.S., referred to a terrestrial Orchid from New Zealand, grown from tubers

received from a correspondent in Shropshire, which he had exhibited on this occasion. He remarked upon its great likeness to an *Arisaema*, and thought it might possibly be *Pterostylis reflexa*. Sir Everard im Thurn said he had seen a very similar plant growing in considerable numbers in Australia.

Crocus from Salonika.—Mr. Bowles showed corms of a *Crocus* which he took to be *Crocus sativus* var. *Cartwrightianus*, from Salonika, in which the tunic was extended for 2 inches or more above the corm, forming a sort of cap. He thought this might be the result of soil conditions.

The Wild Morello Cherry.—Mr. J. Fraser, F.L.S., exhibited a fruiting specimen of *Prunus Cerasus* or Dwarf Cherry, from a Surrey wood, which he considered to be the origin of the cultivated Morello, because the wild and cultivated trees agree in their botanical characters. *P. Cerasus* may be recognized by its dwarf habit (3 to 8 feet) in the wild state, its small, leathery, glabrous leaves on a level with the branches (not drooping), and in being green at all stages of growth. The fruit is round, red, with a globular stone, and the acid juice does not stain. He also showed specimens of *P. Avium* for comparison. It makes a tree twenty to sixty feet high, with large, flaccid, drooping leaves, hairy on the veins beneath, and much tinted with red in their early stages. The fruit is heart-shaped, black or red, with a sweet or bitter (not acid) juice, that stains the hands. This he considered the origin of many of the sweet cherries of gardens.

FRUIT AND VEGETABLE COMMITTEE.

MAY 2, 1916.

Mr. J. CHEAL, V.M.H., in the Chair, and fourteen members present.

Award Recommended :—

Bronze Knightian Medal.

To Mr. P. Edlington, Whitchurch, for a collection of fruit.

Other Exhibits.

Mr. F. Davis, Pershore : Apple 'Pershore Pippin.'

Messrs. Foden, Hemel Hempstead : Apple 'Annie Elizabeth.'

Rev. C. R. Hardy, Canewdon : Apples.

Mr. A. Parsons, Broadway : Apples.

FRUIT AND VEGETABLE COMMITTEE, MAY 8, 1916.

SUB-COMMITTEE AT WISLEY.

Mr. J. CHEAL, V.M.H., in the Chair, and one member present.

The Sub-Committee inspected the trial of Autumn-sown Cabbage, and made the following recommendations for awards :—

First-class Certificate.

To Cabbage :—No. 85, 'Ellam's Early' (Barr).

Award of Merit.

To Cabbage :—Nos. 29, 'Eclipse', (Barr) ; 33, 'First and Best' (Barr) ; 73, 'Harbinger' (Sutton).

Highly Commended.

To Cabbage :—Nos. 22, 'Flower of Spring' (R. Veitch) ; 71, 'April' (Sutton) ; 102, 'Spring Beauty' (Bath).

Commended.

To Cabbage :—Nos. 30, 'Early Favourite' (Farr) ; 31, 'Favourite' (Sutton).

FRUIT AND VEGETABLE COMMITTEE, JUNE 2, 1916.

SUB-COMMITTEE AT WISLEY.

Mr. J. CHEAL, V.M.H., in the Chair, and one member present.

The Sub-Committee inspected the trial of Autumn-sown Cabbages, and made the following recommendations for awards :—

Highly Commended.

To Cabbage :—No. s24, ' Flower of Spring ' (*Sutton*); and 34, ' First and Best ' (*Barr*).

FRUIT AND VEGETABLE COMMITTEE, JUNE 6, 1916.

Mr. J. CHEAL, V.M.H., in the Chair, and eleven members present.

The awards recommended on May 8 and June 2 to Autumn-sown Cabbages at Wisley were confirmed. For descriptions see report of Spring Cabbages at Wisley, 1916.

Exhibit.

Messrs. Laxton, Bedford : Strawberries.

The question of Peaches and Nectarines not fruiting this year, although they flowered profusely both inside and outside, was raised at the Committee. The general opinion was that it was caused by climatic conditions, and not by faulty cultivation.

FRUIT AND VEGETABLE COMMITTEE, JUNE 20, 1916.

Mr. J. CHEAL, V.M.H., in the Chair, and eleven members present.

No awards were recommended on this occasion.

Exhibit.

Messrs. Bunyard, Maidstone : Cherries.

The Committee expressed the great loss which they felt on the death of Mr. Wythes, who was for many years a member of this Committee.

FRUIT AND VEGETABLE COMMITTEE, JULY 4, 1916.

AT HOLLAND PARK.

Mr. J. CHEAL, V.M.H., in the Chair, and fifteen members present.

[For Cups and Medals awarded by the Council after consultation with the Judges, see p. lxxxix.]

No awards were recommended on this occasion.

FRUIT AND VEGETABLE COMMITTEE, JULY 18, 1916.

Mr. J. CHEAL, V.M.H., in the Chair, and thirteen members present.

Awards Recommended :—

Gold Medal.

To Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), Elstree, for vegetables.

Silver-gilt Knightian Medal.

To Major Astor, M.P. (gr. Mr. Camm), Taplow, for 'Black Hambro' Grapes and Strawberries.

Silver-gilt Banksian Medal.

To Messrs. Moritzson, Dunedin, New Zealand, for Apples.

Silver Knightian Medal.

To Messrs. Paul, Waltham Cross, for fruit trees in pots.

Silver Lindley Medal.

To Mr. E. Beckett, V.M.H. (gr. to Hon. Vicary Gibbs), Elstree, for skill in cultivation of vegetables.

Silver Banksian Medal.

To the Church Army Gardens, London, for vegetables.

To Mr. C. W. Muir, Penn, for Cherries.

To Messrs. Sutton, Reading, for educational exhibit of Peas.

Other Exhibits.

Mr. Bucknall, Orpington : Red Currants.

Messrs. Bunyard, Maidstone : Currants.

Mr. H. Close, Orpington : Currants.

Messrs. Hobbies, Dereham : Tomato 'The General.'

Mr. J. J. Kettle, Wimborne : Raspberries.

Messrs. Laxton, Bedford : Raspberries.

Mr. R. C. Notcutt, Woodbridge : Potato 'Keen's Seedling.'

Mr. C. E. Powell, Binfield : Raspberries.

Messrs. Rivers, Sawbridgeworth : Cherries.

Mr. C. Turner, Slough : Cherries.

FRUIT AND VEGETABLE COMMITTEE, JULY 17, 1916.

SUB-COMMITTEE AT WISLEY.

Mr. J. CHEAL, V.M.H., in the Chair, and two members present.

A Sub-Committee inspected the Trial of Mid-season Peas and made the following recommendations for awards :—

Award of Merit.

To Peas :—Nos. 116, 'Clipper' (Sydenham); 65, 'Improved Queen' (Carter); 51, 'Jersey Hero' (Nutting); 87, 'Market Gardener' (Carter); 112 and 113, 'Quite Content' (Barr, Carter) (F.C.C. 1906); 47, 'Royal Salute' (Dickson); 106, 'Market King' (Carter); 9, 'The Newby' (Hurst).

Highly Commended.

Peas :—Nos. 35, 'Best of All' (Sydenham); 5, 'Buttercup' (Carter); 2, 'Daisy' (Simpson); 42, 'Gradus' (Simpson) (F.C.C.:

1887); 94, 'Model Telephone' (Carter); 64, 'Red Cross' (Sim); 15, 'Stratagem' (Carter) (F.C.C. 1882); 110, 'Centenary' (Sutton) (A.M. 1911); 11, 'Favourite' (Sutton); 27, 'Peerless' (Sutton) (F.C.C. 1903); 114, 'King George' (Webb); 88, 'Reliance Marrowfat' (Webb).

Previous Award Confirmed.

Peas :—Nos. 17, 'Danby Stratagem' (Carter) (A.M. 1901); 97, 'Duke of Albany, Selected Stock' (Sutton) (A.M. 1901); 7, 'Evergreen Delicatesse' (Carter) (A.M. 1908); 86, 'Harvestman' (Carter) (A.M. 1908); 85, 'International' (Carter) (A.M. 1908); 54, 'Magnum Bonum' (Barr) (A.M. 1910); 109, 'Prince of Peas' (Sutton) (A.M. 1910); 98, 'Duke of Albany, Reselected' (Carter) (A.M. 1901); 90, 'Sharpe's Standard' (Barr) (A.M. 1900).

FRUIT AND VEGETABLE COMMITTEE, AUGUST 1, 1916.

Mr. A. H. PEARSON, J.P., V.M.H., in the Chair, and seven members present.

Awards Recommended :—

Silver-gilt Knightian Medal.

To Mr. J. C. Allgrove, Slough, for Gooseberries.

Silver-gilt Banksian Medal.

To Mrs. Salamon (gr. Mr. Kent), Dorking, for Gooseberries.

Award of Merit.

To Plum 'Early Laxton' (votes, six for), from Messrs. Laxton, Bedford. A very early variety, of medium size, round in shape, and bluish red in colour. It is the result of a cross between 'Rivers' Early' and 'Early Yellow.'

To Red Currant 'Laxton's Perfection' (votes, unanimous), from Messrs. Laxton, Bedford. A very desirable variety, distinct in foliage and growth. It bears long racemes of fruit.

Cultural Commendation.

To Mr. T. Eames, Elstree, for dish of Pea 'Quite Content.'

To the R.H.S. Gardens, Wisley, for a collection of Peas.

Other Exhibits.

Mr. E. A. Bunyard, Maidstone : Currants.

Hon. V. Gibbs, Elstree : Cherries.

Mr. T. Hitch, Tarporley : Melon.

Mr. F. W. Hunt, Northampton : Runner Beans.

Major Joicey, Fairford : Melon 'Poulton Priory.'

Messrs. Spooner, Hounslow : Apples.

FRUIT AND VEGETABLE COMMITTEE, AUGUST 8, 1916.

SUB-COMMITTEE AT WISLEY.

Mr. J. CHEAL, V.M.H., in the Chair, and two members present.

A Sub-Committee inspected the Trial of Mid-season Peas and made the following recommendations for awards :—

Awards Recommended :—

Award of Merit.

To Pea No. 52, 'Perpetual' (Sutton).

Highly Commended.

Pea No. 18, 'The Victor' (Johnson).

Commended.

Peas :—Nos. 96, 'Alderman' (Simpson) (F.C.C. 1900); 12, 'Commonwealth' (Carter); 40, 'Magnificent' (Barr) (F.C.C. 1884); 119, 'Ne Plus Ultra' (Sydenham); 48, 'Paragon' (Dickson & Robinson); 57, 'Best of All' (Sutton); 21, 'Discovery' (Sutton); 61, 'Incomparable' (Sutton); 20, 'Prize-winner' (Sutton) (F.C.C. 1901); 111, 'Up-to-Date' (Sutton); 108, 'The V.C.' (Sutton); 83, 'William Richardson' (Nutting).

Previous Award Confirmed.

Peas :—Nos. 66, 'Glory of Devon' (Barr) (A.M. 1899); 56, 'Continuity' (Sutton) (A.M. 1898); 55, 'Masterpiece' (Sutton) (A.M. 1913); 63, 'Matchless' (Sutton) (A.M. 1911); 41, 'Satisfaction' (Sutton) (A.M. 1910).

FRUIT AND VEGETABLE COMMITTEE, AUGUST 15, 1916.

Mr. J. CHEAL, V.M.H., in the Chair, and seven members present.

Awards Recommended :—

Award of Merit.

To Raspberry 'Laxton's Bountiful' (votes unanimous), from Messrs. Laxton, Bedford. A very strong-growing and prolific summer-fruited variety, bearing very large deep-red fruits of good flavour.

The recommendations for awards to Mid-season Peas made by the Sub-Committees at Wisley on July 17 and August 8 were confirmed. For descriptions see Report of Mid-season Peas at Wisley, 1916.

Other Exhibits.

Messrs. Cheal, Crawley: Potatos.

Dr. Durham, Hereford: Pea 'Little Breton.'

FRUIT AND VEGETABLE COMMITTEE, AUGUST 25, 1916.

SUB-COMMITTEE AT WISLEY.

Mr. J. CHEAL, V.M.H., in the Chair, and three members present.

The following awards to Tomatos were recommended :—

First-class Certificate.

No. 109, 'Golden Sunrise' (Carter).

Award of Merit.

Nos. 103, 104, 'Golden Nugget' (Sutton, Barr); No. 26, 'Kondine Red' (Cobley); No. 27, 'Kondine Red Selected' (Laxton); No. 41, 'Merrivale' (Cragg); No. 69, 'Water Baby' (Balch); No. 95, 'Winter Coral' (Camm).

Highly Commended.

No. 29, 'Aviator' (Dickson & Robinson); No. 76, 'Best of All' (Sutton); No. 1, 'Evesham Wonder' (Harvey); No. 105, 'Golden Perfection' (Sutton); No. 77, 'Ham Green Favourite' (Barr) (F.C.C. 1887); No. 13, 'Muirtown Seedling' (White), syn. 'Sunrise'; No. 79, 'Princess of Wales' (Sutton) (A.M. 1905); No. 36, 'Sunrise' ♀ × 'Merrivale' ♂ (R.H.S. Wisley).

Commended.

No. 82, 'Ayrshire' (Balch) (A.M. 1900); No. 14, 'Beat All Selected' (Laxton); No. 31, 'Moneymaker' (Dickson & Robinson); No. 44, 'Model' (Dobbie); No. 86, 'Northern King' (Barr); No. 81, 'Stockwood Seedling No. 1' (Rodman).

FRUIT AND VEGETABLE COMMITTEE, AUGUST 29, 1916.

Mr. J. CHEAL, V.M.H., in the Chair, and nine members present.

Awards Recommended :—

Gold Medal.

To C. A. Cain, Esq. (gr. Mr. T. Pateman), Welwyn, for a collection of fruit.

Silver Knightian Medal.

To Mr. J. C. Allgrove, Slough, for a collection of fruit.

The recommendations for awards to Tomatos made by the Sub-Committee at Wisley on August 25 were approved. For descriptions see Report on Tomatos under Glass at Wisley, 1916.

Other Exhibits.

Mr. F. Attrill, Ventnor : Apples.

Mr. T. Denny, Blandford : Runner Bean 'Perfection Longpod.'

Mr. S. F. Paris, Watford : seedling Apple.

Mr. C. Turner, Slough : Apple 'Lady Sudeley.'

Mr. J. Whittaker, Barnoldswick : Celery 'Craven Pink' and 'Craven White.'

FRUIT AND VEGETABLE COMMITTEE, SEPTEMBER 5, 1916.

SUB-COMMITTEE AT WISLEY.

Mr. OWEN THOMAS, V.M.H., in the Chair, and four members present.

A Sub-Committee inspected the Trial of Late Potatos, and made recommendations for awards to be approved at the meeting of the full Committee.

FRUIT AND VEGETABLE COMMITTEE, SEPTEMBER 12, 1916.

Mr. J. CHEAL, V.M.H., in the Chair, and thirteen members present.

Awards Recommended : —

Silver-gilt Knightian Medal.

To C. G. A. Nix, Esq. (gr. Mr. E. Neal), Crawley, for collection of fruit.

Silver Knightian Medal.

To Messrs. Spooner, Hounslow, for Apples.

Award of Merit.

To Black Currant 'Daniels' September Black' (votes unanimous) from Messrs. Daniels, Norwich. A remarkably free-bearing variety, with large bunches of fine fruit, which are said to hang on the bushes till the end of September. The fruit and branches exhibited before the Committee had been picked from a large plantation in an open field. It should prove an acquisition by reason of its lateness.

The awards recommended by the Sub-Committee at Wisley to Late Potatos on September 5 were confirmed as follow. For descriptions see Report on Maincrop Potatoes at Wisley, 1916.

Highly Commended.

No. 93, 'Donside Defiance' (Cook); No. 88, 'King Edward' (Dobbie); No. 76, 'Rob Roy' (Veitch).

Commended.

No. 18, 'Arran Chief' (Dobbie); No. 6, 'Cropper' (Anketell-Jones); No. 58, 'Drumwhindle' (Gavin); No. 89, 'Irish Chieftain

(Lissadell); No. 74, 'Langworthy' (Dobbie); No. 30, 'Prolific' (Dobbie); No. 42, 'Superlative' (Sutton); No. 10, 'The Chapman' (Dobbie); No. 83, 'The Factor,' **F.C.C.** 1905 (Dobbie); No. 8, 'The Provost,' **A.M.** 1907 (Dobbie); No. 65, 'White City' (Sutton).

Other Exhibits.

Messrs. Bunyard, Maidstone: Strawberry 'St. Fiacre.'
Mr. H. Close, Orpington: seedling Crab.
Messrs. Laxton, Bedford: Apples.
Miss Portal, Stockbridge: Apple.

FRUIT AND VEGETABLE COMMITTEE, SEPTEMBER 26, 1916.

Mr. J. CHEAL, V.M.H., in the Chair, and fourteen members present.

Awards Recommended:—

Gold Medal.

To Messrs. Webb, Stourbridge, for a collection of vegetables.

Silver Knightian Medal.

To Mr. J. C. Allgrove, Slough, for Apple trees in pots.
To Messrs. Dickson & Robinson, Manchester, for Onions.
To Purfleet Council School, Essex, for fruit.
To Messrs. Sutton, Reading, for Beans.

Other Exhibits.

Messrs. Bunyard, Maidstone: seedling Apple.
Mr. J. T. Cole, Maidstone: Apple 'Reliance.'
Mr. P. O. Lawrence, Wimbledon: Apples.
Mr. Sanderson, Chislehurst: Perennial Kale.
Mr. W. F. Ware, Fremington: Tomato 'Holmes' Ideal.'
Mr. W. West, Alton: Grape 'Princess of Wales.'

FRUIT AND VEGETABLE COMMITTEE, OCTOBER 3, 1916.

BRITISH FRUIT SHOW.

Mr. A. H. PEARSON, J.P., V.M.H., in the Chair, and twenty-eight members present.

No awards were recommended on this occasion.

Exhibits.

Mr. E. Beckett, V.M.H., Elstree: Cooper's Black Grape.
Rev. M. C. H. Bird, M.A., Stalham: Apples for naming.
Mr. H. Close, Orpington: Apples and Gage 'Little Croft Gem.'

- Mr. G. E. Dyke, Milborne Port : Apple 'Kingsbury Pippin.'
 Messrs. Harrison, Leicester : Apple for naming and Marrow-stem
 Kale.
 Mr. A. Tidy, Cobham : Apple 'Ottershaw Pippin.'
 Mr. W. Wilmot, Langley Mill : Apple 'Mrs. Wilmot's Seedling.'
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FRUIT AND VEGETABLE COMMITTEE, OCTOBER 10, 1916.

Mr. J. CHEAL, V.M.H., in the Chair, and six members present.

Awards Recommended : —*Silver Hogg Medal.*

To C. A. Cain, Esq., J.P. (gr. Mr. T. Pateman), Welwyn, for a collection of fruit.

Silver Knightian Medal.

To The Barnham Nurseries, Barnham Junction, for Apples.

Silver Banksian Medal.

To J. Chivers, Esq., Cambridge, for a collection of fruit.

Other Exhibits.

- Mr. C. Bradshaw, Hillsborough : Grape 'Cooper's Black.'
 C. A. Nix, Esq., Crawley : *Cydonia japonica Wilsonae*.
 Mr. W. Roberts, Melmore : Grape 'Cooper's Black.'
 Sir Albert Rollit, LL.D., D.C.L., Chertsey : *Musa Ensete* in flower.
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FRUIT AND VEGETABLE COMMITTEE, OCTOBER 24, 1916.

Mr. J. CHEAL, V.M.H., in the Chair, and eleven members present.

Award Recommended : —*Award of Merit.*

To Plum 'Orpington Prolific' (votes 8 for, 3 against), from Mr. H. Close, Orpington. A small oval Gage Plum of a greenish-yellow colour when ripe, sometimes covered with russet. It has a good Gage flavour, and is a very valuable variety on account of its lateness. It ripens from the end of October to early in November, and is a prolific bearer and a free grower.

Other Exhibits.

- Messrs. Chapman, Rye : Capsicum 'Rotherside Mammoth.'
 Hon. Vicary Gibbs, Elstree : collections of Black Grapes for comparison with 'Cooper's Black' Grape.

FRUIT AND VEGETABLE COMMITTEE, NOVEMBER 7, 1916.

Mr. J. CHEAL, V.M.H., in the Chair, and thirteen members present.

Awards Recommended :—

Silver Banksian Medal.

To the Duke of Devonshire (gr. Mr. F. Jennings), Chatsworth, for *Diospyros Kaki* 'Vashomarri' and *Encephalartos caffer*.

To Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), Elstree, for Leeks and Celery.

Other Exhibits.

Messrs. Bunyard, Maidstone : seedling Apple.

Messrs. Daniels, Norwich : seedling Apple.

Mr. A. Edmonds, Stroud : seedling Apple.

FRUIT AND VEGETABLE COMMITTEE, NOVEMBER 9, 1916.

SUB-COMMITTEE AT WISLEY.

Mr. J. CHEAL, V.M.H., in the Chair, and three members present.

A Sub-Committee inspected the trial of Savoys and made recommendations for awards to be approved at the meeting of the full Committee.

FRUIT AND VEGETABLE COMMITTEE, NOVEMBER 21, 1916.

Mr. A. H. PEARSON, J.P., V.M.H., and eight members present.

Awards Recommended :—

Award of Merit.

To Savoy 'Norwegian,' from Messrs. Barr, Covent Garden.

To Savoy 'Perfection,' from Messrs. Sutton, Reading.

Highly Commended.

Savoy 'Sugarloaf,' from Messrs. Sutton, Reading.

Commended.

Savoy 'Drumhead Covent Garden Late,' from Messrs. Watkins & Simpson, London.

Savoy 'Perfection,' from Messrs. Hurst, London.

Savoy 'Selected Drumhead' (as an early variety, good for market), from Messrs. Sutton, Reading.

Savoy 'Tom Thumb Re-selected,' from Messrs. Carter, Raynes Park.

For descriptions of the above see the report on Savoys tried at Wisley, 1916.

Other Exhibits.

Mr. W. Green, Horley : seedling Apple.
Messrs. Seabrook, Chelmsford : Apples.
Mrs. Walmsley, Stoke Poges : Apples.

FRUIT AND VEGETABLE COMMITTEE, DECEMBER 5, 1916.

Mr. J. CHEAL, V.M.H., in the Chair, and eight members present.

No awards were recommended on this occasion.

Exhibits.

J. T. Charlesworth, Esq., Nutfield : Apple 'Nutfield Beauty.'
W. North-Row, Esq., Tiverton : Quince and Apples for naming.

FRUIT AND VEGETABLE COMMITTEE, DECEMBER 14, 1916.

SUB-COMMITTEE AT WISLEY.

Mr. W. POUPART in the Chair, and two members present.

A Sub-Committee inspected the trials of Celery and Celeriac and made recommendations for awards to be approved at the meeting of the full Committee.

FLORAL COMMITTEE.

MAY 2, 1916.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-five members present.

Awards Recommended :

Silver-gilt Banksian Medal.

To Messrs. B. R. Cant, Colchester, for Roses.

Silver Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Cutbush, Highgate, for Carnations, Roses, and shrubs.

To Messrs. Cuthbert, Southgate, for miscellaneous flowering plants.

To Messrs. Low, Enfield, for Carnations &c.

To Messrs. Piper, Langley, for alpines, Clematis and clipped trees.

To Messrs. Ware, Feltham, for hardy plants.

Silver Banksian Medal.

To Messrs. Baker, Wolverhampton, for alpines.

To Messrs. Gill, Falmouth, for Rhododendrons.

To Messrs. May, Upper Edmonton, for hardy ferns and flowering plants.

Bronze Flora Medal.

To Mr. J. Douglas, Great Bookham, for Auriculas.

To Mr. E. J. Hicks, Twyford, for Roses.

To Mr. G. Reuthe, Keston, for flowering shrubs, alpines, &c.

To Mr. L. R. Russell, Richmond, for flowering shrubs.

Bronze Banksian Medal.

To Mr. J. C. Allgrove, Slough, for hardy plants.

To Messrs. Cheal, Crawley, for flowering shrubs and alpines.

To Miss C. M. Dixon, Edenbridge, for Polyanthus.

To Mr. G. Kerswill, Exeter, for Gentians.

To Mr. G. W. Miller, Wisbech, for hardy plants.

To Messrs. Waterer, Sons, & Crisp, Bagshot, for hardy plants.

To Messrs. Whitelegg and Page, Chislehurst, for hardy plants.

Award of Merit.

To Carnation 'Lord Kitchener' (votes unanimous), from Messrs. Wells, Merstham. This fine Carnation is a variety of the perpetual-flowering type. The bloom is large and full-petalled, the colour being bright pink with salmon sheen in the centre. The stems are unusually stiff and wiry.

To *Dianthus microlepis rumelicus* (votes 15 for, 1 against), from Messrs. Tucker, Oxford. This small, tufted Pink is a native of the mountains of Thrace and has numerous clear pink flowers.

To *Primula conica* (votes 14 for), from Messrs. Wallace, Colchester. A species of the Muscarioides section. The inflorescence is a crowded spike of lavender-purple blooms, forming a dense head. The stalks are hairy and about 9 in. long. The blooms are about $\frac{1}{4}$ in. across at the mouth and a paler colour in the interior. The leaves are spatulate, about 6 in. long, with short silky hairs. (Fig. 108.)

To *Ribes cruentum* (votes unanimous), from Mr. C. Elliott, Stevenage. An interesting species from North California forming a dwarf, diffusely branched shrub, spiny, and bearing three or five-lobed leaves a little smaller than those of the Gooseberry. The flowers are pendulous and about 1 in. long, the recurving outer petals being crimson maroon, the inner ones tubular and of shell-pink tint with white tips. The shoots are covered with long spines. (Fig. 109.)

Other Exhibits.

Messrs. Barr, Taplow : Saxifrages.

Messrs. Bath, Wisbech : Polyanthus.

Messrs. Cannell, Eynsford : Pelargoniums.

Mr. J. Crook, Camberley : Polyanthus.

Messrs. Fletcher, Ottershaw : Deutzias.

Misses Hopkins, Shepperton : hardy plants.

Col. Mark Lockwood, M.P., Romford : Seedling Carnation.

Messrs. Carter Page, London : Violas.

Miss Willmott, V.M.H., Warley : alpinas.

FLORAL COMMITTEE, MAY 16, 1916.

Mr. H. B. MAY, V.M.H., in the Chair, and nineteen members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. B. R. Cant, Colchester, for Roses.

Silver-gilt Banksian Medal.

To Messrs. F. Cant, Colchester, for Roses.

Silver Flora Medal.

To Messrs. Cuthbert, Southgate, for Antirrhinums.

To Messrs. May, Upper Edmonton, for miscellaneous plants.

Silver Banksian Medal.

To Mr. J. Douglas, Gt. Bookham, for Auriculas.

To Mrs. Lloyd Edwards, Llangollen, for Saxifrages.

To Mr. G. W. Miller, Wisbech, for hardy plants.

To Messrs. Whitelegg & Page, Chislehurst, for Schizanthus.

Bronze Flora Medal.

To Mr. E. J. Hicks, Twyford, for Roses.

Bronze Banksian Medal.

To Messrs. Barr, Taplow, for Irises.

To Messrs. Cheal, Crawley, for alpinas and shrubs.

To Messrs. Gill, Falmouth, for Rhododendrons.

To Mr. G. Kerswill, Exeter, for Gentians.

To Messrs. Low, Enfield, for Carnations.

To Messrs. Piper, Langley, for trees and hardy plants.

To Messrs. Reamsbottom, Geashill, for Anemones.

To Mr. G. Reuthe, Keston, for hardy shrubs and alpinas.

Award of Merit.

To *Auricula* 'Edith' (votes 12 for), from Mr. C. Turner, Slough. A distinct pale violet-lilac variety. The flowers are perfect in form, large, and have a well-defined pale sulphur-yellow paste.

To Carnation 'J. G. Fortescue' (votes 17 for, 1 against), from J. B. Fortescue, Esq., Maidenhead. This is a Malmaison variety, which originated as a sport from 'Horace Hutchinson.' The flowers are large, very full, and of good shape. The colour is white, streaked with red. One of the most pleasing features of this variety is its delicious scent.

To *Daphne Verlotii* (votes 9 for), from Messrs. Waterer, Sons, & Crisp, Bagshot. An evergreen dwarf shrub bearing heads of rich rosy pink, fragrant flowers, less numerous and less densely packed than those of *D. Cneorum*.

To *Pyrus Malus aldenhamensis* (votes 14 for), from Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), Elstree. This is a very striking dark reddish violet variety of *Pyrus Malus*, and is probably of garden origin. It is closely allied to *P. Niedzwetzkyana*, but is said to be superior to it in colour and in the lasting of the flowers. It also flowers later. The fruits much resemble those of *Prunus Pissardii*.

To Rose 'C. E. Shea' (votes 13 for, 4 against), from Mr. E. J. Hicks, Twyford. A deep rosy pink Hybrid Tea variety of good form and size.

To *Saxifraga* 'J. C. Lloyd Edwards' (votes unanimous), from Mrs. Lloyd Edwards, Llangollen. A dwarf mossy variety with large bright rose flowers having a yellow eye. The flowers are borne about 4 inches above the foliage.

To *Saxifraga* 'Mrs. R. T. Wickham' (votes 7 for, 3 against), from Mrs. Lloyd Edwards, Llangollen. A very free-flowering variety of the Mossy section, bearing on dark stems large rose-coloured flowers streaked with a deeper shade. The height of the plants is about 8 inches.

Other Exhibits.

Messrs. Bees, Liverpool: *Isopyrum grandiflorum*.

Messrs. Cutbush, Highgate: miscellaneous plants.

Messrs. Grove, Sutton Coldfield : *Geum* 'Grove's Glory.'
 Misses Hopkins, Shepperton : rock garden.
 Mr. O'Fflahertie, Arreton : *Phyllocactus* 'Marjorie.'
 Messrs. Wallace, Colchester : *Primula membranifolia*.
 Mr. W. West, Holt Hatch : *Amaryllis* 'Victory.'
 Mr. H. Whitehead, Cheltenham : *Lobelia* 'Alice Whitehead.'

FLORAL COMMITTEE, MAY 18, 1916.

SUB-COMMITTEE AT WISLEY.

Mr. H. B. MAY, V.M.H., in the Chair, and five members present.

A Sub-Committee inspected the Trial of Bearded Irises and made the following recommendations for awards, to be approved at the meeting of the full Committee.

Awards Recommended :—

Award of Merit.

To Irises 'Etta,' 'Dorothea,' *Fieberi*, 'Ingeborg,' 'Kharput,' *Kochii*, 'Prince Victor,' and 'Royal.'

Highly Commended.

To Irises *albicans*, 'Argus,' 'Charmante,' 'Delphine,' *florentina*, *germanica*, *Hookeri*, 'Horace,' 'King Christian,' *lutescens aurea*, *missouriensis*, 'Osiris,' *pallida fol.* var., 'Purple King,' and 'Valhalla.'

Commended.

To Irises 'Goldfinch' and 'Standard.'

FLORAL COMMITTEE, MAY 23, 1916.

AT CHELSEA.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-four members present.

[For Cups and Medals awarded by the Council after consultation with the Judges, see p. lxxxii.]

Awards Recommended :—

Award of Merit.

To *Androsace coccinea* (votes 12 for), from Messrs. Bees, Liverpool. A sun-loving species collected by Mr. G. Forrest in China during 1911. The flowers are borne in a capitate umbel, and are carmine-red in colour. The foliage forms a small, close rosette, from which the inflorescence arises.

To Carnation 'Sweet Anne Page' (votes 10 for, 3 against), from Mr. J. Douglas, Great Bookham. A border variety of good size and

substance. The ground colour is pale yellow, heavily streaked with lilac-mauve.

To *Clematis* 'Crimson King' (votes unanimous), from Messrs. Jackman, Woking. A variety of the *Jackmanii* type, bearing large rosy crimson flowers.

To *Iris bracteata* (votes 10 for), from Messrs. Wallace, Colchester. A fairly dwarf Californian species, having broad horizontal falls of a creamy yellow colour veined with purple. (Fig. 110.)

To Lilac 'President Fallières' (votes unanimous), from Mr. R. C. Notcutt, Woodbridge. A pale lilac-mauve double variety, bearing its flowers in a good and not overcrowded truss.

To Lilac 'Réaumur' (votes 11 for, 1 against), from Mr. C. Turner, Slough. A very deep mauve variety, having large individual flowers borne in a big dense truss.

To Pæony 'Ceres' (votes 9 for, 1 against), from Messrs. Barr, Taplow. A bright cerise pink single variety, with a mass of golden anthers. The foliage is small and deeply lobed.

To *Papaver orientale* 'King George' (votes 10 for), from Mr. A. Perry, Enfield. The flowers of this variety are deeply fringed and are bright scarlet in colour, with black blotches at the base of the petals.

To *Primula conspersa* (votes 7 for, 3 against), from Messrs. Bees, Liverpool. A beautiful Primula of the *farinosa* section, collected by Mr. R. Farrer on the Tibetan Alps. The rose-pink flowers are borne in whorls, often having three tiers. The scapes are about a foot high, and, like the calyces, are farinose. The foliage is ovate-linear in shape, with notched margins.

To *Primula helodoxa* (votes 10 for), from Messrs. Wallace, Colchester. A new species introduced by Mr. G. Forrest from Western China. The flower spikes are about 2½ feet high, and carry often as many as seven whorls of large deep yellow flowers. This plant has so far proved to be hardy in the Edinburgh Botanic Gardens.

To *Rhododendron* 'Bagshot Ruby' (votes 14 for), from Messrs. Waterer, Sons & Crisp, Bagshot. A very free-flowering variety, having bright red flowers borne in fine conical trusses.

To Rose 'Molly Bligh' (votes 14 for), from Messrs. A. Dickson, Newtownards. A Hybrid Tea variety of fine form and possessing some fragrance. The colour is rosy pink.

To *Sedum humifusum* (votes 10 for, 1 against), from Mr. R. Prichard, West Moors. A small carpeting species with golden yellow flowers. Its hardiness remains to be proved.

To *Spiraea* 'Princess Mary' (votes 10 for, 4 against), from Messrs. Rochford, Broxbourne. A very fine deep rose-pink variety.

To Sweet Pea 'Dora' (votes 9 for), from Messrs. Dobbie, Edinburgh. The standards of this variety are salmon-pink in colour, faintly suffused with rose, while the wings are of a very much paler shade. This is said to be an excellent variety for growing under glass.

Other Exhibits.

Mr. A. P. Bruce, Chorlton-cum-Hardy: *Sarracenia Ashbridgei*,
Dionaea muscipula erecta.

Messrs. H. Chapman, Rye: Irises.

Messrs. Clark, Dover: *Calceolaria violacea rustica*, Stock 'F. D. Hopper'

Hon. V. Gibbs, Elstree: new unnamed species of *Gunnera*.

Messrs. Low, Bush Hill Park: Carnations and Gloxinias.

Mr. R. Malby, Woodford: *Edraianthus serpyllifolius* 'White Queen' and *E. serpyllifolius* 'Amethyst.'

Miss Mangles, Seale: *Rhododendron* 'Tara.'

Mrs. Martineau, Twyford: strain of *Iris sibirica*.

Mr. G. Reuthe, Keston: *Azalea Maxwelli*, *Rhododendron Roylei magnificentum*.

Mr. L. R. Russell, Richmond: *Solanum jasminoides variegata*.

Messrs. Ware, Feltham: *Begonia* 'Ethel Deane.'

Miss E. Willmott, Warley: *Tritonia* 'Prince of Orange.'

 FLORAL COMMITTEE, JUNE 2, 1916.

SUB-COMMITTEE AT WISLEY.

Mr. H. B. MAY, V.M.H., in the Chair, and five members present.

A Sub-Committee inspected the Trial of Bearded Irises and made the following recommendations for awards:—

Awards Recommended:—*First-class Certificate.*

To 'Alcazar.'

Award of Merit.

To 'Benbow,' 'Diane,' 'Eldorado,' 'Gagus,' 'Iris King,' 'Isoline,' 'Jeanne d'Arc,' 'Katerina,' 'Lady Foster,' 'Lohengrin,' 'Morwell,' 'Nibelungen,' 'Oriflamme,' *pallida dalmatica*, 'Prosper Laugier,' and 'Rhein Nixe.'

Highly Commended.

To 'Albert Victor,' 'Amas,' 'Arnols,' 'Assyrie,' 'Aurea,' 'Caprice,' 'Céleste,' 'Crusader,' 'Dalmarius,' 'Delicata,' *flavescens*, 'Gracchus,' 'Isola,' 'Loreley,' 'Madame Chereau,' 'Miss Eardley,' 'Mme. Blanche Pion,' 'Mrs. Allan Gray,' 'Mrs. H. Darwin,' 'Mrs. Neubronner,' 'Parisiana,' 'Perfection,' 'Porsenna,' 'Princess Victoria Louise,' 'Queen Mary,' 'Queen of May,' 'Ring Dove,' 'Shelford Chieftain,' 'Sincerity,' 'Stamboul,' 'Standard Bearer,' 'Tamerlaine,' 'Troyana (Guildford),' and 'Zephyr.'

Commended.

'Á Loute,' 'Archevêque,' 'Beauty,' 'Comtesse de Courcy,' 'Con-

fucius,' 'Cordelia,' 'Dr. Bernice,' 'Elizabeth,' 'Fro,' *germanica alba*,
'Grand Bouquet,' 'Hilda,' 'Kathleen,' 'Kitty Reuthe,' 'L'Honorable,'
'Meimung,' 'Miss Maggie,' 'Mithras,' 'Monsignor,' 'Mrs. Leonard
Loat,' 'Oporto,' 'Petit Vitry,' 'Porcelain,' 'Prince of Orange,' 'Pro-
pendens,' 'Reggie,' 'Sibyl,' 'Sphax,' 'Vésuve,' 'Viola,' and 'Virginie.'

FLORAL COMMITTEE, JUNE 6, 1916.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-seven members
present.

Awards Recommended :—

Gold Medal.

To Messrs. Dobbie, Edinburgh, for Sweet Peas and Antirrhinums.

Silver-gilt Flora Medal.

To Messrs. Kelway, Langport, for Pæonies and Delphiniums.

To Messrs. Waterer, Sons, & Crisp, Bagshot, for Rhododendrons
and hardy plants.

Silver-gilt Banksian Medal.

To Messrs. Bide, Farnham, for Sweet Peas.

To Messrs. Peed, Norwood, for Gloxinias.

Silver Flora Medal.

To Messrs. Cuthbert, Southgate, for Clarkias and Antirrhinums.

To Mr. E. J. Hicks, Twyford, for Roses.

To Messrs. Jackman, Woking, for hardy plants.

To Messrs. May, Upper Edmonton, for miscellaneous plants.

To Mr. C. Turner, Slough, for Philadelphus and Deutzias.

To Messrs. Wallace, Colchester, for Irises.

Silver Banksian Medal.

To Mr. J. C. Allgrove, Slough, for hardy plants.

To Mrs. Burns, Hatfield, for White Amaryllis.

To Messrs. B. R. Cant, Colchester, for Roses.

To Messrs. Cheal, Crawley, for hardy shrubs and flowers.

To Messrs. Low, Enfield, for Carnations.

To Mr. G. W. Miller, Wisbech, for hardy plants.

To Mr. A. Perry, Enfield, for hardy plants.

To Mr. G. Prince, Longworth, for Roses.

Bronze Banksian Medal.

To Messrs. Baker, Codsall, for hardy plants.

First-class Certificate.

To *Meconopsis simplicifolia*, Bailey's variety (votes 20 for), from
Edinburgh Botanic Garden. This very handsome variety was found
by Captain Bailey in Eastern Tibet in the region of the Sanpo River,



FIG. 108.—PRIMULA CONICA (*Garden*).
(p. clv.)

[*To face p. clx.*



FIG. 109.—*RIBES CRUENTUM* (*Gard. Chron.*).
(p. clv.)

where rain is very abundant. The plant exhibited carried one fine flower measuring about 3 inches across. It was borne on a stem nearly 2 feet high, and was of a beautiful Antwerp-blue colour ('Répertoire de Couleurs'). The mass of golden stamens added greatly to the charm of the flower.

To *Nomocharis pardanthina* (votes 15 for), from Edinburgh Botanic Garden. This lovely plant, the sole representative of its genus, was found by Forrest in Yunnan. It is very nearly related to *Lilium* and *Fritillaria*. The flowers are drooping and about 2 inches across. They are of a reddish-rose colour, and have three inner broad ovate segments with serrated edges, and three outer narrower lanceolate segments with entire edges and spotted at the base with crimson. There are six large, prominent golden anthers. The lily-like foliage is borne in whorls on the flower stem. The individual leaves are about 1 inch long and lanceolate in shape. (Fig. III.)

Award of Merit.

To *Iris laevigata* (votes 17 for), from Mr. C. W. Christie-Miller, Sonning. A beautiful species of water-side Iris growing from 18 to 30 inches high and bearing deep violet-blue flowers having a streak of white on the falls.

To *Iris* 'Rembrandt' (votes 20 for, 1 against), from Messrs. Dobbie, Edinburgh. A Dutch Iris with broad falls of light Cambridge blue, having a large deep golden yellow blotch and standards of deep blue.

To *Rhododendron* 'Diphole Pink' (votes 7 for), from Messrs. Waterer, Sons, & Crisp, Bagshot. A bright cerise-pink variety, faintly dotted with light brown. The trusses are large and spreading.

To *Rhododendron* 'Donald Waterer' (votes 12 for), from Messrs. Waterer, Sons, & Crisp, Bagshot. The flowers of this variety are deep rose pink in colour, fading to a paler shade towards the centre. The trusses are good, and the individual flowers are of large size.

To *Rhododendron* 'Duchess of Teck' (votes unanimous), from Messrs. Waterer, Sons, & Crisp, Bagshot. This variety produces nice trusses of white flowers deeply edged with rosy mauve.

The Committee confirmed the awards recommended to Bearded Irises by the Sub-Committees on May 18 and June 2. For descriptions see Report on Bearded Irises at Wisley, 1915-16.

Other Exhibits.

Messrs. Bees, Liverpool: Primulas and *Roscoea Humeana*.

Messrs. Cannell, Eynsford: greenhouse plants.

Messrs. Chaplin, Waltham Cross: Rose 'Lady Gwendoline Calvin.'

Mr. F. Gifford, Hornchurch: Pæonies.

M. Hornibrook, Esq., Abbeyleix: *Saxifraga* × *Aizo-retioides*, *Sax.* × 'Diana,' *Viola* × *knaptonensis*.

Mr. G. Reuthe, Keston: hardy plants.

Miss Willmott, Warley: *Verbascum* 'Warley Pearl,' *Silene alpestris fl. pl.*

FLORAL COMMITTEE, JUNE 14, 1916.

SUB-COMMITTEE AT WISLEY.

Mr. H. B. MAY, V.M.H., in the Chair, and four members present.

A Sub-Committee inspected the Trial of Bearded Irises and made the following recommendations for awards.

Awards Recommended :—

Highly Commended.

To Irises 'Beauty,' 'Darius,' 'Florence Wells,' 'Fro,' 'Jacquiniana,' 'Maori King,' 'Mithras,' and 'Queen Alexandra.'

Commended.

To Irises 'Arlequin,' 'Cengialti Loppio,' 'Cherubim,' 'Crépuscule,' 'Demi Deuil,' 'Faust,' 'Gules,' 'Her Majesty,' 'Knysna,' 'Marie Corelli,' 'Modeste Guérin,' 'Mme. Boulet,' 'Mme. Denis,' 'Pfaeuenaue,' 'Rhoda,' 'Saracen,' 'Thora,' 'Thorbecke,' and 'Unique.'

FLORAL COMMITTEE, JUNE 20, 1916.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-six members present.

Awards Recommended :—

Gold Medal.

To Messrs. Kelway, Langport, for Delphiniums and Pæonies.

Silver-gilt Banksian Medal.

To Messrs. Peed, Norwood, for Gloxinias and Streptocarpus.

Silver Flora Medal.

To Messrs. Bath, Wisbech, for Pæonies.

To Messrs. Cheal, Crawley, for hardy plants.

To Messrs. Dobbie, Edinburgh, for Campanulas.

To Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), Elstree, for Streptocarpus.

To Mr. G. W. Miller, Wisbech, for Delphiniums.

To Mr. A. Perry, Enfield, for hardy plants.

Silver Banksian Medal.

To Messrs. Bees, Liverpool, for Primulas.

To Messrs. Bunyard, Maidstone, for hardy plants.

To Messrs. B. R. Cant, Colchester, for Roses.

To Mr. J. C. Jenner, Rayleigh, for Carnations.

To Messrs. Ladhams, Southampton, for border Pinks.

To Messrs. Low, Bush Hill Park, for Carnations.

To Messrs. May, Upper Edmonton, for miscellaneous plants.

To Messrs. W. Paul, Waltham Cross, for Roses.

To Messrs. Ware, Feltham, for hardy plants.

Bronze Flora Medal.

To Mr. J. C. Allgrove, Slough, for *Rosa Moyesii*.

To Messrs. Chaplin, Waltham Cross, for Roses.

To Messrs. Carter Page, London, for Dahlias and Violas.

To Mr. G. Reuthe, Keston, for hardy plants.

Bronze Banksian Medal.

To Messrs. Cutbush, Highgate, for Pelargoniums.

First-class Certificate.

To *Rosa Moyesii* (votes 15 for), from Mr. J. C. Allgrove, Slough. This very distinct Chinese species received an Award of Merit in 1908. The flowers are about $2\frac{1}{2}$ inches across and of a rich deep-red colour. The stems are densely armed with thorns, and the leaves are composed of from nine to thirteen oval, slightly glaucous leaflets.

To *Tricuspidaria lanceolata* (votes 17 for, 3 against), from the Donard Nursery, Newcastle, Co. Down. An evergreen shrub or small tree of stiff, bushy habit, growing from 10 to 15 feet high. It is a native of Chile and is hardy in the British Isles only in favoured spots. The leaves are oblong lanceolate, pointed, $1\frac{1}{2}$ –5 inches long and $\frac{1}{2}$ – $1\frac{1}{4}$ inch wide, coarsely toothed, dark green above, paler beneath and downy on the midrib. The flowers are produced singly from the terminal leaf axils and are urn-shaped, about 1 inch long, fleshy, rich crimson in colour, and pendulous.

Award of Merit.

To *Delphinium tanguticum* (votes 19 for, 1 against), from Messrs. Bees, Liverpool. A dwarf species collected in China by Mr. R. Farrer. It is about 7–8 inches high, and bears deep violet-blue flowers with a white eye.

To *Deutzia crenata magnifica* (votes 17 for), from Messrs. G. Paul, Chessent. A very fine double white form of this useful hardy shrub.

To *Iris* 'Asia' (votes 19), from Mr. G. Yeld, York. A very fine, tall-growing bearded *Iris*. Spathe valves one-flowered, green, slightly flushed purple, partly scarious, keeled; pedicels $\frac{3}{4}$ inch; flowers 6 inches deep, substance good, odour fragrant, falls wide spatulate, colour dull red-purple, veined darker, margins lighter, slightly smoky, drooping; veins bluish purple, distinct; haft yellow and white, veins dull purple-brown; beard white, yellow tipped; standard light red-purple, veined darker, slightly smoky towards haft, erect; haft yellow, veined purple-brown; styles purplish, margins yellow, dentate; crest large, acuminate, much dentate; ovary $\frac{3}{4}$ inch; tube $\frac{3}{4}$ inch.

To *Iris germanica* 'Richard II.' (votes 18 for, 1 against), from Mr. A. Perry, Enfield. A seedling from 'Black Prince' having deep violet purple falls and white standards.

To *Olearia semidentata* (votes unanimous), from the Donard Nursery, Newcastle, Co. Down. A beautiful species from New Zealand, having flowers about 2 inches across. The ray florets are pale lilac in colour and are borne in a double row. The disc is deep violet-

purple. The foliage is lanceolate, serrated, and covered with a thick white tomentum on the underside.

To strain of Hybrid Primulas (votes 11 for), from Messrs. Bees, Liverpool. This beautiful strain has been raised by crossing *Primula Beesiana* ♀ and *P. Bulleyana* ♂. The plants are all of medium stature, and the colours of the flowers cover a wide range, including salmon, orange, rose, magenta, orange-red, fiery orange, and lilac.

To Rose 'Lucy Williams' (votes 19 for), from Dr. A. H. Williams, Harrow-on-the-Hill. A strong, vigorous climber of the *Wichuraiana* type, raised by crossing 'Jersey Beauty' ♀ and 'Edward Mawley' ♂. The flowers are large, very deep rose-pink in colour, and delicately perfumed. The foliage is vigorous, and the plant is said to remain in bloom for about two months, commencing at the beginning of June.

To Rose 'Mrs. A. W. Atkinson' (votes 13 for, 1 against), from Messrs. Chaplin, Waltham Cross. A Hybrid Tea variety suitable for exhibition. The flowers are large, scented, of good form with high pointed centre, and ivory-white in colour.

To *Sphaeralcea canescens* (votes unanimous), from S. Morris, Esq., Norwich. A beautiful dwarf shrubby plant belonging to the Malvaceae. It is a native of Arizona and has proved perfectly hardy at Norwich, where it grows in a hot dry place, and freely sows itself. The flowers are reddish orange in colour, and are borne in great abundance. The plant grows about 3 feet high.

The Committee confirmed the awards to Bearded Irises recommended by the Sub-Committee on June 14. For descriptions see Report on Bearded Irises at Wisley, 1915-16.

Other Exhibits.

Messrs. Barr, Taplow : hardy plants.

Miss Bayne, Edinburgh : double Clematis.

W. R. Dykes, Esq., Godalming : *Iris* 'Belle Alliance.'

Mrs. Hirsch, London : *Hibiscus* 'Peach Blow.'

Misses Hopkins, Shepperton : hardy plants.

Mary, Countess of Ilchester, London : *Meconopsis rudis*.

Mr. J. S. Kelly, Esher : *Epilobium macropus*.

Sir G. Meyrick, Christchurch : Carnation 'Lady Meyrick.'

Miss E. Willmott, V.M.H., Great Warley : *Acantholimon androsaceum*.

FLORAL COMMITTEE, JULY 4, 1916.

AT HOLLAND PARK.

Mr. H. B. MAY, V.M.H., in the Chair, and fifteen members present.

[For Cups and Medals awarded by the Council after consultation with the Judges, see p. lxxxix.]

Awards Recommended :—

Award of Merit.

To *Begonia* 'Mrs. C. F. Langdon' (votes 6 for, 3 against), from Messrs. Blackmore & Langdon, Bath. A very fine variety bearing beautiful double flowers measuring 6–7 inches across and of a bright fiery orange colour. (Fig. 112.)

To *Campanula persicifolia* 'Telham Beauty' (votes unanimous), from Messrs. Barr, Taplow. A beautiful border Campanula said to be the result of a cross between *C. persicifolia* and *C. turbinata*. The large, open, shallow cup-shaped flowers are about $2\frac{1}{2}$ inches across, and are pale lilac-mauve in colour. They are borne in spikes of ten. (Fig. 113.)

To *Cyananthus incanus leiocalyx* (votes unanimous), from Mr. R. Prichard, West Moors. A beautiful dwarf hardy alpine plant of spreading habit, bearing pale blue Gentian-like flowers which have a mass of dark blue hairs at the throat. The flowers are about $1\frac{1}{2}$ inch long, and $\frac{3}{4}$ inch broad at the corolla. The foliage is small, spatulate, and hairy on the underside. The plant has been growing outside for four years in Dorset, and is said to be splendid for the moraine.

To *Delphinium* 'Mrs. A. J. Watson' (votes 6 for, 1 against), from Messrs. Blackmore & Langdon, Bath. This variety has very large semi-double flowers, of which the outer petals are cornflower-blue and the inner deep lilac-mauve. The centre of the flower is occupied by a small dark eye. The spike is about 2– $2\frac{1}{2}$ feet long. (Fig. 114.)

To *Delphinium* 'Mrs. Colin McIver' (votes 9 for, 1 against), from Messrs. Blackmore & Langdon, Bath. A violet-mauve variety having double flowers with a white eye. The spike measures about 18 inches long. (Fig. 114.)

To *Delphinium* 'Mrs. Shirley' (votes 9 for, 1 against), from Messrs. Blackmore & Langdon, Bath. The fine spikes of this variety are about 2 feet long, and carry semi-double lilac-mauve flowers lightly arranged. (Fig. 114.)

To *Dianthus* 'Miss Gladys Cranfield' (votes 9 for), from Mr. A. Perry, Enfield. A very useful, free-flowering, single garden Pink. The flowers measure 2 inches across, and are of a pale pink colour with dark crimson eye.

To *Escallonia* 'Donard Seedling' (votes unanimous), from the Donard Nursery Co., Newcastle, Co. Down. This beautiful shrub is the result of a cross between *E. langleyensis* ♂ × *E. Philippiana* ♀. The flowers are larger than either of the parents, and are white tinged with rose. The leaves are ovate in shape.

To *Gentiana Przewalskii* (votes 10 for), from Messrs. Piper, Bayswater. A very free-flowering species from China, bearing prostrate sprays of deep-blue flowers, white at the base of the tube. The flowers are about $1\frac{1}{2}$ inch long and 1 inch wide at the corolla. The leaves are lanceolate in shape and about 6 inches long.

To *Leptospermum* 'Donard Beauty' (votes, 6 for, 3 against), from the Donard Nursery Co., Newcastle, Co. Down. This variety is the

result of a cross between *L. Boscawenii* and *L. Nichollii*. The flowers are of large size and are cerise-pink in colour.

To *Polystichum angulare divisilobum plumosum*, Perry's No. 1 (votes 5 for), from Mr. A. Perry, Enfield. A very fine pale green form of this useful hardy fern, with finely divided plumose fronds.

To Rose 'Blush Queen' (votes 10 for, 2 against), from Messrs. F. Cant, Colchester. A very pale pink Hybrid Tea variety, becoming white with age. The blooms are of good form and size.

To Rose 'C. V. Haworth' (votes unanimous), from Messrs. A. Dickson, Newtownards. A large crimson H.T. of good form and sweetly scented. The petals are tinged with a darker shade near the tips.

To *Salvia warleyensis* (votes 6 for, 3 against), from Miss E. Willmott, V.M.H., Great Warley. The flowers of this species are violet-purple with a white lip. They are about 1 inch long, and the hairy calyces are of a very dark purplish colour. The leaves are large and ovate in shape.

To *Streptocarpus* 'Rose Queen' (votes unanimous), from Messrs. Cuthbert, Southgate. A very large-flowered variety. The colour is bright rose-pink, and white at the throat.

To *Streptocarpus* 'Southgate White' (votes 10 for, 3 against), from Messrs. Cuthbert, Southgate. The flowers of this variety are of large size and are white in colour, with a pale sulphur-yellow throat.

To Sweet Pea 'John Porter' (votes 11 for), from Messrs. A. Dickson, Newtownards. A large-flowered variety having the standards salmon-orange and the wings rose. It is a very bright Sweet Pea, and its blooms are mostly borne in fours.

To *Trollius* 'King Cup' (votes, 7 for 1 against), from Messrs. Wallace, Colchester. A hybrid between *T. yunnanensis* and *T. chinensis*. It is intermediate in character between its parents, and grows about 3 feet high, bearing an abundance of deep golden yellow green-tipped flowers measuring about 2 inches across.

Other Exhibits.

Mr. J. C. Allgrove, Slough: hardy plants.

Mrs. Berkeley, Spetchley: *Lilium mirabile*, Campanula 'Spetchley Hybrid.'

Messrs. Bunyard, Maidstone: *Delphinium* 'Queen Mary.'

Messrs. Chaplin, Waltham Cross: Roses.

Mr. J. Douglas, Bookham: Carnation 'Henry Brett.'

Mr. W. Easlea, Leigh-on-Sea: Roses.

Mr. C. Elliott, Stevenage: hardy plants.

Messrs. E. W. King, Coggeshall: Sweet Peas.

Mr. P. le Cornu, Jersey: Roses.

Messrs. Rogers, Southampton: Rose 'Lady Swaythling.'

Messrs. Stark, Gt. Ryburgh: double Poppies.

Mr. W. Wells, junr., Merstham: Delphiniums.

FLORAL COMMITTEE, JULY 18, 1916.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-five members present.

Awards Recommended :—

Gold Medal.

To Messrs. Jones, Lewisham, for Phloxes.

Silver-gilt Banksian Medal.

To Messrs. Blackmore & Langdon, Bath, for Delphiniums.

Silver Flora Medal.

To Messrs. B. R. Cant, Colchester, for Roses.

To Messrs. Chaplin, Waltham Cross, for Roses.

To Messrs. Grove, Sutton Coldfield, for Campanulas.

To Messrs. Jackman, Woking, for hardy plants.

To Messrs. May, Upper Edmonton, for ferns &c.

To Mr. M. Prichard, Christchurch, for hardy plants.

To Mr. J. Stevenson, Wimborne, for Sweet Peas.

Silver Banksian Medal.

To Mr. J. C. Allgrove, Slough, for Roses.

To Messrs. F. Cant, Colchester, for Roses.

To Messrs. Cheal, Crawley, for flowering shrubs and Dahlias.

To Messrs. Cuthbert, Southgate, for Gloxinias and *Streptocarpus*.

To Mr. J. Douglas, Great Bookham, for border Carnations.

To Messrs. Waterer, Sons, & Crisp, Bagshot, for hardy plants.

Bronze Flora Medal.

To Messrs. Burch, Peterborough, for Roses.

To Messrs. Harkness, Hitchin, for Roses.

To Rev. H. J. Pemberton, Romford, for Roses.

Bronze Banksian Medal.

To Messrs. Cutbush, Highgate, for greenhouse plants.

To Messrs. Forbes, Hawick, for Phloxes, Pentstemons, and Delphiniums.

To Messrs. Hobbies, Dereham, for Roses.

To Mr. G. Reuthe, Keston, for hardy plants.

Award of Merit.

To *Aconitum Napellus album grandiflorum* (votes 15 for), from Messrs. Barr, Taplow. A large-flowered variety of this handsome herbaceous plant. The flowers are creamy white in colour, and are borne in spikes measuring from 2½ to 3 feet in length.

To *Campanula* 'Chastity' (votes 11 for, 2 against), from Messrs. Grove, Sutton Coldfield. This is a very free-flowering seedling from *Campanula* 'Norman Grove,' bearing white bell-shaped flowers about 1 inch in diameter. The height of the plant is about 9 inches.

To *Campanula Waldsteiniana* (votes 11 for), from Messrs. Grove, Sutton Coldfield. A charming dwarf species bearing small pale blue, star-shaped, flat flowers in great abundance.

To Lavender 'Barr's Large-flowered Munstead Dwarf' (votes 13 for, 4 against), from Messrs. Barr, Taplow. A very free-flowering variety of dwarf bushy habit. The flowers are of large size, very sweetly scented; and are borne on stems about 8 inches long.

To *Nemesia* 'Orange Prince' (votes unanimous), from Messrs. Dobbie, Edinburgh. A very striking variety, bearing large flowers of a deep orange colour. The height of the plants is about 9 inches, and they are very free-flowering in habit.

To Sweet Pea 'Anzac' (votes 16 for), from Messrs. Dobbie, Edinburgh. A very large-flowered variety, having the wings lilac-mauve, and the standards are claret-maroon. The blooms are borne mostly in fours.

To Sweet Pea 'Crimson Queen' (votes 14 for), from Messrs. Hobbies, Dereham. A good bright crimson variety, of large size. The blooms are borne mostly in fours.

To Sweet Pea 'Faith' (votes unanimous), from Mr. J. Stevenson, Wimborne. A very charming pale lavender variety, raised by the exhibitor. Practically all the sprays are four-flowered, and the individual blooms are of large size.

To Sweet Pea 'Honour Bright' (votes 15 for), from Mr. J. Stevenson, Wimborne. A very distinct and beautiful bright orange-cerise variety, of large size and perfect form. It was raised by the exhibitor.

Other Exhibits.

Mr. J. Box, Lindfield: *Campanula lactiflora alba grandiflora*.

Dowager Countess of Bradford, Castle Bromwich: seedling Begonia.

Mr. H. Close, Orpington: hardy plants.

Mr. R. M. Fisher, London: Pelargoniums.

Mr. J. A. Jarrett, Anerley: Dahlia 'Anerley Gem.'

Mr. H. Kempshall, Dorchester: *Prostanthera lasianthos*, *Myoporum laetum*.

Mr. A. Perry, Enfield: hardy plants.

Mr. N. Rushworth, Walton-on-Thames: *Delphinium* 'Dresden China.'

Mr. H. J. Talbot, Berkhamsted: *Cyrtanthus Mackenii*.

FLORAL COMMITTEE, AUGUST 1, 1916.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-five members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. Jones, Lewisham, for Phloxes.

To Messrs. Kelway, Langport, for Gladioli.

To Messrs. Piper, Bayswater, for Sweet Peas.

Silver-gilt Banksian Medal.

To Mr. R. Bolton, Carnforth, for Sweet Peas.



FIG. 110.—IRIS BRACTEATA (*Gard. Chron.*),
(p. clviii.)

[To face p. clviii.]



FIG. 111.—*NOMOCHARIS PARDANTHINA* (*Garden*).
(p. clxi.)



FIG. 112.—BEGONIA 'MRS. C. F. LANGDON.'
(p. clxv.)



FIG. 113.—*CAMPANULA* 'TELHAM BEAUTY' (*Gard. Chron.*).
(p. clxv.)

[To face p. clxix.]

Silver Flora Medal.

- To Mr. J. Box, Haywards Heath, for hardy plants.
 To Messrs. May, Upper Edmonton, for Scolopendriums.
 To Mr. A. Perry, Enfield, for hardy plants.

Silver Banksian Medal.

- To Mr. E. J. Hicks, Twyford, for Roses.
 To Mr. G. W. Miller, Wisbech, for hardy plants.
 To Messrs. Peed, Norwood, for Begonias and Campanulas.
 To Mr. L. R. Russell, Richmond, for shrubs.
 To Messrs. Wallace, Colchester, for hardy plants.

Bronze Flora Medal.

- To Messrs. Baker, Wolverhampton, for hardy plants.
 To the Donard Nursery Co., Newcastle, co. Down, for Dieramas.
 To Messrs. Grove, Sutton Coldfield, for Campanulas.
 To Rev. J. H. Pemberton, Romford, for Roses.

Award of Merit.

To *Astilbe* 'Gloria' (votes 11 for, 5 against), from Mr. G. W. Miller, Wisbech. A very free-flowering rose-pink variety of the *Arendsii* type, with stiff, bushy plumes.

To *Delphinium* 'Mrs. H. Kaye' (votes 11 for, 3 against), from Mr. W. Wells, Junr., Merstham. A very fine deep violet-purple variety, with a dark eye. The flowers are semi-double, and are borne in spikes about 2½ feet long.

To *Gladiolus* 'Phyllis Kelway' (votes unanimous), from Messrs. Kelway, Langport. A deep-yellow *primulinus* hybrid, of very fine form.

To *Gladiolus* 'Wraith' (votes 8 for, 2 against), from Messrs. Kelway, Langport. A large-flowered *primulinus* hybrid, having a ground colour of pale yellow, heavily suffused and streaked with reddish orange.

To *Lomatia pinnatifolia* (votes 13 for), from the Donard Nursery Co., Newcastle, Co. Down. A handsome evergreen shrub for the milder parts of the British Isles. The leaves are much divided, like those of a *Grevillea*, and are very dark green above and paler below. The flowers are of a greenish yellow colour, heavily tinged with carmine pink inside. They are borne in short racemes.

Other Exhibits.

- Mr. J. C. Allgrove, Slough : *Gentiana quinquenervia*.
 Messrs. Cheal, Crawley : hardy plants and Dahlias.
 Mr. G. F. Hallett, Carlisle : Carnations.
 Messrs. Hobbies, Dereham : Sweet Pea 'Liège.'
 Messrs. E. W. King, Coggeshall : Sweet Pea 'Mavis.'
 Mr. G. Reuthe, Keston : hardy plants.
 Messrs. Waterer, Sons, & Crisp, Bagshot : *Daphne Verlotii*.
 Mr. H. Weller, Ashted : Roses.

FLORAL COMMITTEE, AUGUST 15, 1916.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Mr. J. Box, Haywards Heath, for Phloxes &c.

Silver Flora Medal.

To Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), Elstree, for trained Chinese climbers.

To Messrs. Kelway, Langport, for Gladioli.

Silver Banksian Medal.

To Mr. G. Reuthe, Keston, for hardy plants.

Award of Merit.

To Dahlia 'Bonfire' (votes, unanimous), from Messrs. Dobbie, Edinburgh. An excellent Colletterte variety of a bright bronzy orange-scarlet colour. The flowers are of large size and are borne on stiff, erect stems. The smaller florets are flushed with yellow at the tips.

Other Exhibits.

Messrs. Baker, Wolverhampton : *Gentiana septemfida* var. *Lagodeckiana*.

Messrs. Barr, Taplow : Lavender 'Grapenhall.'

Messrs. Cheal, Crawley : Dahlias.

Mr. H. Close, Orpington : hardy flowers.

Mr. W. Wells, Junr., Merstham : Delphiniums.

FLORAL COMMITTEE, AUGUST 29, 1916.

Mr. H. B. MAY, V.M.H., in the Chair, and nineteen members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Mr. J. Box, Haywards Heath, for hardy flowers.

Silver Flora Medal.

To Messrs. May, Upper Edmonton, for Ferns.

To Mr. G. W. Miller, Wisbech, for hardy flowers.

Bronze Flora Medal.

To Rev. H. J. Pemberton, Romford, for Roses.

To Mr. G. Reuthe, Keston, for hardy flowers.

To Mr. W. Wells, junr., Merstham, for hardy flowers.

Bronze Banksian Medal.

To Messrs. Cheal, Crawley, for Dahlias.

Award of Merit.

To Dahlia 'Alabaster' (votes 7 for), from Messrs. Stredwick, St. Leonards-on-Sea. A very large white Cactus variety, of fine form. The colour at the base of the florets becomes greenish.

To Dahlia 'Amethyst' (votes unanimous), from Messrs. Stredwick, St. Leonards-on-Sea. An excellent Pompon Cactus variety. The flowers are of a rosy-mauve colour and are borne on wiry stems.

To Dahlia 'Bizarre' (votes unanimous), from Messrs. Stredwick, St. Leonards-on-Sea. A good Cactus variety, with curled and twisted florets. The colour in the centre of the flower is a shade of crimson-maroon, which becomes very much lighter in the outer rows of florets.

To Dahlia 'Mascot' (votes unanimous), from Messrs. Stredwick, St. Leonards-on-Sea. A large, deep Tyrian rose variety of the Collerette type with a white collar.

To Dahlia 'Pte. Ed. Drury' (votes 5 for, 2 against), from Messrs. Stredwick, St. Leonards-on-Sea. A dull salmon-red Collerette variety with a yellow collar.

To Dahlia 'Saffron' (votes 7 for), from Messrs. Stredwick, St. Leonards-on-Sea. A deep sulphur-yellow Cactus variety of nice form.

To Montbretia 'Queen of Spain' (votes, 13 for), from S. Morris, Esq., Earham Hall, Norwich. The flowers of this very fine variety measure $3\frac{1}{2}$ in. across, and the colour, which is somewhat deeper than that of 'Star of the East,' is a shade of scarlet orange.

To Rose 'Callisto' (votes 11 for, 2 against), from Rev. J. H. Pemberton, Romford. A new seedling perpetual Hybrid Tea Rose. The flowers are borne abundantly in bunches. The colour is a very pale shade of cadmium-yellow and the blooms are very fragrant. Flowering is said to continue over a long period.

Note.—The above awards to Dahlias were recommended by a Joint Committee of the R.H.S. and the National Dahlia Society.

Other Exhibits.

Mr. J. C. Allgrove, Slough : *Thalictrum dipterocarpum*.

Messrs. Bunyard, Maidstone : hardy Fuchsias.

Messrs. H. Chapman, Rye : Cyclamen.

Mr. C. Elliott, Stevenage : Veronica 'Redstart.'

Mr. J. A. Jarrett, Anerley : Dahlias.

Messrs. S. Low, Enfield : Gloxinias.

C. J. Lucas, Esq., Horsham : *Itea ilicifolia*.

H. C. Slingsby, Esq., Bush Hill Park : Pelargonium 'H. C. Slingsby.'

FLORAL COMMITTEE, SEPTEMBER 1, 1916.

SUB-COMMITTEE AT WISLEY.

Mr. H. B. MAY, V.M.H., in the Chair, and four members present. A Sub-Committee inspected the Trials of Annual Carnations and Indian Pinks, Clarkias, Delphiniums (Annual) and Larkspurs, Godetias,

Annual Sunflowers, and Mignonettes, and made recommendations for awards to be approved at the meeting of the full Committee.

FLORAL COMMITTEE, SEPTEMBER 12, 1916.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-two members present.

Awards Recommended :—

Gold Medal.

To R. Cory, Esq. (gr. Mr. A. J. Cobb), Duffryn, for a group of decorative garden Dahlias.

Silver-gilt Flora Medal.

To Messrs. Treseder, Cardiff, for Dahlias.

Silver Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Cheal, Crawley, for Dahlias.

To Messrs. May, Upper Edmonton, for Ferns &c.

To Mr. J. T. West, Brentwood, for Dahlias.

Silver Banksian Medal.

To Mr. G. Reuthe, Keston, for hardy flowers.

To Mr. W. Wells, Jun., Merstham, for hardy flowers.

Bronze Banksian Medal.

To Rev. J. H. Pemberton, Romford, for Roses.

To Messrs. Carter Page, London, for Violas.

Award of Merit.

To Dahlia 'Admiral' (votes 6 for, 1 against), from Messrs. Cheal, Crawley. An excellent Collettere variety, of large size. The colour is dark crimson and the collar is white.

To Dahlia 'Bonfire' (votes unanimous), from Messrs. Dobbie, Edinburgh. The award made to this variety on August 15 was confirmed on this occasion in order that it might also receive the First-class Certificate of the National Dahlia Society.

To Dahlia 'British Lion' (votes unanimous), from Messrs. Stredwick, St. Leonards. A bronzy orange Cactus variety, with twisted and curled florets.

To Dahlia 'Challenger' (votes unanimous), from Messrs. Stredwick, St. Leonards. A large Decorative variety. Its colour is buff, suffused with shades of pink.

To Dahlia 'Crimson Flag' (votes unanimous), from Messrs. Cheal, Crawley. A deep crimson Decorative Dahlia, of nice shape and medium size.

To Dahlia 'Dandy' (votes unanimous), from Messrs. Burrell, Cambridge. A very large deep crimson Pæony-flowered variety, with very broad florets and a golden centre.

To Dahlia 'Eileen' (votes unanimous), from Messrs. Cheal, Crawley. A very pretty single variety, with broad ovate pink florets, tipped with white and yellow at the base.

To Dahlia 'Elegance' (votes unanimous), from Mr. J. Emberson, Walthamstow. A very decorative deep rose-pink Star Dahlia, having several rows of florets.

To Dahlia 'General Joffre' (votes unanimous), from Mr. J. T. West, Brentwood. A deep crimson maroon Decorative variety, with broad twisted florets.

To Dahlia 'General Sir Douglas Haig' (votes unanimous), from Messrs. Stredwick, St. Leonards. A very pale pink Cactus variety, having the florets yellow at the base.

To Dahlia 'Lady Beatrice Stewart' (votes unanimous), from R. Cory, Esq. (gr. Mr. Cobb), Duffryn. A beautiful Pæony-flowered variety. The flowers are large, and the colour is bright cerise-pink, flushed with orange.

To Dahlia 'Lieut. W. L. Robinson, V.C.' (votes unanimous), from Messrs. Stredwick, St. Leonards. A deep rose Cactus variety. The colour becomes lighter in the centre of the flower.

To Dahlia 'Margery Choune' (votes 5 for, 2 against), from Mr. A. Brown, Leagrave. A neat single variety, of bright reddish-purple colour, with yellow at the base of the florets.

To Dahlia 'Miss Irwin' (votes unanimous), from Messrs. Treseder, Cardiff. A Decorative variety, medium in size, and of a purplish-rose colour.

To Dahlia 'Mrs. Margaret Stredwick' (votes unanimous), from Messrs. Stredwick, St. Leonards. A pale rose-pink Cactus variety, with curled and twisted florets.

To Dahlia 'Speedwell' (votes unanimous), from Messrs. Stredwick, St. Leonards. A very nice white Pompon Cactus Dahlia, especially useful for cutting.

To Dahlia 'Wyvern' (votes 8 for, 1 against), from Messrs. Stredwick, St. Leonards. A large Decorative variety, of nice form. The colour is a very striking and unusual shade of lilac-mauve.

To Dahlia 'Yellow Queen' (votes unanimous), from Messrs. Dobbie, Edinburgh. A good deep lemon-yellow Collerette variety.

To Echinacea 'King of Echinaceas' (votes 12 for, 3 against), from Mr. G. Downer, Chichester. This is a great improvement on already existing varieties. The flowers are about $4\frac{1}{2}$ ins. broad and have very broad ray florets, the colour of which is a shade of Solferino red (Rép. de Couleurs). (Fig. 115.)

To *Oxalis lobata* (votes 14 for, 1 against), from Mr. C. Elliott, Stevenage. An excellent dwarf species, introduced from Chile in 1823. The blossoms are about $\frac{3}{4}$ in. across, and are of a rich yellow colour. The foliage is deeply lobed and bright green. The plant is said to be generally hardy in the British Isles. (Fig. 116.)

The awards recommended by the Sub-Committee at Wisley to various annuals under trial on September 1 were confirmed as follow :

Annual Carnations and Indian Pinks.

Highly Commended.

No. 7, *Dianthus Heddewigii* 'Crimson Bell' (Barr); No. 4 *Dianthus Heddewigii*, New Deeply Fringed (Barr); No. 31, *Dianthus Heddewigii* 'Star of Devon' strain (Veitch); No. 2, *Dianthus Heddewigii superbissimus* mixed (Sydenham).

Commended.

No. 18, *Heddewigii* 'Fireball' (Watkins & Simpson, Dobbie); No. 8, *Heddewigii laciniatus* (Watkins & Simpson, Veitch); Nos. 9, 10, *Heddewigii laciniatus* 'Vesuvius' (Barr, Watkins & Simpson); No. 26, *Heddewigii* 'Salmon Queen' (Barr); No. 3, *Heddewigii* single mixed (Sydenham); No. 36, *Heddewigii superbissimus* 'Queen Alexandra' (Watkins & Simpson, Veitch).

Clarkias.

Highly Commended.

Nos. 13, 14, 17, elegans 'Brilliant' (Sydenham, Watkins & Simpson, Simpson); Nos. 27, 28, 29, elegans fl. pl. 'Orange King' (Watkins & Simpson, Veitch, Barr); No. 39, elegans 'Rose Beauty' (Barr); No. 21, elegans 'Salmon Scarlet' (Sutton); No. 23, elegans 'Scarlet Queen' (Watkins & Simpson, Nutting); Nos. 18, 19, elegans fl. pl. 'Vesuvius' (Watkins & Simpson, Dobbie).

Commended.

No. 12, elegans fl. pl. 'Queen Mary' (Watkins & Simpson); No. 3, elegans 'Purple Prince' (Barr); No. 43, pulchella 'Double White' (Sydenham).

Annual Delphiniums and Larkspurs.

Award of Merit.

No. 13, 'Blue Butterfly' (award confirmed, **A.M.** 1900) (Hurst).

Highly Commended.

No. 5, 'Azure Fairy' (Dobbie); No. 7, 'Azure Fairy' (Watkins & Simpson); No. 4, 'Rosy Scarlet' (Sydenham).

Godetias.

Award of Merit.

No. 23, 'Lavender' (Carter) (**A.M.** 1915, confirmed).

Highly Commended.

No. 40, 'Duke of Fife' (**A.M.** 1890) (Daniels); No. 30, Schaminii fl. pl. (**A.M.** 1905) (Watkins & Simpson); No. 16, Whitneyi 'Crimson Gem' (Barr); No. 22, Whitneyi 'Marchioness of Salisbury' (**A.M.** 1895) (Barr).

Commended.

No. 10, compacta 'Sunset' (Sydenham); No. 34, Schaminii 'Double Carmine' (Dickson); No. 3, 'Tall Double Mauve' (Simpson); No. 2, Whitneyi 'White Gem' (Barr).

*Mignonettes.**Highly Commended.*

No. 32, 'Giant' (*Dobbie*); Nos. 36, 39, 'Golden Queen' (Sydenham, Barr); No. 27, 'Machet' (*Veitch*); No. 23, 'Machet Giant Crimson' (Watkins & Simpson); No. 18, 'Machet Hercules' (Barr); No. 7, 'Paris Market' (Barr).

Commended.

No. 31, 'Gabriele' (Hurst); No. 25, 'Machet Improved' (Barr).
No awards were recommended for Annual Sunflowers.
For descriptions see Reports on Trials at Wisley, 1916.

Other Exhibits.

Mr. H. Close, Orpington: Asters.
Misses Hopkins, Shepperton: hardy plants.
Messrs. Lefever, Plaistow: Dahlia 'Majestic.'
Mr. L. R. Russell, Richmond: *Gloriosa aurea*.
Mr. C. Turner, Slough: Dahlias and Hibiscus.

 FLORAL COMMITTEE, SEPTEMBER 26, 1916.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-one members present.

Awards Recommended :—*Silver-gilt Flora Medal.*

To Mr. J. Box, Lindfield, for hardy flowers.

Silver-gilt Banksian Medal.

To Messrs. B. R. Cant, Colchester, for Roses.
To Messrs. Jones, Lewisham, for Michaelmas Daisies.
To Messrs. Carter Page, London, for Dahlias.

Silver Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. May, Upper Edmonton, for Ferns.

Silver Banksian Medal.

Mr. J. C. Allgrove, Slough, for Roses and rose heps.
To Messrs. Cheal, Crawley, for Dahlias and shrubs.
To Messrs. Cutbush, Highgate, for hardy flowers.
To Messrs. G. Paul, Cheshunt, for flowering shrubs.
To Mr. G. Prince, Longworth, for Roses.
To Mr. W. Wells, Jun., Merstham, for hardy flowers.

Bronze Flora Medal.

To Messrs. Felton, London, for *Physalis Franchetii*.
To Rev. J. H. Pemberton, Romford, for Roses.
To Mr. G. Reuthe, Keston, for hardy flowers.

Bronze Banksian Medal.

To Mr. L. R. Russell, Richmond, for shrubs and vines.

Award of Merit.

To Chrysanthemum 'Dick Barnes' (votes 15 for), from Mr. A. W. Thorpe, Lichfield. A rich chestnut-red early-flowering variety, of perfect shape, with a buff reverse.

To Chrysanthemum 'Harry Thorpe' (votes 20 for), from Mr. A. W. Thorpe, Lichfield. A rich yellow early-flowering variety, with a shading of bronze in the centre.

To Clematis 'Campanile' (votes 18 for), from Messrs. G. Paul, Cheshunt. A very free-flowering herbaceous variety, with bunches of pale violet-blue flowers having prominent white stamens. The foliage is pale green (Fig. 117.)

To Dahlia 'Alex. Kennedy' (votes unanimous), from Messrs. Stredwick, St. Leonards. A bright carmine-red Cactus variety, of good form.

To Dahlia 'Autumn Star' (votes unanimous), from Messrs. Cheal, Crawley. A very bright Star variety. The ground colour is yellow, suffused with shades of cerise-pink.

To Dahlia 'Cupid' (votes unanimous), from Mr. J. T. West, Brentwood. A Collerette variety having deep Tyrian rose florets edged with white. The collar is white.

To Dahlia 'Ermine' (votes 5 for), from Messrs. Stredwick, St. Leonards. A creamy-white Collerette variety, with rounded outer florets.

To Dahlia 'Gipsy' (votes 5 for, 2 against), from Messrs. Burrell, Cambridge. A Collerette variety, with rounded florets. The colour of the larger florets is dark crimson, and that of the collar is white.

To Dahlia 'Janus' (votes unanimous), from Messrs. Burrell, Cambridge. A very neat crimson Pompon variety.

To Dahlia 'Kangaroo' (votes unanimous), from Mr. J. T. West, Brentwood. A fine Collerette variety, of a deep crimson colour. The collar is white, tinged with crimson.

To Dahlia 'Lemur' (votes unanimous), from Mr. J. T. West, Brentwood. A very striking crimson-scarlet Single variety.

To Dahlia 'Marion' (votes 4 for, 2 against), from Messrs. Burrell, Cambridge. A very large orange-yellow Pæony-flowered variety, deeply suffused with rose.

To Dahlia 'Mastiff' (votes 4 for, 2 against), from Messrs. Stredwick, St. Leonards. A very large, deep yellow Decorative variety, the older florets of which are shaded with buff.

To Dahlia 'Moonstar' (votes 6 for), from Mr. Jarrett, Anerley. A very nice white Cosmea-flowered variety, with narrow florets.

To Dahlia 'Pastel' (votes unanimous), from R. Cory, Esq. Duffryn. A very large Single variety. The colour is bright rose, shaded with buff, and at the base of the florets the colour is a deeper shade of rose.



FIG. 114.—DELPHINIUMS 'MRS. COLIN McIVER' (on left) ;
'MRS. A. J. WATSON' and 'MRS. SHIRLEY.'
(p. clxv.)

[To face p. clxxvi.]



FIG. 115.—ECHINACEA 'KING OF ECHINACEAS.'
(p. clxxiii.)



FIG. 116.—OXALIS LOBATA (Garden).
(p. clxxii.)

[To face p. clxxvi.]



FIG. 117.—CLEMATIS 'CAMPANILE' (*Lemoine*).
(p. clxxvi.)

To Dahlia 'Profusion' (votes 6 for, 1 against), from Mr. J. T. West, Brentwood. A deep rose Decorative variety, of medium size, flushed and tipped with golden yellow.

To Dahlia 'Queenie' (votes unanimous), from Messrs. Burrell, Cambridge. A very full Decorative variety, of a deep golden-yellow colour, flushed with bronzy red.

To Dahlia 'Rowena' (votes unanimous), from Messrs. Burrell, Cambridge. A very pretty Dahlia of the Decorative section. The colour is very pale lilac-mauve, heavily shaded with buff.

To Dahlia 'Yellow Prince' (votes unanimous), from Messrs. Dobbie, Edinburgh. A clear lemon-yellow Collerette variety, with rounded florets. The collar is slightly paler in colour.

To *Euonymus latifolius* (votes 13 for, 5 against) from Messrs. G. Paul, Cheshunt. A very ornamental deciduous shrub or small tree, bearing long-stalked pendulous fruits of a rosy-red colour, which, after bursting, effectively display the bright orange seeds within. The leaves are oval in shape and shining green in colour, and are larger than those of the common Spindle Tree, *Euonymus europaeus*.

To *Gentiana sino-ornata* (votes 13 for), from Mr. C. Elliott, Stevenage. The flowers of this charming plant are clear pale blue in colour, and are about 2 inches long. They are very freely produced, and the plant makes numerous trailing stems.

To *Pyrus Vilmorini* (votes 20 for), from Messrs. G. Paul, Cheshunt. An elegant, perfectly hardy shrub or small tree, of wide-spreading habit. The leaves are pinnate and from 3 to 5 inches long, and the leaflets are very narrow and about $\frac{1}{2}$ inch long. The pale rosy-red globular fruits, about the size of a culinary pea, are borne in bunches, and form one of the most pleasing features of this shrub in the autumn. It is a native of Western China.

NOTE.—The above awards to Dahlias were recommended by a Joint Committee of the R.H.S. and the National Dahlia Society.

Other Exhibits.

Mr. A. Bullock, Epping : Aster 'Mrs. Wythes.'

Mr. A. S. Dunton, Penn : Chrysanthemum 'Amber Queen.'

Commander Hodgkinson, R.N., Chislehurst : Dahlia 'Joan Tylor.'

Misses Hopkins, Shepperton : hardy plants.

Mr. F. Legge, Arundel : fruiting spray of *Trachycarpus excelsus*.

Mr. J. MacDonald, Harpenden : Grasses.

Messrs. Wells, Merstham : Chrysanthemums.

The late Mr. E. Mawley, V.M.H.—The Chairman expressed the deep regret the Committee felt at the death of Mr. E. Mawley, V.M.H., who was for so long a member of the Floral Committee, and whose kindly courtesy and ready assistance had been of the utmost value. A vote of condolence with Mrs. Mawley in her bereavement was passed.

FLORAL COMMITTEE, OCTOBER 10, 1916.

Mr. H. B. MAY, V.H.M., in the Chair, and twenty-one members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Mr. J. B. Riding, Chingford, for Dahlias.

Silver Flora Medal.

To Messrs. Cheal, Crawley, for Dahlias, clipped trees, and shrubs.

To Mr. J. J. Kettle, Corfe Mullen, for Violets.

To Messrs. Piper, Bayswater, for Chinese plants.

To Mr. L. R. Russell, Richmond, for Ivies.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Baker, Wolverhampton, for hardy flowers.

To Messrs. Cutbush, Highgate, for hardy flowers.

To Mr. E. J. Hicks, Twyford, for Roses.

To Messrs. May, Upper Edmonton, for ferns &c.

To Mr. G. Prince, Longworth, for Roses.

To Mr. G. Reuthe, Keston, for hardy flowers.

To Messrs. Waterer, Sons, & Crisp, Bagshot, for hardy flowers and shrubs.

To Mr. W. Wells, Jun., Merstham, for hardy flowers.

Bronze Flora Medal.

To Rev. J. H. Pemberton, Romford, for Roses.

Award of Merit.

To Aster 'J. S. Baker' (votes 18 for), from Messrs. Baker, Wolverhampton. An excellent free-flowering double white variety of the *Novi-Belgii* section. It may well be described as a white 'Beauty of Colwall.'

To Aster 'King of the Belgians' (votes 11 for, 2 against), from Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), Elstree. A free-flowering pale lilac-blue variety, of great beauty. The flowers have several rows of florets, and are $1\frac{3}{4}$ in. across.

To Chrysanthemum 'Lichfield Pink' (votes 10 for, 2 against), from Mr. A. W. Thorpe, Lichfield. A very fine rose-pink early-flowering variety, of perfect form and good substance.

To *Colchicum illyricum superbum* (votes 15 for), from Messrs. Barr, Taplow. A useful addition to this race of autumn-flowering plants. The flowers are, speaking generally, intermediate between those of *C. speciosum* and *C. autumnale* in height and size. They are of a pale purplish-lilac colour, and white at the base.

To Dahlia 'Anerley Yellow' (votes 5 for), from Mr. J. A. Jarrett, Anerley. A clear yellow Pæony-flowered variety, of nice form and good size, with broad florets.

To Dahlia 'Autumn Tints' (votes unanimous), from Messrs.

Stredwick, St. Leonards. A reddish-orange Collerette variety with a yellow collar.

To Dahlia 'Elaine' (votes 4 for, 2 against), from Mr. J. T. West, Brentwood. A useful Collerette variety, borne on nice stiff stems. The florets are rich crimson in colour, with yellow at the tip and base. The collar is also yellow.

To Dahlia 'J. A. Jarrett' (votes unanimous), from Mr. J. A. Jarrett, Anerley. A very attractive Pæony-flowered variety, with broad twisted florets. The colour is a shade of bright red, with yellow at the base.

To *Geum Borisii* (votes 17 for), from Mr. C. Elliott, Stevenage. A very charming hardy plant of dwarfer habit than *G. Heldreichii* and with larger flowers. The colour of the flowers is a very striking shade of fiery red or russet-orange.

To Nerine 'Rotherside' (votes 15 for), from Messrs. H. Chapman, Rye. A seedling resulting from *N. corusca*, believed to have been crossed with pollen of *N. Fothergilli*. The flowers are borne in good umbels, and are of a pale rosy-orange colour, paler than that of *N. Fothergilli major*, with a golden lustre which is said to show to great effect under artificial light.

To Pelargonium 'General Joffre' (votes 10 for, 4 against), from Mr. W. H. Robbins, Lewes. A very striking sport from 'King of Denmark.' The flowers are semi-double and are borne in good trusses. The colour is rose-pink, suffused with orange.

To *Viburnum dasyanthum* (votes 7 for, 3 against), from Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), Elstree. A beautiful berried shrub, native of Szechwan, China, and introduced by Mr. E. H. Wilson, V.M.H., in 1907. The leaves are dark green, ovate, smooth, and sparingly toothed. The flowers open in early July, and are succeeded in autumn by large corymbs of very ornamental red berries. Even when the leaves have fallen, the dark, smooth, purplish-brown branches are quite effective for some time. This is the best and most effective of a series of Chinese Viburnums which include *V. hupehense*, *V. lobophyllum*, and *V. betulifolium*, all very closely allied.

Other Exhibits.

Messrs. Clark, Dover : hardy flowers.

Misses Hopkins, Shepperton : hardy flowers.

Mr. G. Kerswill, Exeter : Gentians.

Messrs. G. Paul, Cheshunt : shrubs.

FLORAL COMMITTEE, OCTOBER 24, 1916.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-five members present.

Awards Recommended :—

Silver Flora Medal.

To Mr. J. J. Kettle, Corfe Mullen, for Violets.

To Messrs. May, Upper Edmonton, for ferns &c.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Mr. F. Lilley, Guernsey, for Nerines.

To Rev. J. H. Pemberton, Romford, for Roses.

To Messrs. Wallace, Colchester, for Berberises and other berried shrubs.

To Messrs. Wells, Merstham, for Chrysanthemums.

Bronze Flora Medal.

To Mr. G. Reuthe, Keston, for hardy flowers and Nerines.

Bronze Banksian Medal.

To Messrs. Cheal, Crawley, for autumn foliage.

To Messrs. Godfrey, Exmouth, for Chrysanthemums.

To Mr. L. R. Russell, Richmond, for Conifers.

Award of Merit.

To Chrysanthemum 'Dawn of Day' (votes 13 for, 1 against), from Mr. Norman Davis, Framfield. A very fine large Japanese variety, with broad twisted florets of a deep golden colour, tinged with reddish bronze.

To Chrysanthemum 'Mrs. Algernon Davis' (votes 11 for, 2 against), from Mr. Norman Davis, Framfield. A very beautiful rose-pink Japanese variety of large size, with broad, long, hanging florets. The colour is lighter in the centre.

Other Exhibits.

Messrs. Barr, Taplow : Nerines.

Messrs. Chapman, Rye : Solanums.

Mr. G. R. Downer, Chichester : Gaillardia 'Downer's Double.'

Misses Hopkins, Shepperton : hardy flowers.

Mr. G. Kerswill, Exeter : Gentians.

Mr. G. H. H. Wassell, Basingstoke : Chrysanthemums.

Mr. W. Wells, Jun., Merstham : hardy flowers.

FLORAL COMMITTEE, NOVEMBER 7, 1916.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. Jones, Lewisham, for Chrysanthemums.

To Messrs. Wells, Merstham, for Chrysanthemums.

Silver Flora Medal.

To Messrs. Barr, Taplow, for Nerines.

To Messrs. S. Low, Bush Hill Park, for Begonias and Carnations.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

- To Messrs. Cheal, Crawley, for autumn foliage.
 To Messrs. Godfrey, Exmouth, for Chrysanthemums.
 To Messrs. May, Upper Edmonton, for ferns &c.
 To Messrs. Piper, Bayswater, Chinese Berberis &c.
 To Mr. G. Reuthe, Keston, for Nerines and hardy plants.

Bronze Flora Medal.

- To Messrs. Blackmore & Langdon, Bath, for Violets.
 To Messrs. Waterer, Sons, & Crisp, Bagshot, for shrubs.

Bronze Banksian Medal.

- To Mr. C. Boatwright, Herne Hill, for foliage plants.
 To Mr. G. W. Miller, Wisbech, for hardy plants.

First-class Certificate.

To *Berberis rubrostilla* (votes unanimous), from the Gardens of the Royal Horticultural Society, Wisley. A deciduous shrub, about 3-4 ft. high, young branches reddish brown, the older ones grey, spines trifid, slender and rigid, yellowish brown, grooved beneath. Leaves oblanceolate or narrowly ovate, generally mucronate and often narrowed into a short petiole, entire or spinose near the top, glaucous beneath. Fruits in racemes of from one to four, ripe in November, large, scarlet, ovate, over $\frac{1}{2}$ in. long.

To *Berberis Sargentiana* (votes unanimous), from Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), Elstree. This hardy evergreen species received an Award of Merit on August 31, 1915. Its stems are reddish and its large lanceolate leaves are serrated, and many of them assume in the autumn a beautiful dull-red tint. One of the features of this species is the long white spines, often over an inch in length, which subtend the foliage shoots. The berries are said to be dull purple when ripe.

Other Exhibits.

- Mr. G. R. Downer, Chichester; Gaillardia 'Downer's Double.'
 Misses Hopkins, Shepperton: hardy plants.
 Mr. G. Kerswill, Exeter: Gentians.

FLORAL COMMITTEE, NOVEMBER 21, 1916.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-three members present.

Awards Recommended :—

Silver-gilt Flora Medal.

- To Messrs. Jones, Lewisham, for Chrysanthemums.

Silver-gilt Banksian Medal.

- To Messrs. Wells, Merstham, for Chrysanthemums.

Silver Flora Medal.

To Messrs. Cheal, Crawley, for Conifers.

To Messrs. May, Upper Edmonton, for hardy and greenhouse ferns.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Mr. D. Robertson, Berkhamsted, for Begonias.

Bronze Flora Medal.

To Messrs. Barr, Taplow, for Nerines.

To Messrs. Felton, London, for Eucalyptus and Hakea.

To Messrs. Low, Bush Hill Park, for Begonias and Carnations.

To Mr. G. Reuthe, Keston, for hardy plants and Nerines.

Award of Merit.

To Carnation 'Rose Sensation' (votes 12 for, 1 against), from Messrs. Wells, Merstham. The flowers of this variety, which is a sport from 'Pink Sensation,' are of a very deep and pleasing rose colour, and are of large size with crinkled petals. The flower stems are stiff and wiry, and the calyces are non-bursting.

To Chrysanthemum 'J. Bryant' (votes 15 for), from Messrs. Wells, Merstham. A very large white Japanese variety, with a tinge of green in the centre of the blooms. The florets are long and curled.

To Chrysanthemum 'Lady Stanley' (votes 11 for, 4 against), from Messrs. Wells, Merstham. A very useful Decorative Japanese variety, with large flowers of a pleasing shade of pale rose-pink.

To Chrysanthemum 'Mrs. Moss' (votes 13 for, 1 against), from Mr. P. Ladds, Swanley. A good deep yellow Single variety. The individual blooms measure nearly 5 in. across.

Other Exhibits.

Mr. C. Adlam, Bathwick : Chrysanthemum 'Grace Adlam.'

Mr. H. Bishop, Bolton : Chrysanthemums.

Messrs. Cannell, Eynsford : Chrysanthemums.

F. H. Chapman, Esq., Rye : Nerines.

Mr. B. Gaiger, Shipton : Carnation.

Mr. C. Garland, Rayleigh : seedling Carnation.

Misses Hopkins, Shepperton : hardy plants.

Messrs. Smith, Guernsey : *Berberis Smithiana*.

FLORAL COMMITTEE, DECEMBER 5, 1916.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-four members present.

Awards Recommended :—

Gold Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

Silver-gilt Banksian Medal.

To Messrs. Wells, Merstham, for Chrysanthemums.

Silver Flora Medal.

To Mr. J. C. Jenner, Rayleigh, for Carnations.

To Messrs. Low, Bush Hill Park, for Carnations and Begonias.

Silver Banksian Medal.

To Messrs. Cutbush, Highgate, for Carnations.

To Messrs. May, Upper Edmonton, for ferns and flowering plants.

Award of Merit.

To Chrysanthemum 'Joan Maitland' (votes unanimous), from Mr. G. Carpenter, West Hall Gardens, Byfleet. An excellent Decorative Japanese variety, of good form and size. The colour is very striking, and may be described as chestnut-bronze with a buff reverse. The variety is said to be the result of cross between 'His Majesty' and 'Mrs. R. Luxford.'

To *Cupressus Lawsoniana Pottensi* (votes unanimous), from Messrs. Fletcher, Chertsey. A very graceful form of this useful conifer, with pale green, slightly drooping, growths which are glaucous beneath. The tree is said to keep its beautiful conical shape and to make only the main leader. The specimen exhibited was about 8 feet high.

Other Exhibits.

J. de Pass, Esq., King's Lynn : Chrysanthemum 'Mrs. J. de Pass.'

Messrs. Felton, London : foliage shrubs.

Mr. Godber, Willington : Chrysanthemums.

Mr. E. J. Hicks, Twyford : Rose 'C. E. Shea.'

Misses Hopkins, Shepperton : hardy plants.

Mr. G. Reuthe, Keston : hardy plants.

A. Wright, Esq., Skegness : *Hippophae rhamnoides*.

ORCHID COMMITTEE.

MAY 2, 1916.

Sir HARRY J. VEITCH in the Chair, and twenty-three members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for *Odontoglossums*.

Silver Banksian Medal.

To Messrs. Sander, St. Albans, for a group with many rare species.

To Messrs. Stuart Low, Jarvisbrook, for *Dendrobiums* and hybrids.

Award of Merit.

To *Miltonia vexillaria* 'Lyoth,' Shrubbery variety (*chelsiensis* × 'Memoria G. D. Owen') (votes 14 for, 1 against), from F. M. Ogilvie, Esq., The Shrubbery, Oxford (gr. Mr. Balmforth). A large form of true *M. vexillaria*, with rose-pink flowers having a dark mask at the base of the lip as in *M. vexillaria* 'Memoria G. D. Owen.'

To *Brassolaeliocattleya* × 'Queen of the Belgians,' Bryndir variety (*B.-l.* × *Digbyano-purpurata* × *C. Mendelii* 'Princess of Wales') (votes unanimous), from Dr. Miguel Lacroze, Roehampton (gr. Mr. Cresswell). Flowers large, pure white except the front half of the labellum, which is rosy-lilac.

To *Odontioda* × *Gratrixiae*, Bryndir variety (*Oda.* × *Charlesworthii* × *Odm.* × *amabile*) (votes unanimous), from Messrs. Flory & Black, Slough. In colour resembling *Oda.* × *Charlesworthii*, very dark red, the lip having a yellow crest, and rose-tinted band at the margin.

To *Odontioda* × 'Aurora' (parentage unrecorded) (votes unanimous), from G. W. Bird, Esq., the Manor House, West Wickham (gr. Mr. Redden). Flowers of large size and good shape, the inner parts of the segments blotched with red-brown, the margins tinged lilac.

Preliminary Commendation.

To *Odontoglossum* × 'General Townshend' ('King Emperor' × *Wilckeanum*), deep bronzy-red, with narrow white margin.

To *Odontoglossum* × 'Erzerum' (*Fascinator* × *crispum*), heavily blotched with claret-purple on white ground. Both from Messrs. Armstrong & Brown.

Other Exhibits.

F. M. Ogilvie, Esq. : *Miltonia* × 'Violetta' (parentage unrecorded).

C. J. Lucas, Esq. : *Laeliocattleya* × 'Geo. Branch' ('G. S. Ball' × *bletchleyensis*).

G. W. Bird, Esq. : *Odontioda* × 'Trebizond' (*Odm.* × *Fascinator* × *Oda.* × *Charlesworthii*).

S. H. Lane, Esq. : *Epidendrum variegatum coriaceum*.

Messrs. Armstrong & Brown : hybrid *Odontoglossums*.

Messrs. Flory & Black : *Sophrolaeliocattleya* × *xanthina* (*S.-l.* × 'Psyche' × *L.-c.* × 'Ophir').

Mr. C. F. Waters : a group of *Odontoglossums* &c.

ORCHID COMMITTEE, MAY 16, 1916.

Sir JEREMIAH COLMAN, Bt., in the Chair, and thirteen members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To F. Menteith Ogilvie, Esq., The Shrubbery, Oxford (gr. Mr. Balmforth), for fine specimens of rare *Odontiodas*, *Odontoglossums*, &c.

Award of Merit.

To *Miltonia* × *Hyeana* 'F. M. Ogilvie,' Shrubbery variety (*Bleuana Stevensii* × *vexillaria* 'Memoria G. D. Owen') (votes 7 for, 0 against), from F. M. Ogilvie, Esq. Flower of fine shape, pure white, with rose flush at the bases of the petals and ruby crimson mask on the lip.

Preliminary Commendation.

To *Odontoglossum* × *Farmeri* ('King Emperor' × *amabile*), from Messrs. Armstrong & Brown, Tunbridge Wells. Flowers orange-red with a white margin to the segments a quarter of an inch wide.

Other Exhibits.

C. J. Lucas, Esq. (gr. Mr. Duncan) : *Odontoglossum* × *ardentisper* (*ardentissimum* × 'Jasper').

Dr. Miguel Lacroze (gr. Mr. Cresswell) : *Odontoglossum* × 'Dora,' Bryndir variety.

H. T. Pitt, Esq. (gr. Mr. Thurgood) : *Cymbidium* × *Lowgrinum* (*Lowianum* × *tigrinum*).

R. G. Thwaites, Esq. (gr. Mr. Hannington) : *Odontoglossum Pescatorei* 'Grand Duchess.'

T. J. Finnie, Esq. (gr. Mr. Frogley) : *Catasetum Rodigasianum*.

ORCHID COMMITTEE, MAY 23, 24, 25.

CHELSEA SHOW.

Sir HARRY J. VEITCH in the Chair, and twenty-six members present.

[For Cups and Medals awarded by the Council after consultation with the Judges, see p. lxxxiii.]

Awards Recommended :—

First-class Certificate.

To *Odontoglossum* × *ardentissimum* 'Memoria J. Gurney Fowler'

(*crispum* 'Solum' × *Pescatorei*) (votes unanimous), from Miss Louisa Fowler, Brackenhurst, Pembury, Tunbridge Wells. A very remarkable and interesting hybrid showing that irregular characters in a parent are perpetuated in the hybrid. The flowers are large, white, with a rose flush on the sepals and with one large maroon blotch on some of the sepals and petals, the others being plain, and no order followed in the distribution of the coloured blotches as in *O. crispum* 'Solum.' Lip dark ruby-red with white apiculate front.

Award of Merit.

To *Odontioda* × *Brewii* var. *cuprea* (*Oda.* × *Charlesworthii* × *Odm.* × *Harryanum*) (votes unanimous), from Messrs. Charlesworth. The original form was dark mahogany-red, the present variety is of a light orange-copper tint, a new colour in *Odontiodas*.

To *Odontioda* × 'Florence' (*Oda.* × *Cooksoniae* × *Odm.* × 'Dora') (votes unanimous), from Messrs. Charlesworth. Flowers white, with rose margin and red-purple markings. The spike bore thirty-four flowers.

Miltonia × 'Frank Reader' (*M. vexillaria* 'Memoria G. D. Owen' × ?) (votes unanimous), from Messrs. Armstrong & Brown, Tunbridge Wells. The largest and best of the rose-coloured hybrid *Miltonias*. Flowers of perfect shape, bright rose-pink, with darker veining and a large ruby-red mask at the base of the lip.

To *Laeliocattleya* × 'Sir Mervyn Buller' (*L.-c.* × 'Mrs. Temple' × *C. Mossiae*) (votes unanimous), from Messrs. Armstrong & Brown. Flowers deep rose colour, with a broad dark crimson lip having gold lines from the base.

To *Cattleya* × 'Naidia' var. *luminosa* (*iridescens* × *Hardyana*) (votes unanimous), from Messrs. Flory & Black, Slough. Sepals and petals bronzy-orange, with a slight rose shade. Lip violet-crimson, with large orange disc.

Other Exhibits.

Mrs. Norman C. Cookson: *Odontoglossum crispum* 'Millicent,' large and handsomely blotched.

From the collection of the late J. Gurney Fowler, Esq.: rare Orchids.

W. P. Burkinshaw, Esq.: *Cattleya Mendelii* 'White Queen.'

C. Webb, Esq.: *Bifrenaria Harrisoniae*.

ORCHID COMMITTEE, JUNE 6, 1916.

Sir HARRY J. VEITCH in the Chair, and fourteen members present.

Awards Recommended:—

Silver Flora Medal.

To Dr. Miguel Lacroze, Roehampton (gr. Mr. Cresswell), for *Laeliocattleyas*, *Odontoglossums*, &c.

To Messrs. Charlesworth, Haywards Heath, for hybrids including forms of *Miltonia* × *Charlesworthii*.

Silver Banksian Medal.

To Messrs. Sander, St. Albans, for *Cattleya Mossiae* and *Laeliocattleyas*.

To Messrs. Flory & Black, Slough, for varieties of *Laeliocattleya* × *Canhamiana* and *L.-c.* × 'Aphrodite.'

To Messrs. Stuart Low, Jarvisbrook, for a group.

Bronze Banksian Medal.

To Messrs. Hassall, Southgate, for hybrids.

Award of Merit.

To *Wilsonara* × *insignis* (*Oncidioda* × *Charlesworthii* × *Odontoglossum* × *illustrissimum*) (votes unanimous), from Messrs. Charlesworth, Haywards Heath. A combination of *Cochlioda*, *Oncidium*, and *Odontoglossum*, and approaching nearest to *Oncidioda* × *Charlesworthii* (*Oncidium incurvum* × *Cochlioda Noezliana*). The character of the growth and the erect inflorescence indicate the *Oncidium* parent, the *Odontoglossum* features being obscured. The flowers, which are nearly two inches across, have the sepals and petals purplish claret-red, the three-lobed lip being whitish lilac, with an elongated blotch of claret-red in front of the crest.

To *Odontoglossum* × *Lambardeanum* var. 'Gatton Prince' (*Vuytstekeae* × *coeruleum*) (votes unanimous), from Sir Jeremiah Colman, Bt., Gatton Park (gr. Mr. Collier). Flowers large and with broad segments. Ground colour white, the greater part of the surface bearing large claret-purple blotches, a few transverse white lines appearing between them. Lip white, with one large and some smaller purple blotches.

Other Exhibits.

F. Menteith Ogilvie, Esq.: six specimens of his large form of *Cypripedium Lawrenceanum Hycanum*, one of them with six flowers.

Col. Stephenson R. Clarke, C.B.: *Laeliocattleya* × *Fascinator* 'The Bride,' a white form with a slight blush tint.

R. G. Thwaites, Esq.: forms of *Laeliocattleya* × *Cowanii* (*C. Mossiae* × *L.* × *cinnabrosa*).

ORCHID COMMITTEE, JUNE 20, 1916.

Sir HARRY J. VEITCH in the Chair, and sixteen members present.

Awards Recommended :—*Silver-gilt Flora Medal.*

To Messrs. Charlesworth, Haywards Heath, for hybrid *Odontoglossums*, *Odontiodas*, and *Miltonias*.

Silver Flora Medal.

To Messrs. Sander, St. Albans, for *Cattleyas*, *Laeliocattleyas*, &c.

Silver Banksian Medal.

To Messrs. Flory & Black, Slough, for *Disa* × *Luna* and *D.* × *Blackii*.

Cultural Commendation.

To Messrs. Sander, St. Albans, for *Laeliocattleya* × *Gottoiana Imperator* with a spike of five flowers.

Other Exhibits.

Dr. Miguel Lacroze : *Cattleya* × 'Teucra.'

Ernest Mocatta, Esq. : *Laeliocattleya* × 'Aphrodite.'

Messrs. Hassall : *Laeliocattleyas*.

Messrs. McBean : *Cattleya* × 'Mabel' ('Mrs. Myra Peeters' × *Warneri alba*).

ORCHID COMMITTEE, HOLLAND HOUSE, JULY 4, 5, 6.

Sir HARRY J. VEITCH in the Chair, and twenty-three members present.

[For Cups and Medals awarded by the Council after consultation with the Judges, see p. xci.]

Awards Recommended :—

Silver Lindley Medal.

To F. Menteith Ogilvie, Esq., Oxford (gr. Mr. Balmforth), for an immense plant of *Epidendrum prismatocarpum* with thirty-eight spikes.

First-class Certificate.

To *Laeliocattleya* × 'Isabel Sander,' Blenheim variety (*C. Mossiae Wageneri* × *L.-c.* × *Canhamiana*) (votes unanimous), from His Grace the Duke of Marlborough, Blenheim Palace (orchid-grower Mr. Smith). A very beautiful hybrid with large silver-white flowers tinged with rose, the front of the lip being claret-crimson.

Award of Merit.

To *Laeliocattleya* × 'Isabel Sander' var. 'Gatton Queen' (*C. Mossiae Wageneri* × *L.-c.* × *Canhamiana*) (votes 12 for, 6 against), from Sir Jeremiah Colman, Bt., Gatton Park (gr. Mr. Collier). Sepals and petals pure white, the broad labellum being reddish violet.

To *Miltonia* × 'Isabel Sander,' Charlesworth's variety (*Hyeana* × *Roezii*) (votes unanimous), from Messrs. Charlesworth, Haywards Heath. Equal in size to the best form of *M. vexillaria*, clear white, with light violet bases to the petals and a rayed purple mask at the base of the lip.

Miltonia × 'John Barker' (parentage unrecorded) (votes 11 for, 2 against), from Messrs. Sander, St. Albans. Flowers of medium size, white, tinged and flaked with rose, the lip having a ruby-red base.

To *Brassocattleya* × 'Ilene,' Low's variety (*B.-c.* × 'Madame Chas. Maron' × *C. Dowiana*) (votes 10 for, 3 against). Flowers large and well displayed, primrose-yellow flaked with lilac, the fringed lip having a yellow disc.

Cultural Commendation.

To Mr. Thurgood, gr. to H. T. Pitt, Esq., Stamford Hill, for two fine specimens of *Platyclinis filiformis*.

To Messrs. Sander, St. Albans, for *Cirrhopetalum robustum* with twelve spikes.

Other Exhibits.

Sir Mervyn Buller, Bt., Broomhill, Spratton, Northants (gr. Mr. Kench): *Vanda coerulea* 'Killarney.'

Messrs. Armstrong & Brown, Tunbridge Wells: hybrid *Odontoglossums*, *Odontiodas*, and *Miltonias*, among the last being the handsome *M.* × 'J. Gurney Fowler.'

ORCHID COMMITTEE, JULY 18, 1916.

Sir HARRY J. VEITCH in the Chair, and twelve members present.

Awards Recommended:—*Silver Flora Medal.*

To Messrs. Charlesworth, Haywards Heath, for hybrid *Miltonias*, *Odontoglossums*, and *Odontiodas*.

To Messrs. Stuart Low, Jarvisbrook, for varieties of *Cattleya Warscewiczii*.

Silver Banksian Medal.

To Messrs. Armstrong & Brown, Tunbridge Wells, for new hybrids.

First-class Certificate.

To *Laeliocattleya* × 'Momus' (*L.-c.* × 'Rubens' *Lambeauiana* × *C.* × 'Octave Doin') (votes unanimous), from Messrs. Charlesworth. A large flower of perfect shape and fine substance, bright rose colour, with ruby-crimson front to the lip.

Award of Merit.

To *Cattleya* × 'Saturn,' Orchidhurst variety (*O'Brieniana alba* × *Gaskelliana alba*) (votes 9 for, 4 against), from Messrs. Armstrong & Brown. Flower pure white, with a pale yellow disc to the labellum.

To *Miltonia vexillaria* 'Dreadnought' (votes 6 for, 3 against), from Messrs. Armstrong & Brown. A seedling form with rose-pink flowers having a white base to the labellum, the disc being yellow, with three red lines in front. Labellum four inches across.

To *Cattleya* × 'Hesta' ('Suzanne Hye de Crom' × *Warscewiczii* 'Fr. M. Beyrodt') (votes unanimous), from Messrs. Charlesworth. Sepals and petals pure white, the front of the lip veined with purple.

Other Exhibits.

Ernest Mocatta, Esq.: *Laeliocattleya* × 'Carmencita.'

G. W. Bird, Esq.: *Odontioda* × 'Vesper.'

Messrs. Flory & Black: hybrid *Disas* &c.

Messrs. Hassall: forms of *Cattleya* × 'Sybil.'

ORCHID COMMITTEE, AUGUST 1, 1916.

Sir JEREMIAH COLMAN, Bt., in the Chair, and fifteen members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for hybrids.

Award of Merit.

To *Laeliocattleya* × 'General Letchitsky' (*callistoglossa* × *blechleyensis*) (votes 9 for, 1 against), from Messrs. Charlesworth. Sepals and petals bright rose colour, and the lip deep purple, with a narrow lilac margin.

To *Laeliocattleya* × 'Maqueda' (*L.-c.* × 'Geo. Woodhams' × *C.* × 'Lord Rothschild') (votes 10 for, 0 against), from Messrs. Armstrong & Brown, Tunbridge Wells. In this, as in some other *Laeliocattleyas* recently shown, progressive crossing has almost entirely eliminated the yellow disc of the lip, which is a prominent feature in *Cattleya Dowiana*, which twice enters into its composition, *C. Gaskelliana*, *C. Warscewiczii*, and *Laelia purpurata*, which also took part in the production. Flowers large and of good shape, bright purplish rose, with ruby-crimson lip.

Other Exhibits.

Sir Jeremiah Colman, Bt., Gatton Park (gr. Mr. Collier) : *Laelia* × *eximia*, Gatton Park variety.

Messrs. Flory & Black, Slough : *Cattleya* × 'Nena' ('Adula' × *Dietrichiana*).

Messrs. Mansell & Hatcher, Rawdon, Yorks : *Cattleya* × 'Helen Langley' ('Mrs. Myra Peeters' × *Dusseldorfei* 'Undine').

Messrs. Armstrong & Brown, Tunbridge Wells : new hybrids.

Messrs. Charlesworth, Haywards Heath : *Laeliocattleya* × 'General Sakharoff' (*L.-c.* × *callistoglossa* × *C. Gaskelliana*) and *L.-c.* × 'Appam' (*L.-c.* × 'Scylla' × *C. Dowiana aurea*).

ORCHID COMMITTEE, AUGUST 15, 1916.

Sir HARRY J. VEITCH in the Chair, and fifteen members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for hybrid *Cattleyas* and *Laeliocattleyas*.

Silver Banksian Medal.

To Messrs. Stuart Low, Jarvisbrook, for showy species and hybrids.

To Messrs. Hassall, Southgate, for *Cattleya* × 'Sybil' and *C.* × 'Adula.'

Award of Merit.

To *Cattleya* × *weedonaurea* (*weedoniensis* × *Dowiana aurea*) (votes unanimous), from His Grace the Duke of Marlborough, Blenheim, Woodstock. In general characters resembling *C.* × *Hardyana*. Sepals and petals pale rose colour, with darker veining. Lip ruby-crimson, with yellow lines at the base.

To *Laeliocattleya* × 'Serbia' (*L.-c.* × 'St. Gothard' × *C.* × 'Enid') (votes 9 for, 3 against), from Messrs. Charlesworth. *Cattleya* predominating in the ancestry of this hybrid, *C. Warneri*, obtained through *L.-c.* × *Gottoiana*, one of the parents of *L.-c.* × 'St. Gothard,' gives the fine form and large size to this hybrid. Flowers bright rose colour, with deep claret lip having yellow lines running into the centre.

Cultural Commendation.

To Mr. Thurgood, gr. to H. T. Pitt, Esq., for a fine specimen of *Odontoglossum aspidorhinum* with many spikes, partly produced from old pseudo-bulbs.

Other Exhibits.

Frederick J. Hanbury, Esq.: *Cypripedium* × 'Miss Faith Hanbury' (*niveum* × *glaucophyllum*).

Dr. Miguel Lacroze: *Laeliocattleya* × *Colmaniana*, Bryndir variety (*L.-c.* × *callistoglossa* × *C. Dowiana aurea*).

Messrs. Armstrong & Brown: *Odontoda* × *Cooksoniae*.

ORCHID COMMITTEE, AUGUST 29, 1916.

Sir HARRY J. VEITCH in the Chair, and thirteen members present.

Awards Recommended:—*Silver Flora Medal.*

To Messrs. Armstrong & Brown, Tunbridge Wells, for hybrids.

To Messrs. Charlesworth, Haywards Heath, for hybrids and rare species.

Silver Banksian Medal.

To Messrs. Hassall, Southgate, for *Cattleya* × 'Sybil' varieties and other *Cattleyas*.

To Messrs. Sander, St. Albans, for a group.

Award of Merit.

To *Laeliocattleya* × 'Thyone,' Bryndir variety (*L.-c.* × 'Ophir' × *C. Dowiana aurea*) (votes unanimous), from Dr. Miguel Lacroze, Bryndir, Roehampton Lane (Orchid-grower Mr. Taylor). Sepals and petals bright chrome-yellow; lip orange colour, with broad ruby-claret margin.

To *Laeliocattleya* × 'Golden Wren' (*L.-c.* × 'Thyone' × *C.* × *iridescens*) (votes unanimous), from Messrs. Armstrong & Brown, Tunbridge Wells. A rich yellow flower of fine substance, with ruby-purple front to the lip.

Other Exhibits.

Messrs. Flory & Black, Slough: Sophrocattleyas and Laeliocattleyas.

Messrs. Stuart Low, Jarvisbrook: Cattleyas &c.

Mr. C. F. Waters, Balcombe: hybrids flowering for the first time.

ORCHID COMMITTEE, SEPTEMBER 12, 1916.

Sir JEREMIAH COLMAN, Bt., in the Chair, and nineteen members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for hybrid Cattleyas &c.

Silver Banksian Medal.

To His Grace the Duke of Marlborough, Blenheim, Woodstock (gr. Mr. J. Smith), for hybrid Orchids.

To Messrs. Armstrong & Brown, Tunbridge Wells, for hybrids and white Cattleyas.

To Messrs. McBean, Cooksbridge, for a group.

Award of Merit.

To *Cattleya* × 'Venus' var. 'Victrix' (*Iris* × *Dowiana aurea*) (votes unanimous), from Pantia Ralli, Esq., Ashted Park, Surrey (Orchid grower, Mr. W. H. White). Sepals and petals broad, greenish-gold colour with a bronze shade. Lip ruby-red in front, and the base yellow.

To *Cattleya* × 'Venus' var. 'Golden Queen' (votes unanimous), from Messrs. Charlesworth. Flowers bright cowslip-yellow. Lip violet colour with red base.

Cultural Commendation.

To Messrs. McBean, Cooksbridge, for *Dendrobium Sanderæ*, each with fifty to sixty large white flowers with purple lines on the lip.

Other Exhibits.

Pantia Ralli, Esq.: *Cattleya* × 'Adula' *excelsa*.

Messrs. Sander, St. Albans: a group.

Mr. C. F. Waters, Balcombe: *Laeliocattleya* × 'Fleury' (*L.-c.* × 'Issy' × *C. Dowiana aurea*).

ORCHID COMMITTEE, SEPTEMBER 26, 1916.

Sir HARRY J. VEITCH, in the Chair, and sixteen members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for hybrids including forms of *Odontoglossum eximium xanthotes* and allied varieties.



FIG. 118.—NARCISSUS 'CENTURION' (*Bath*).
(p. cc.)

[To face p. cxcii.]



FIG. 119.—NARCISSUS 'WHITE KNIGHT' (*Bath*).
(p. ccii.)

First-class Certificate.

To *Sophrocattleya* × 'Sir Mervyn Buller' (*S.-c.* × *Wellesleyae* × *C.* × 'Empress Frederick') (votes unanimous), from Messrs. Armstrong & Brown, Orchidhurst, Tunbridge Wells. A remarkable novelty formed like *Cattleya Mossiae*. Sepals and petals apricot-yellow, minutely dotted and veined with reddish rose. Lip copper-red with darker freckling, yellow base, and radiating lines.

Award of Merit.

To *Laeliocattleya* × 'Lady Manningham Buller' ('Thyone,' Orchidhurst variety × *luminosa*) (votes unanimous), from Messrs. Armstrong & Brown. Sepals and petals pale canary-yellow. Lip dark maroon-purple, with yellow lines from base to centre.

To *Brassocattleya* × 'Oberon' var. 'Majestic' (*B.-c.* × *Digbyano-Mossiae* × *C. Schroederæ*) (votes unanimous), from Messrs. Sander, St. Albans. A very large white flower with a pink shade. Lip fringed; disc yellow.

To *Cattleya* × 'Rhoda,' Langley variety (*Iris* × *Hardyana*) (votes unanimous), from Messrs. Flory & Black, Slough. Flowers yellow, heavily flaked with mulberry-red. Lip ruby-red, with yellow lines.

Other Exhibits.

R. G. Thwaites, Esq. : varieties of *Cattleya* × 'Venus.'

C. A. Harrison, Esq. : two hybrids.

Messrs. Armstrong & Brown : hybrids.

Messrs. Sander : a group.

Mr. E. V. Low : Cattleyas and *Laeliocattleyas*.

Mr. H. Dixon : *Sophrolaeliocattleya* × 'Pandora.'

ORCHID COMMITTEE, OCTOBER 10, 1916.

Sir HARRY J. VEITCH in the Chair, and nineteen members present.

Awards Recommended :—*Silver Banksian Medal.*

To Messrs. Charlesworth for Cattleyas, *Laeliocattleyas*, and *Odontoglossums*.

To Messrs. Armstrong & Brown for hybrids.

To Messrs. Sander for interesting species and hybrids.

To Messrs. Hassall for hybrid Cattleyas.

To Messrs. Stuart Low for a group.

To Messrs. McBean for home-raised *Cattleya* × *Hardyana*.

Award of Merit.

To *Odontoglossum* × *percultum* var. 'Nicator' (*ardentissimum* × *Rolfeæ*) (votes unanimous), from Ernest G. Mocatta, Esq., Woburn Place, Addlestone (gr. Mr. Stevenson). Sepals and petals broad and fringed, reddish claret, with white margins and tips to all the segments. The plant bore two spikes, each with eleven flowers.

To *Cattleya* × 'Venus,' Orchidhurst variety (*Iris* × *Dowiana aurea*) (votes unanimous), from Messrs. Armstrong & Brown, Orchidhurst, Tunbridge Wells. Flowers of good shape, bronzy-yellow, with ruby-crimson lip, having orange markings on the base and isthmus between the short side lobes and expanded front.

To *Sophrolaeliocattleya* × 'Lutetia' (*S.-l.-c.* × 'Sandhage' × *C.* × 'Fabia') (votes unanimous), from Messrs. Charlesworth, Haywards Heath. Sepals gold-bronze colour with a violet shade, petals rose-purple with reddish tips. Lip dark claret, with orange centre and yellow lines at the base.

Other Exhibits.

R. Windsor Rickards, Esq., Usk Priory, Monmouthshire: rare *Cypripediums* and *Odontoglossum* × 'Albion' *rubescens*.

R. G. Thwaites, Esq., Streatham: varieties of *Laeliocattleya* × *luminosa*.

Mr. C. F. Waters, Balcombe: *Vanda coerulea*.

Messrs. Flory & Black, Slough: *Cirrhopetalum Rothschildianum*.

ORCHID COMMITTEE, OCTOBER 24, 1916.

Sir HARRY J. VEITCH in the Chair, and eighteen members present.

Awards Recommended:—

Gold Medal.

To Messrs. Charlesworth, Haywards Heath, for a fine group of hybrids, including over 100 specimens of the orange-scarlet *Epidendrum vitellinum autumnale*.

Silver Flora Medal.

To Messrs. Sander, St. Albans, for hybrids and rare species.

To Messrs. Hassall, Southgate, for hybrid *Cattleyas*.

Silver Banksian Medal.

To Messrs. Armstrong & Brown, Tunbridge Wells, for new hybrids.

To Messrs. Flory & Black, Slough, for *Cattleyas* and *Laeliocattleyas*.

First-class Certificate.

To *Odontoglossum* × 'Menier' (*gandavense* × *amabile*) (votes unanimous), from Ernest G. Mocatta, Esq., Woburn Place, Addlestone (gr. Mr. Stevenson). The original form, shown previously in its early stage by Mr. Mocatta. A very fine *Odontoglossum*. The stout spike bore thirteen large chocolate-claret flowers, with white tips to the segments.

To *Cattleya* × 'Thebes' var. 'Britannia' ('Adula' × *Dowiana aurea*) (votes unanimous), from Messrs. Sander, St. Albans. One of the best yellow-petalled *Cattleyas*. Flowers large and of good substance, cowslip-yellow, with ruby-red lip tinged with purple in front.

Award of Merit.

To *Cattleya* × 'Fabia,' 'Memoria Lord Roberts' (*labiata* × *Dowiana aurea*) (votes unanimous), from Messrs. Sander. A large, intensely dark form, with purplish-rose sepals and petals and claret-red lip, having orange lines from the base to the centre.

To *Cattleya* × 'Prince John,' Orchidhurst variety (*Hardyana alba* × *Dowiana aurea*) (votes unanimous), from Messrs. Armstrong & Brown. Resembling a large form of *C. Hardyana alba*, pure white with purplish-crimson lip, which has a yellow disc in the centre.

To *Cattleya* × 'Alexandra' ('Carmen' × *Hardyana*) (votes unanimous), from Messrs. Flory & Black. Sepals and petals bright rosy-mauve. Lip ruby-red, with a yellow blotch on each side.

To *Brassocattleya* × 'Mars' var. *xantholeuca* (B.-c. × 'Mrs. J. Leemann' × *C.* × 'Maggie Raphael' *alba*) (votes unanimous), from Messrs. Flory & Black. Flowers eight inches across, white, with orange-coloured disc to the fringed lip.

Other Exhibits.

Sir Jeremiah Colman, Bt., Gatton Park (gr. Mr. Collier): blue-tinted *Cattleyas* raised at Gatton, and varieties of *Cattleya Bowringiana*.

Col. Stephenson Clarke, Cuckfield (gr. Mr. Gillett): *Cattleya Bowringiana lilacina*.

 ORCHID COMMITTEE, NOVEMBER 7, 1916.

Sir JEREMIAH COLMAN, Bt., in the Chair, and seventeen members present.

Awards Recommended:—*Silver Flora Medal.*

To Messrs. Sander, St. Albans, for *Cattleya Fabia*, of which seventy-five plants were white-petalled varieties.

To Messrs. Armstrong & Brown, Tunbridge Wells, for new hybrid *Odontoglossums*.

To Messrs. Charlesworth, Haywards Heath, for *Cattleyas* and *Laeliocattleyas*.

To Messrs. J. Cypher, Cheltenham, for *Cypripediums*, *Dendrobium Phalaenopsis*, &c.

First-class Certificate.

To *Cypripedium* × 'Mrs. Hilary Jenkinson' (parentage unrecorded) (votes 10 for, 1 against), from R. Windsor Rickards, Esq., Usk Priory, Monmouthshire. A fine flower of *C.* × 'Dreadnought' class. Dorsal sepal three and a half inches across, white, with a yellowish base and purple spotting. Lip and petals yellow, tinged with chestnut-red.

Award of Merit.

To *Cypripedium* × 'A. J. H. Smith' (*niveum* × 'Hera Euryades') (votes unanimous), from Mrs. N. C. Cookson, Wylam (gr. Mr. H. J. Chapman). Flower white, with purple dotted lines up the middle of the dorsal sepal and petals.

Preliminary Commendation.

To *Odontoglossum* × 'General Cadorna' (*Ossuistonii* × 'King Emperor'), from Messrs. Armstrong & Brown. Flower large, primrose-yellow, heavily blotched with claret.

Cultural Commendation.

To Mr. Redden (gr. to G. W. Bird, Esq., West Wickham), for *Odontoglossum* × *percultum* with eighty-four flowers.

Other Exhibits.

Sir Jeremiah Colman, Bt.: *Laeliocattleyas* raised at Gatton Park.

R. G. Thwaites, Esq.: hybrid *Cattleyas*.

H. F. Goodson, Esq.: *Sophrocattleya* × 'Annette.'

Messrs. Stuart Low: *Cattleya* × 'Prince John,' Low's variety.

Messrs. Flory & Black: *Brassocattleya* × 'Merlin.'

Mr. C. F. Waters: *Cypripedium* × seedlings.

ORCHID COMMITTEE, NOVEMBER 21, 1916.

Sir JEREMIAH COLMAN, Bt., in the Chair, and eighteen members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Armstrong & Brown, Tunbridge Wells, for white hybrid *Cattleyas*, new *Odontoglossums*, &c.

To Messrs. Charlesworth, Haywards Heath, for hybrid *Cattleyas*, *Laeliocattleyas*, &c.

To Messrs. McBean, Cooksbridge, for hybrids.

Silver Banksian Medal.

To Messrs. Sander, St. Albans, for hybrids and rare species.

To Messrs. J. Cypher, Cheltenham, for *Cypripediums*.

Award of Merit.

To *Cypripedium* × 'Madame Albert Fevrier,' Chardwar variety ('Germaine Opoix' × *insigne* 'Harefield Hall') (votes 15 for, 0 against) from G. F. Moore, Esq., Chardwar, Bourton-on-the-Water (gr. Mr. Page). Resembling the best form of *C.* × 'Germaine Opoix,' but larger in size. Dorsal sepal circular, white, with yellowish base and numerous dotted lines of claret-red. Lip and petals tinged mahogany-red, with some dark spotting on the petals.

To *Cattleya* × 'Monastir' ('Freya' var. 'Mrs. Fred. Sassoon' ×

Dowiana aurea) (votes unanimous), from Messrs. Armstrong & Brown, Tunbridge Wells. Sepals and petals rose-purple, shaded with pink. Lip ruby-red, with gold lines in the centre.

To *Cattleya* × *Claesiana alba* (*Loddigesii alba* × *intermedia alba*) (votes 14 for, 0 against). Flowers pure white, with pale yellow disc to the lip. The coloured type was imported as a natural hybrid.

To *Laeliocattleya* × 'Soulange,' Bryndir variety (*L.-c.* × 'Lustre' × *C. Dowiana aurea*) (votes 15 for, 0 against), from Messrs. Flory & Black, Slough. A large rose-coloured flower, with purplish-crimson lip having gold lines from the base as in *C. Dowiana aurea*.

Other Exhibits.

Messrs. Flory & Black: *Laeliocattleya* × 'Monastir' (*L.-c.* × *callistoglossa* × *C.* × *Pittiana*).

G. Hamilton Smith, Esq.: *Cymbidium* × 'Castor' var. *aureum* (*insigne* × *Woodhamsianum*).

Mr. C. F. Waters: *Laeliocattleya* × 'Harclon' (*C. Harrisoniana* × *L.-c.* × 'Clonia').

ORCHID COMMITTEE, DECEMBER 5, 1916.

Sir JEREMIAH COLMAN, Bt., in the Chair, and seventeen members present.

Awards Recommended:—

Gold Medal.

To Messrs. Armstrong & Brown, Tunbridge Wells, for winter-flowering Cattleyas.

Silver Flora Medal.

To R. Windsor Rickards, Esq., Usk Priory, Monmouth, for *Cypripediums*.

To Messrs. Charlesworth, Haywards Heath, for hybrid Orchids.

Silver Banksian Medal.

To Messrs. Cypher, Cheltenham, for *Cypripediums*.

To Messrs. Hassall, Southgate, for Cattleyas and *Cymbidium*s.

First-class Certificate.

To *Brassolaeliocattleya* × 'The Baroness,' Orchidhurst variety (*B.-c.* × 'Mrs. J. Leemann' × *L.-c.* × 'Ophir') (votes 11 for, 1 against), from Messrs. Armstrong & Brown. A finer variety of the original which received **F.C.C.** Aug. 26, 1913. Flowers clear citron-yellow, with light purple markings at the base of the broad-fringed labellum.

Award of Merit.

To *Cypripedium* × 'John Cypher' (*Fairrieanum* × *aureum* 'Surprise') (votes 12 for, 0 against), from R. Windsor Rickards, Esq., Usk Priory. Flowers pale yellow, with faint green lines on the dorsal sepal, which is white on the upper half.

To *Cypripedium* × 'Chardwar' ('Hera Euryades' × unknown) (votes 10 for, 4 against), from R. Windsor Rickards, Esq. An improved form of *C.* × 'Hera Euryades.' Dorsal sepal white, with green base and heavy chocolate-purple spotting. Lip and petals purplish-brown on yellow ground colour.

To *Laeliocattleya* × 'Lorna' (*L.-c.* × *Wrigleyi* × *C. labiata*) (votes 11 for, 0 against), from Messrs. Flory & Black, Slough. In appearance and colour resembling *L.-c.* × *Wrigleyi* (*L. anceps* × *C. Boweringiana*), but of dwarfer habit, and flowers nearly as large as *C. labiata*. Flowers rosy-lilac, with purple lines at the base of the lip, which has a broad purple band in front.

Preliminary Commendation.

To *Odontoglossum* × 'Doris,' Orchidhurst variety (*Ossulstonii* × *crispum*), from Messrs. Armstrong & Brown.

To *Odontioda* × 'Madeline' var. 'Black Prince' (*Oda.* × *Charlesworthii* × *Odm. crispum*), from Messrs. Armstrong & Brown.

Other Exhibits.

Baron Bruno Schröder : flowers of hybrid Orchids.

Dr. Miguel Lacroze : *Laeliocattleya* × 'Serbia,' Bryndir variety.

Ernest G. Mocatta, Esq. : *Laeliocattleya* × 'Thyone' var. 'Goldone.'

Messrs. Flory & Black : hybrid Orchids.

Messrs. Sander : a group of hybrids and interesting species.

Messrs. Stuart Low : *Cattleya maxima alba*.

NARCISSUS AND TULIP COMMITTEE.

MARCH 7, 1916.

Mr. E. A. BOWLES in the Chair, and six members present.

It was moved by Mr. Chas. H. Curtis (Hon. Sec.), seconded by Mr. G. W. Leak, and agreed, that a recommendation be sent to the Council:—"That, in future, meetings of the Narcissus Committee be held on the occasion of the two R.H.S. meetings in February."

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. Cuthbert, Southgate, for Tulips in pots.

Silver-gilt Banksian Medal.

To Messrs. Bath, Wisbech, for Daffodils and Tulips grown in fibre.

To Messrs. Barr, Covent Garden, for Daffodils gathered out of doors in Cornwall.

NARCISSUS AND TULIP COMMITTEE, MARCH 14, 1916.

Mr. E. A. BOWLES in the Chair, and ten members present.

Awards Recommended:—

Silver-gilt Banksian Medal.

To Messrs. Barr, for Daffodils cut in the open in Cornwall.

To Messrs. J. R. Pearson, Lowdham, for Daffodils.

To Messrs. Bath, for Daffodils and Tulips grown in fibre.

Bronze Banksian Medal.

To Messrs. Robert Sydenham, Birmingham, for Daffodils.

Award of Merit.

To *Narcissus* 'Pippin' for pots (votes 9 for, 0 against), an early *Barrii* form ('Princess Mary' × 'Chaucer'), with cream-coloured perianth and a very wide orange crown, from Messrs. F. H. Chapman, Rye.

To *Narcissus* 'Sparkler' for cutting and market (votes 9 for, 0 against), a robust *Incomparabilis* variety, with deep yellow perianth and orange-scarlet cup, from Messrs. Barr.

NARCISSUS AND TULIP COMMITTEE, MARCH 28, 1916.

Mr. E. A. BOWLES in the Chair, and twelve members present.

The Rev. J. Jacob proposed and the Hon. Sec. seconded, and it

was carried unanimously, that the following recommendation be sent to the Council:—"The Narcissus and Tulip Committee of the Royal Horticultural Society, realizing that *Fusarium* is steadily increasing among Daffodil bulbs in private and trade gardens, requests the Council to cause investigations to be made at Wisley with a view to the publication of a report dealing with the nature of the fungus and its attack, and, if possible, suggesting methods of combating its ravages."

A charming little Daffodil raised at Oporto by Baron Soutellino was exhibited. It was the result of crossing *Narcissus cyclamineus* with *N. Tazetta* 'Soleil d'Or,' the latter of which is rarely sufficiently fertile to be a parent. The flower was sent up to the Scientific Committee and recommended for a *Botanical Certificate*, which was subsequently granted.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. Barr, for Daffodils.

Silver Flora Medal.

To Messrs. Bath, for Daffodils and Tulips grown in fibre.

Award of Merit.

To *Narcissus* 'Centurion'—for pots (votes 6 for, 1 against); a large *Incomparabilis* variety with ivory-white perianth and pale yellow cup, from Messrs. Bath. (Fig. 118.)

To *Narcissus* 'Cymry'—for garden decoration (votes 11 for, 0 against); a golden yellow variety, with flowers carried on stout stems, from Mr. Batson, Beaworthy.

NARCISSUS AND TULIP COMMITTEE, APRIL 11, 1916.

Mr. E. A. BOWLES in the Chair, and twelve members present.

A favourable reply from the Council, respecting the resolution concerning *Fusarium* disease, was read, and the Chairman was requested to convey the thanks of the Committee to the Council for the promised investigation.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. Barr, for Tulips.

To Messrs. Bath, for Tulips.

To Mr. Alex. Wilson, Shovel, for new Daffodils.

Silver-gilt Banksian Medal.

To Messrs. Sutton, for Tulips.

To Messrs. Cuthbert, for Tulips.

Silver Flora Medal.

To Messrs. F. H. Chapman, Rye, for Daffodils.

To Messrs. Bath, for Daffodils.

Award of Merit.

To *Narcissus* 'Ozan'—for show purposes (votes 10 for, 0 against), a milk-white *Incomparabilis* variety, with crinkled pale yellow cup, from Mr. Alex. Wilson.

To *Narcissus* 'Double Sir Watkin'—for show purposes (votes 8 for, 0 against); a double sport from a popular variety; it has both primrose-yellow and orange segments; from Messrs. Bath.

To *Narcissus* 'Palermo'—for show purposes (votes 7 for, 0 against), a robust *Barrii* form, yellow, with orange-red cup, from Mr. Alex. Wilson.

To *Narcissus* 'Poetry'—for the rock garden (votes 8 for, 0 against), a *triandrus* hybrid, with drooping flowers; creamy-white, with primrose cup; from Mr. F. Barchard, Uckfield.

NARCISSUS AND TULIP COMMITTEE, APRIL 18, 1916.

Mr. E. A. BOWLES in the Chair, and eighteen members present.

Nominations for the award of the Peter Barr Memorial Cup for good work in connexion with Daffodils were invited by the Chairman. It was suggested that in future the Hon. Secretary notify members of the date of election and invite nominations. The voting was by ballot and resulted in the award of the cup to Mrs. R. O. Backhouse.

Awards Recommended :—*Gold Medal.*

To Messrs. Barr, for Daffodils.

Silver-gilt Flora Medal.

To Messrs. Bath, for Daffodils and Tulips.

To Messrs. James Carter, Raynes Park, for Daffodils.

Silver-gilt Banksian Medal.

To Messrs. J. R. Pearson, Lowdham, for Daffodils.

To Mr. Christopher Bourne, Bletchley, for Daffodils.

Silver Flora Medal.

To Messrs. Dobbie, Edinburgh, for Daffodils.

Silver Banksian Medal.

To Messrs. Robert Sydenham, Birmingham, for Daffodils.

To Mr. C. A. Jardine, Balham, for Daffodils and Daffodil seedlings in various stages of development.

Award of Merit.

To *Narcissus* 'White Pennant'—for show purposes (votes 11 for, 0 against); a giant *Leedsii* form, with uniformly white flowers, from Messrs. Bath.

To *Narcissus* 'Phyllida'—for show purposes (votes 14 for, 0 against), a large *Incomparabilis* variety with cream-coloured perianth and canary-yellow cup, from Mr. W. F. M. Copeland, Southampton.

To *Narcissus* 'White Pearl' (votes 10 for, 0 against), a dainty Daffodil with milk-white perianth and creamy-white cup, from Mr. W. F. M. Copeland.

To *Narcissus* 'Coral'—for show purposes (votes 12 for, 2 against), a substantial *Leedsii* variety, with white perianth and crinkled creamy-white cup, from Mr. W. F. M. Copeland.

NARCISSUS AND TULIP COMMITTEE, MAY 2, 1916.

Rev. G. H. ENGLEHEART, V.M.H., in the Chair, and eleven members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. Bath, for Daffodils.

To Messrs. Barr, for Daffodils and Tulips.

Award of Merit.

To *Narcissus* 'St. Ilario'—for show purposes (votes 8 for, 0 against), a graceful *Leedsii* variety with white perianth, and white yellow-edged cup, from Messrs. J. R. Pearson.

To *Narcissus* 'White Knight'—for show purposes (votes 9 for, 0 against), a fine white trumpet variety, of beautiful form and texture, from Messrs. Bath. (Fig. 119.)

To Tulip 'Samson' (votes 9 for, 0 against), an early single variety, orange-red, lilac flushed on outer surface, and with yellow base, from Messrs. James Carter.

NARCISSUS AND TULIP COMMITTEE, MAY 16, 1916.

Mr. E. A. BOWLES in the Chair, and eleven members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. Barr, for Tulips.

To Messrs. Dobbie, for Tulips.

Silver-gilt Banksian Medal.

To Messrs. R. Wallace, Colchester, for Tulips.

To Messrs. J. Waterer, Sons, & Crisp, for Tulips.

Silver Flora Medal.

To Messrs. Bath, for Tulips.

Award of Merit.

To Tulip 'Lady Love' (votes 9 for, 1 against), flowers large and long, and of a delicate yellow colour, from Messrs. Walter T. Ware, Inglescombe, Bath.

To Tulip 'Inglescombe Mauve' (votes 9 for, 0 against), clear mauve, with lavender-blue base, from Messrs. Walter T. Ware.

To Tulip 'Zorilla' (votes 10 for, 0 against), orange-red, with dark yellow base, fine in size and form, from Messrs. Walter T. Ware.

To Tulip 'Asturias' (votes 9 for, 1 against), a mauve-coloured variety, with white base and elongated form, from Messrs. Walter T. Ware.

CERTIFICATES FOR DILIGENT INTEREST IN PLANTS,
1916.

CERTIFICATES for Diligent Interest in Plants have been awarded to the following during 1916:—

Lieba Smollan, 1st in the Waterloo Wesleyan Girls' School Competition for the best collection of wild flowers.

Evelyn Bunting, 1st in the Waterloo Wesleyan Girls' School Competition for the best kept garden plot.

Sydney Vaus, 1st in the Westerham Boys' C.E. School Competition for the best work on the school gardens.

And to the following members of the St. Mark's, Birmingham, Amateur Gardening Society:—

For Window-Box Gardening, and the good Upkeep of Back and Front Gardens.

Mr. Davies.	Mr. H. Wright.
Mrs. Barber.	Mr. J. Day.
Mr. Saunders.	Mr. Palfreyman.
Miss Lunn.	Mr. S. Warren.
Mrs. Bowen.	Mr. S. Harper.
Mr. Johnson.	Mrs. Banks.
Mr. Boswell.	Mr. F. Webb.
Mrs. Jones.	Mrs. Addiscott.
Mr. Bowden.	Mr. Frost.
Mrs. Mason.	Mr. Moorehouse.
Mrs. Summers.	Mr. Blewitt.
Mrs. Sands.	Mrs. Oldham.
Mr. Jenkins.	Mrs. Chapman.
Mr. Furness.	Mrs. Duckett.
Mr. Strawford.	Mr. J. Wardell.
Mr. Frampton.	Mr. W. Dowler.
Mr. Ridgway.	Mrs. S. Warren.
Mr. A. Botting.	Mr. Addiscott.

HORTICULTURAL SUNDRIES.

AWARDS MADE IN 1916.*

Spraying Machines.*Award of Merit.*

1. "Southern Cross" Spraying Pump, sent by Messrs. The Four Oaks Co., Sutton Coldfield. A powerful pump for attaching to a tub or water barrow, easy to work, constructed of brass with brass ball valves, and suitable for spraying plants and for lime-washing.

2. "Little Wonder" Dry Powder Sprayer for distributing powdered sulphur and other powders, sent by Messrs. The Four Oaks Co., Sutton Coldfield. Gives a very even distribution of powder, capable of graduation, easily cleansed, and carrying to full capacity of container.

Highly Commended.

3. "Streatley" Hand Pneumatic Sprayer, pattern de luxe. Sent by Messrs. The Four Oaks Co., Sutton Coldfield. A pneumatic hand sprayer, holding 3 pints of spray-fluid, and containing a brass alloy pump with thumb lever tap. Strongly made and suitable for spraying small areas both indoors and out.

Miscellaneous :*Award of Merit.*

4. Adjustable Sand Distributor (patent), sent by Messrs. H. Pattison Ltd., Greyhound Lane, Streatham, S.W. A machine for evenly distributing sand, dry chemical manures, worm-killers, &c., on lawns, paths, &c., capable of graduation according to the "grain" and quantity of material to be distributed.

Commended.

5. Turf Renovator, sent by Messrs. H. Pattison, Ltd., Greyhound Lane, Streatham, S.W. An iron instrument for cutting out small circular patches of turf and replacing pieces of good turf of the exact size.

* These awards stand for ten years only, and lapse in 1926.

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3. Subscriptions.
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1. R.H.S. PANEL OF GARDEN EXPERTS FOR WAR NEEDS.

LECTURES ON FRUIT BOTTLING.

In connexion with the Government's scheme for increasing the quantity of home-grown vegetable food, and the powers now vested in local Authorities for the further cultivation of vacant land, the

President and Council of the Royal Horticultural Society have prepared a list of those who are willing to serve on local Food Production Committees, and to give advice, or lectures, or demonstrations, in their own neighbourhoods to Societies of Allotment holders, or to classes of school children having gardens. The Panel now contains upwards of 1,000 names, and numberless requests for their help are being received. All unavoidable expense will be defrayed by the Society, Committee, or Association making request for such help.

All who are able, willing, and competent to give such help are requested to communicate with the Secretary, R.H.S., Vincent Square, S.W. 1.

A circulating lecture on the Preparation of the Soil and the Cultivation of Vegetable Crops, illustrated by lantern slides, has been prepared by the Society, and can be hired for 5s., the Society paying carriage one way.

Attached to this Panel are also a number of itinerant Advisers, Lecturers, and Demonstrators who will be sent to neighbourhoods and districts where there is no one acting voluntarily.

Arrangements have now been made for Lectures and Demonstrations on Fruit and Vegetable Bottling and Preserving to be given all over the country this season. Anyone who may be prepared to organize and be responsible for the holding of a Meeting for such a purpose should communicate at once with the Secretary, R.H.S., Vincent Square, S.W. 1, giving full particulars, such as (1) where the Meeting will be held, (2) the date suggested, (3) the number expected to be present, (4) what bottles and apparatus can you supply. As long a notice as is anyway possible must be given, as applications will be numerous.

2. IMPORTANT NOTICES.

1. Since the Gardeners' Diary was printed the Society's Hall in Vincent Square has been occupied by the Australian Imperial Force. As a consequence, the Fortnightly Meetings will be held in the London Scottish Drill Hall, Buckingham Gate, Victoria Street. It is hoped that Fellows will do their utmost to support the Fortnightly Meetings during their temporary transference to the Drill Hall.

2. The Lectures will be given at the Drill Hall.

3. The Society's Offices and Library will continue in Vincent Square as heretofore. The Scientific Committee will also meet at Vincent Square.

4. Fellows are requested to strike out the following Meetings printed in the Gardener's Diary :—

Strike out—

October 10.

December 18.

3. SUBSCRIPTIONS.

All annual subscriptions are payable in advance on the 1st day of January in each year. A Fellow, if elected before the 1st of July, pays the annual subscription for the current year; if elected after the 1st of July and before the 1st of October, he pays half a year's subscription; if elected after the 1st of October and before the 1st of January, he pays one full year's subscription, and no further subscription until the following January twelvemonth. To avoid the inconvenience of remembering their subscriptions Fellows can *compound* by the payment of one lump sum in lieu of all further annual payments; or they can, by applying to the Society, obtain a form of instruction to their bankers to pay for them every January 1. It may be a week or more before the Tickets reach the Fellows, owing to the very large number (over 20,000) to be despatched every January. Fellows who have not already given an order on their bankers for the payment of their subscriptions are requested to do so, as this method of payment saves the Fellows considerable trouble. Fellows whose subscriptions remain unpaid are debarred from all the privileges of the Society; but their subscriptions are nevertheless recoverable at law, the Society being incorporated by Royal Charter.

In paying their subscriptions, Fellows often make the mistake of drawing their cheques for Pounds instead of for Guineas. Kindly note that in all cases it is Guineas, and not Pounds. Cheques and Postal Orders should be made payable to "The Royal Horticultural Society," and crossed "London County and Westminster Bank, Victoria Branch, S.W."

4. FORM OF BEQUEST.

I give and bequeath to the Treasurer for the time being of the Royal Horticultural Society, London, the sum of £....., to be paid out of such part of my personal estate as I can lawfully charge with the payment of such legacy, and to be paid free of legacy duty, within six months of my decease; the receipt of such Treasurer to be a sufficient discharge for the same. And I declare that the said legacy shall be applied towards [the general purposes of the Society].*

5. NEW FELLOWS.

The President and Council hope that existing Fellows will enlist the sympathy of all their friends, as owing to the great increase in work which has fallen upon or been voluntarily undertaken by the Society, it is now more important than ever to fill the places of those who are taken from us.

* Any special directions or conditions which the testator may wish to be attached to the bequest may be substituted for the words in brackets.

6. AN APPEAL.

What has been accomplished for the Society is largely due to the unwearied assistance afforded by the Fellows themselves, and as all belong to the same Society, so it behoves each one to do what he or she can to further its interests, especially by:—

1. Increasing the Number of Fellows.
2. Presenting Books for the Library at Vincent Square and at Wisley.
3. Sending new or rare Plants, Seeds, and Roots for the Garden and for distribution to Fellows, and for helping to keep the Hospital Camps in France and Flanders, &c., furnished.*

7. THE SOCIETY'S GARDENS AT WISLEY.

In connexion with the scheme approved at the 1914 Annual Meeting for the further development of the practical and scientific work at Wisley, the Council were fortunate in securing the services of Dr. Keeble, F.R.S., as Director. By friendly arrangement between the Society and the Imperial College of Science, the Wisley Gardens are now the joint Experimental Entomological Station of the Society and the Imperial College. All communications to the Gardens should in future be addressed to "The Director," R.H.S. Gardens, Wisley, Ripley, Surrey.

The Gardens are open daily to Fellows and others showing Fellows' Transferable Tickets, from 9 A.M. till sunset, except on Sundays, Good Friday, Christmas Day, and Exhibition Days. Each Fellow's Ticket admits three to the Gardens. The Public are not admitted at any time.

The Gardens are about $3\frac{1}{2}$ miles from Byfleet, $3\frac{1}{2}$ miles from Horsley, and $5\frac{1}{2}$ miles from Weybridge, all on the South-Western Railway. Carriages to convey four persons can be obtained by writing to Mr. D. White, fly proprietor, Ripley, Surrey; the charge being, to and from Weybridge, waiting two hours at the Gardens, 8s.; or waiting three hours, 10s.; or to and from Horsley or Byfleet, 7s. Motor cars will be found at Byfleet Station. Accommodation and refreshments can be had at the Hut Hotel, close to the Gardens, and also at the Hautboy, Ockham.

8. ROCK GARDEN AT WISLEY.

In response to the interest taken in what are popularly called "Alpines," or "Rock Plants," the Council in 1911 constructed a Rock

* The attention of Fellows is specially called to the Wisley Gardens Endowment Trust Fund, the object of which is to make the Gardens self-supporting for ever, so that the important work to which they are devoted may go on uninterrupted by any fluctuation in the Society's finances. To do this £100,000 is required. In 1914 the Council voted £25,000 towards it as a nucleus. Will not Fellows help to make up this sum?

Garden at Wisley on a somewhat extensive scale. The idea is to obtain the best possible positions and soils for the different plants to grow in, the growth and well-being of the plants being considered to be of greater importance than the artistic effect of the rockwork. In a Horticultural Society's Garden every single detail should teach something, so that Fellows visiting it may be able to take away an idea of how best to do this or that, or where best to plant this or that.

9. STUDENTS AT WISLEY.

The Society admits young men, between the ages of sixteen and twenty-two years, to study Gardening at Wisley. The curriculum includes not only practical garden work in all the main branches of Gardening, but also Lectures, Demonstrations, and Horticultural Science in the Laboratory, whereby a practical knowledge of Garden Chemistry, Biology, &c., may be obtained.

10. DISTRIBUTION OF SURPLUS PLANTS.

A few years ago the Council drew attention to the way in which the annual distribution of surplus plants has arisen. In a large garden there must always be a great deal of surplus stock, which must either be given away or go to the waste-heap. A few Fellows, noticing this, asked for plants which would otherwise be discarded; and they valued what was so obtained. Others hearing of it asked for a share, until the Council felt they must either systematize this haphazard distribution or else put a stop to it altogether. To take the latter step seemed undesirable. Why should not such Fellows have them as cared to receive such surplus plants? It was, therefore, decided to keep all plants till the early spring, and then give all Fellows alike the option of claiming a share of them by Ballot.

Fellows are, therefore, particularly requested to notice that only waste and surplus plants raised from seeds or cuttings are available for distribution. Many of them may be of very little intrinsic value, and it is only to avoid their being absolutely wasted that the distribution is permitted. The great majority also are, of necessity, *very small*, and may require careful treatment for a time.

Fellows are particularly requested to note that a Form of Application and list to choose from of the plants available for distribution is sent in January *every year* to every Fellow, enclosed in the "Report of the Council." To avoid all possibility of favour, all application lists are kept until the last day of February, when they are all thrown into a Ballot; and as the lists are drawn out, so is the order of their execution, the plants being despatched as quickly as possible after March 1.

Of some of the varieties enumerated the stock is small, perhaps not more than twenty-five or fifty plants being available. It is, therefore, obvious that when the Ballot is kind to any Fellow he will receive the majority of the plants he has selected, but when the Ballot has given

him an unfavourable place he may find the stock of almost all the plants he has chosen exhausted. A little consideration would show that all Fellows cannot be first, and some must be last, in the Ballot. Application forms received after March 1 and before April 30 are kept till all those previously received have been dealt with, and are then balloted in a similar way. Fellows having omitted to fill up their application form before April 30 must be content to wait till the next year's distribution. The work of the Garden cannot be disorganized by the sending out of plants at any later time in the year. All Fellows can participate in the annual distribution *following* their election.

The Society does not pay the cost of packing and carriage. Owing to the Railways declining to deliver these parcels any longer they *must* now be sent by post, the postage being prepaid by Fellows. Directions as to the amount of the remittance to be sent will be found on the application form for plants, which kindly consult.

Parcels will be addressed exactly as given by each Fellow on the address label accompanying his application form.

Fellows residing beyond a radius of thirty-five miles from London are permitted to choose double the number of plants to which they are otherwise entitled.

Plants cannot be sent to Fellows residing outside the United Kingdom.

No plants will be sent to Fellows whose subscriptions are in arrear, or who do not fill up their forms properly.

11. A NATIONAL DIPLOMA IN HORTICULTURE.

Most gardeners have welcomed the initiation by the Society of a scheme whereby a National Diploma in Horticulture may be gained by those who pass the Preliminary and Final Examinations. The Diploma is thoroughly "National," for, by the consent of H.M. Government, the Department of Agriculture consented to co-operate with the Society if the Society would undertake the work of organizing the Examinations, and authorized the Diploma bearing the following words: "Awarded by the Royal Horticultural Society under a scheme approved by the Board of Agriculture."

The Examinations, which are held in June, are practical, *viva voce*, and written; the practical part being held in a suitable garden.

Information may be obtained by sending a directed envelope, stamped, to the Secretary, Royal Horticultural Society, Vincent Square, S.W. 1.

12. EXAMINATIONS.

N.B.—A Syllabus of the different examinations can be obtained from the Society's Office, Vincent Square, S.W. 1, post free for 2½d. (See also pages 91 to 94, Book of Arrangements.)

13. INFORMATION.*

Fellows may obtain information and advice from the Society as to the names of flowers and fruits, on points of practice, insect and fungoid attacks, and other questions, by applying to the Secretary, R.H.S., Vincent Square, Westminster, S.W. 1. Where at all practicable it is particularly requested that letters and specimens may be timed to reach Vincent Square by the first post on the mornings of the fortnightly Meetings, so as to be laid before the Scientific or other Committees at once.

14. INSPECTION OF FELLOWS' GARDENS.

The Inspection of Gardens belonging to Fellows is conducted by a thoroughly competent Inspector from the Society, who reports and advises at the following cost—viz. a fee of £3 3s. for one day (or £5 5s. for two consecutive days), together with all out-of-pocket expenses. No inspection may occupy more than two days, save by special arrangement. Fellows wishing for the services of an Inspector are requested to give at least a week's notice and choice of two or three days, and to indicate the most convenient railway station and its distance from their gardens. Gardens can only be inspected at the *written* request of the *owner*.

15. AFFILIATION OF LOCAL SOCIETIES.

One of the most successful of the many branches of the Society's work is the affiliation of local Horticultural Societies to the R.H.S.; no fewer than 300 Societies having joined our ranks.

Secretaries can obtain a specimen Card for the use of Affiliated Societies for Certificates, Commendations, &c. Price, including postage, 4s. for 10 copies, 6s. for 20, 12s. 6d. for 50, 21s. for 100. At the request of several of the Societies, the Council have had the Card coloured. The coloured Card is sold at 1s. a single copy, or 10 for 6s., post free.

The Council have also struck a special Medal for the use of Affiliated Societies. It is issued at cost price in Bronze, Silver, and Silver-gilt—viz. Bronze, 5s. 9d., with case complete; Silver, 12s. 9d., with case complete; Silver-gilt, 16s. 9d., with case complete. Award Cards having the Medal embossed in relief can be sent with the Medal if ordered, price 9d. each.

16. R.H.S. GARDENERS' DIARY.

The R.H.S. Gardeners' Diary for 1918 will contain a considerable quantity of new information. The enormous sale of this Diary

* See R.H.S. Gardeners' Diary, 1917, page 68. "How to send Specimens for Identification."

is sufficient testimony as to its practical utility. Fellows may obtain it post free 1s. 3*d.*, from the R.H.S. Office, Vincent Square, London, S.W. 1; or 2s. 3*d.* if leather bound.

17. RULES FOR JUDGING—1914 CODE.

The "Rules for Judging, with Suggestions to Schedule Makers and Exhibitors," have been revised. The Secretaries of Local Societies are advised to obtain a fresh copy. It will be sent post free on receipt of a postal order for 1s. 9*d.*, addressed to the Secretary, Royal Horticultural Society, Vincent Square, Westminster, S.W. 1.

18. RULES FOR JUDGING COTTAGE AND ALLOTMENT GARDENS.

To assist Allotment Holders and Cottage Gardeners in their competitions, a set of Rules, with hints to both Exhibitors and Judges, has been drawn up. These Rules may be had at twopence a copy, or fifty for 7s. (War Time Issue).

A companion Judges' Sheet in a very convenient book-like form can also be had for 2s. 6*d.* a dozen. This Judges' Sheet has, in tabulated form, a list of the subjects usually grown in allotment gardens, flower gardens, and for window and wall decoration. The allotments or gardens to be judged are all numbered, and columns are provided in the judging sheet for the points given (War issue).

19. R.H.S. POPULAR PRACTICAL PAMPHLETS.

The following pamphlets can be ordered from the Royal Horticultural Society, Vincent Square, London, S.W. 1. They have been prepared with a view of meeting the needs of the present urgent times and will be found eminently practical and useful. Circulation over 200,000. The prices of each are as follows:—

All except *k*.—Single Copy, 3*d.*; 25, 5s. 6*d.*; 50, 8s. 6*d.*; 100, 15s.
k. ,, ,, 6*d.*; 25, 11s.; 50, 17s.; 100, 30s.

- (*k*) Fruit Bottling and Storing, and Vegetable Bottling and Storing (price 6*d.*).
- (*a*) A selected list of Hardy Fruits, with Notes on Cultivation, &c., 1916 Edition.
- (*b*) The Training of Fruit Trees.
- (*c*) The Pruning of Fruit Trees.
- (*d*) Keeping Fruit Trees Clean.
- (*e*) Vegetables and How to Grow them.
- (*f*) Autumn Vegetables from Seed sown in July.
- (*g*) The Herbaceous Garden.
- (*h*) The Rose Garden.
- (*i*) Flowers for Small Gardens, Window Boxes, &c.
- (*j*) Hardy and Half-Hardy Annuals in the Open Air.
- (*m*) Vegetable Cookery.
- (*n*) Salads and Salad Making.
- (*o*) Economy in the Garden.
- (*p*) Medicinal Plants and their Cultivation.

- (q) The Cultivation and Manuring of the Kitchen Garden.
- (r) The Potato as a Garden Crop.
- (s) Fruits under Glass in War Time.
- (t) The Pruning of Hardy Shrubs.
- (u) The Children's Garden.
- (v) The Cropping of the Allotment and Small Garden.

200,000 of these Pamphlets have been issued.

20. TULIP REPORT.

The results of the exhaustive Trial of Tulips at Wisley are now issued as a separate publication, at a charge of 2s. 6d. (3s. post free). This illustrated Report will constitute the standard authority on Tulips for many years to come, and will contain lists of varieties most recommended for various purposes and arranged according to colours. Descriptions will be given of all the Tulips which were grown in the Trials at Wisley, illustrations of the various types of forms and colouring, lists of synonyms, references to the principal literature of the Tulip, &c. To be obtained from the Society's Publishers, Messrs. Wesley & Son, 28 Essex Street, Strand, W.C. 2.

21. LIST OF THE MOST DESIRABLE VARIETIES OF FRUIT.

DRAWN UP BY THE FRUIT COMMITTEE.

Orders for this list may now be given. Its price is 2s. post free. It contains nearly 200 pages, and besides the original list drawn up by the Committee, it gives lists of varieties recommended by nearly 100 expert growers and gardeners all over the country for their respective geographical divisions of Great Britain. The list shows the result of a ballot as to which varieties are to be preferred from such points of view as vigour of constitution, and for various types of growth and cultivation, as, *e.g.*, in the case of Apples—Bush, Standard, Espalier; Pears—Bush, Standard, Espalier, Wall. It also shows the best varieties for cooking as distinct from dessert, the best for markets, and much similar detailed information which must prove of great help in these days when the planting of more fruits as well as of more vegetables is so widely recognized as being of urgent necessity.

22. FRUIT BOTTLING FOR COTTAGERS.

A leaflet for the use of cottagers and small householders, on Fruit Bottling, has been prepared by the Secretary for free circulation. It can be had on application to the R.H.S. Office, Vincent Square, Westminster, S.W. 1, accompanied by a halfpenny *stamped* and addressed envelope. Owing to shortness of staff, any application not thus made cannot receive attention.

23. BOOK ON FRUIT AND VEGETABLE BOTTLING.

Fellows of the Society have shown exceptional interest in the long series of lectures given during this year at the Society's Fortnightly Meetings by Mr. and Mrs. Vincent Banks on Fruit and Vegetable Bottling. They have now, in response to many requests, prepared a book on the subject. The Council, recognizing the value of the information it contains, and the demand for instruction of this kind, have consented to publish it, and it is now ready. It will be found to contain the most up-to-date information on the subject and is most practical. It deals not only with the Bottling of both Fruits and Vegetables, but also with the making of Jam, and the pulping of fruit to be made into jam later on, when sugar supplies are more abundant than they are just now. There are also many useful household recipes, and all the information given is the result of the actual experience of the authors extending over a long number of years. Mr. and Mrs. Banks' exhibits of Bottled Fruits at the Society's Meetings are well known to the Fellows for their excellence. The price of the book which may be obtained from the R.H.S., Vincent Square, London, S.W. 1, is 1s., post paid 1s. 2d.; bound in stiff paper covers.

24. R.H.S. PUBLICATIONS.

In future, Fellows only can obtain the Society's publications from the R.H.S. Office, Vincent Square, S.W. 1. Non-Fellows should order direct from Messrs. Wesley & Son, 28 Essex Street, Strand, W.C. 2, who have been appointed Agents for the Society. (See list, pp. 120-122, Book of Arrangements.)

25. ADVERTISEMENTS.

Fellows are reminded that the more they can place their orders with those who advertise in the Society's Publications the more likely others are to advertise also, and in this way the Society may be indirectly benefited.

26. R.H.S. WAR RELIEF FUND.

On May 1, the total amount received and promised for our War Relief Fund amounted to over £15,500.

The *Daily Telegraph's* Special Correspondent said on March 22, 1917:—

“At each step the troops advancing in French territory yielded by the Germans find fresh evidence of the enemy's systematic devastation. . . . The Germans have methodically ruined the entire country. . . . Fruit trees and bushes especially have been deliberately sawn

off or ringed of their bark, which must kill them, and all the vines, apricots, and plums on the walls have been torn down and destroyed."

Such recent evidence of the need of our Fund for helping to reconstruct these destroyed gardens is surely a sufficient appeal for universal support of our Concert and of our Fund also.

A most generous friend of our Fund, writing under date October 21, 1916, says:—

"I am willing to give £1,000 if you can get a further £9,000 subscribed after October 1, 1916."

Will you not help us to obtain this £1,000 by sending a donation?

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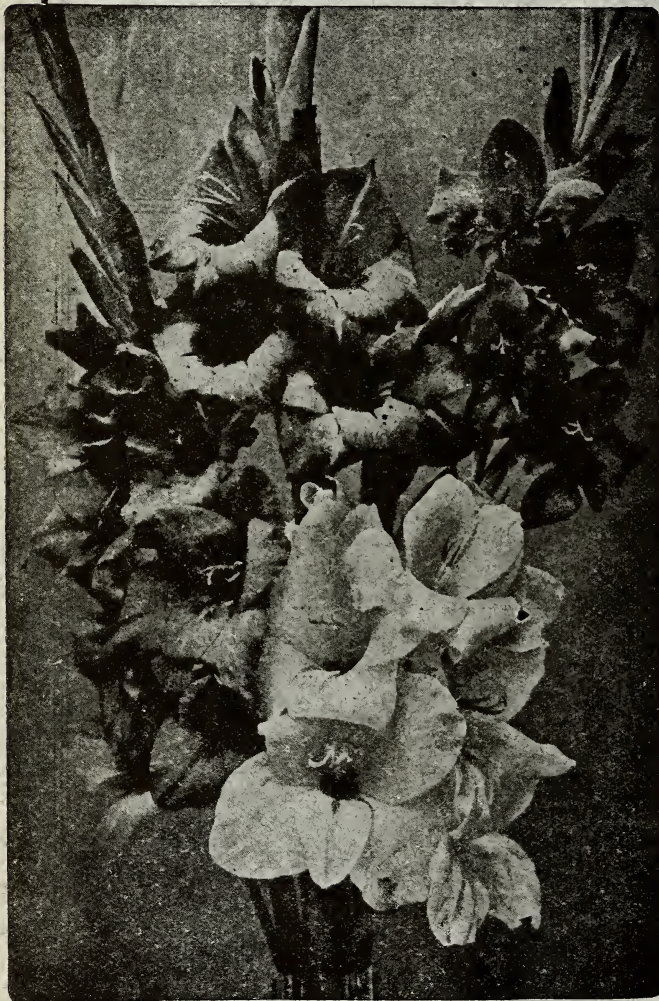
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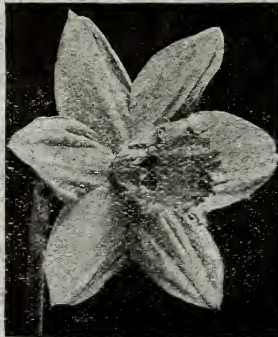
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